

UNIVERSIDADE DE SÃO PAULO  
FACULDADE DE ODONTOLOGIA DE BAURU

ALEXANDRE VINICIUS VIEIRA GONÇALVES BATISTA

**Esthetic perception of facial profile changes in patients treated with  
Jasper Jumper appliance**

**Percepção estética das alterações do perfil facial em pacientes  
tratados com aparelho Jasper Jumper**

BAURU

2022

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Dissertação constituída por artigo apresentada à Faculdade de Odontologia de Bauru da Universidade de São Paulo para obtenção do título de Mestre em Ciências no Programa de Ciências Odontológicas Aplicadas, na área de concentração Ortodontia.

Orientador: Prof. Dr. José Fernando Castanha  
Henriques

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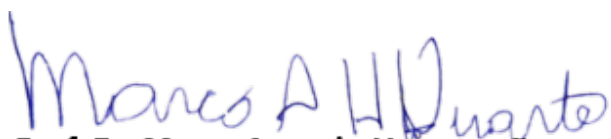
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## DEDICATÓRIA

Dedico esse trabalho...

A **Deus** por me permitir alcançar esse sonho e me guiar pelos melhores caminhos sempre.

Aos meus pais **Marcos** e **Léa** pelo amor incondicional e por me proporcionarem a base de minha educação.

Aos meus irmãos **Arthur** e **Ewerton** pela amizade e companheirismo.

A vocês, dedico minha eterna gratidão e todo meu amor.

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# **ABSTRACT**

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## ABSTRACT

**Title: Esthetic perception of facial profile changes in patients treated with Jasper Jumper appliances**

**Introduction:** In this study, we sought to assess the perception of changes in soft-tissue profile after Jasper Jumper appliance treatment by comparing facial profile silhouettes before treatment, after treatment, and 2 years after treatment, as examined by orthodontists, general dentists, and laypersons. **Materials and methods:** The sample comprised 25 patients of both sexes (female 13, male 12) who were treated with the Jasper Jumper device with an initial mean age of 12.64 years, final mean age 14.0 years and mean long-term control age of 21.0 years, for a period of 20 months or mean of 1.83 years. Three lateral telerradiographs were obtained at different times: initial, after treatment with the Jasper Jumper device and 2 years later the removal of the appliance. The 75 resulting profile silhouettes were evaluated by 120 examiners divided into 3 groups: orthodontists, general dentists, and laypersons. The examiners were instructed to choose their preferred profile and note how much change they perceived across profiles using a visual analog scale. **Results:** All groups of examiners evaluated the silhouettes of the facial profiles similar in the three times: pre-treatment, post-treatment and long-term, not succeeding differences in results, demonstrating that the changes in profile silhouettes were appreciable, although the magnitude of the improvement was quite small, there was no difference. **Conclusion:** Although Jasper Jumper conceives some soft tissue changes, a magnitude of the changes cannot be perceived clinically relevant as statistically significant.

**Keywords:** Class II malocclusion; Orthodontic Appliance; Fixed Functional Appliance.

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# RESUMO

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## RESUMO

**Título:** Percepção estética das alterações do perfil facial em pacientes tratados com aparelho Jasper Jumper

**Introdução:** Neste estudo, procuramos avaliar a percepção de alterações no perfil de tecidos moles após o tratamento com aparelho Jasper Jumper comparando as silhuetas do perfil facial antes do tratamento, após o tratamento e 2 anos após o tratamento, conforme examinado por ortodontistas, dentistas gerais e leigos.

**Materiais e Métodos:** A amostra composta por 25 pacientes de ambos os sexos (feminino 13, masculino 12) que foram tratados com o aparelho Jasper Jumper com idade média inicial 12.64 anos, idade média final 14.0 anos e idade média de controle a longo prazo de 21.0 anos, por um período 20 meses ou média de 1.83 anos. Três Telerradiografias laterais foram obtidas em momentos diferentes: inicial, após o tratamento com o aparelho Jasper Jumper e 2 anos após a remoção do aparelho. As 75 silhuetas de perfil resultantes foram avaliadas por 124 examinadores divididos em 3 grupos: ortodontistas, cirurgiões dentistas e leigos. Os examinadores foram instruídos a escolher seu perfil preferido e anotar quanta mudança eles perceberam entre perfis usando uma escala analógica visual. **Resultados:** Todos os grupos de examinadores avaliaram similar as silhuetas dos perfis faciais distintos nos três tempo: pré-tratamento, pós-tratamento e ao longo prazo, não sucedendo diferenças nos resultados, demonstrando que as mudanças nas silhuetas de perfil foram apreciáveis, embora a magnitude da melhora tenha sido bastante pequena, não houve diferença, eles avaliaram parecidos. **Conclusões:** Embora o Jasper Jumper conceba algumas mudanças no tecido mole, a magnitude das alterações pode não ser percebida clinicamente relevante como estatisticamente significativa.

**Palavras-chave:** Má oclusão de Angle Classe II; Aparelhos Ortodônticos; Aparelho Funcional Fixo.

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## LIST OF ABBREVIATIONS AND ACRONYMS

<b>T1</b>	Pre-treatment, Time 1.
<b>T2</b>	Post-treatment, Time 2.
<b>T3</b>	In The long-term, Time 3.
<b>EVA</b>	Visual Analog Scale.

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# 1 INTRODUÇÃO

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## 1 INTRODUCTION

Class II malocclusion is one of the most frequent among patients seeking orthodontic treatment.<sup>1</sup> They usually present a skeletal component representing great difficulty for the orthodontist, since it has different etiologies, therefore requires different approaches.<sup>2</sup> One of its most important characteristics is mandibular deficiency that produces a convex and retrognathism profile, especially the retracted mental and lower lip in relation to the middle third of the face.<sup>3</sup>

In the Class II molar relationship, the lower first permanent molar is more distal in relation to the upper one, due to class II malocclusion characterized by maxillary prognathism, mandibular deficiency or the involvement of both.<sup>4</sup> There are different characteristics between Class II division 1 (characterized by upper incisor lip version and increased horizontal overbite), and Class II division 2 (characterized by labioversion of the upper incisors and overbite), and Class II division 2 (characterized by linguoversion of the upper incisors and overbite and overbite) vertical increased).<sup>5</sup>

Among the various treatment options for Class II malocclusion functional devices are recognized for their effectiveness reflected in skeletal, dentoalveolar effects and in the facial profile.<sup>6</sup> In the concept of functional appliances is included a variety of fixed or removable devices designed to alter the position of the jaw in order to favor its development by stimulating growth at the level of the cartilage of the condyle in cases of retrognathism mandibular.<sup>7</sup> For this fact, treatment with fixed functional appliances is often indicated in class II correction during growth. The common point among functional orthopedic appliances for the correction of Class II malocclusion is the forced anterior displacement of the mandible, varying only the intermittent or continuous nature of this advance.

The Herbst appliance, introduced in 1905 by Emil Herbst, and its variations are the most well-known and studied fixed functional appliances.<sup>3</sup> The literature reports that about 70% of the effects of treatment are dentoalveolar, with the primary skeletal effect being a short-term increase in mandibular growth, sagittal skeletal relationships, reduced oversorgency and molar relationship.<sup>8</sup>

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More recently, in 1987, the Jasper Jumper appliance was developed by James Jasper, with a mechanism similar to that of the Herbst appliance, with a lower cost.<sup>9</sup> The Jasper Jumper appliance has a fixed device consisting of a flexible force module allowing a light and continuous force through the mandibular feed with the possibility of laterality movements of the jaw. The flexible spring module provided greater freedom for the movement of the jaw than with the Herbst appliance mechanism, which is more rigid.<sup>10</sup>

Rego et al (2017)<sup>11</sup> analyzed changes in the perception of the tegumentary profile in patients with Class II malocclusion treated with Herbst appliance. The sample consisted of 21 patients, 12 girls and 9 boys with an average of 9.5 years treated with Herbst appliances in an average period of 12 months. Three cephalograms were obtained at different times before treatment at the end of treatment and 2 years after treatment. The 120 evaluators divided into 3 groups, orthodontists, general practitioners and lay people used a visual analog scale to score the 63 profile silhouettes of patients. All groups of examiners preferred the post-treatment profiles, both immediately after and during the follow-up period. However, in the quantitative evaluation of the perceived changes in the profiles, these were variable and gently perceived, and the groups of the laity were the ones who most noticed changes in the profiles.

A systematic review of changes in the soft tissues of the face after the use of fixed functional appliances in patients with Class II malocclusion was conducted by Flores-Mir.<sup>12</sup> Even though fixed functional appliances result in significant soft profile changes; the magnitude of the changes may not be perceived as clinically significant. It is concluded that they should be considered with caution because only a secondary level of evidence was found. Three-dimensional quantification of soft tissue alterations is necessary to overcome the current limitations in our understanding of soft tissue changes obtained, with the use of fixed functional appliance.<sup>12</sup>

The use of functional devices has been related to a significant esthetic improvement of the facial profile.<sup>13</sup> Esthetics is currently the reason for greater demand for orthodontic treatment, and every day it is increasingly sought to identify the factors that alter facial balance and harmony.<sup>14</sup>

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Soft tissue analysis represents a set of quantitative measures of facial features. When one or more characteristics are out of the normal range, an individual standard can be designed to determine the treatment plan that will balance the characteristics of optimal facial beauty.<sup>15</sup> It is important to note that the balance of facial structures is affected by orthodontic treatment and growth. Thus, it is essential that the clinician understands the amount and direction of growth that is expected by facial structures, in addition to the effects of treatment.<sup>16</sup>

Paula et al (2017)<sup>17</sup> analyzed the effects on facial profile produced by the mandibular propellant device (PMA) associated with corrective treatment in Class II patients. An album containing the silhouettes of the pre-treatment and post-treatment profiles based on the cephalograms of the patients was prepared for 60 orthodontists and 60 laypeople to choose the most aesthetic silhouette (pre-treatment or post-treatment) and the number of perceived changes between the two silhouettes, according to a visual analog scale. Statistically significant differences were found between preferences in relation to pre-treatment and post-treatment silhouettes for both groups, and post-treatment silhouettes were preferred by most evaluators. According to the visual analog scale, lay evaluators identified greater differences between silhouettes than orthodontists.

Analyzing the facial profile and defining it as normal or not, is a subjective task, because it is already understood by some authors that facial profiles change according to the lived season and also with ethnicity, that is, in different countries we will find values of different normality. The harmonious profile, then, can be considered a variant, depending on ethnic or racial factors and time factors of individuals, and cannot be analyzed exclusively by mean values or numbers.<sup>16</sup> For this it is necessary that orthodontists move away from this skeletal view only. It is important that there is an association of information in planning; skeletal measurements and subjective analysis of facial pattern.

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## **2 PURPOSES**

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## **2 PURPOSES**

Evidence related to long-term profile attractiveness in patients treated with jasper jumper is scarce in the literature. In view of the above, the present study aims to evaluate the perception of laypeople, orthodontists and dentists in relation to the attractiveness of the facial profile of patients after treatment with jasper jumper fixed functional appliance and long-term of 2 years.

# **3 ARTICLE**

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### **3 ARTICLE**

The article presented in this Dissertation was written according to the instructions and guides for submissions of articles of the journal: "American Journal of Orthodontics and Dentofacial Orthopedics" (version Portuguese).

- **Article** – Esthetic perception of facial profile changes in patients treated with Jasper Jumper appliance.

## ABSTRACT

**Title: Esthetic perception of facial profile changes in patients treated with Jasper Jumper appliances**

**Introduction:** In this study, we sought to assess the perception of changes in soft-tissue profile after Jasper Jumper appliance treatment by comparing facial profile silhouettes before treatment, after treatment, and 2 years after treatment, as examined by orthodontists, general dentists, and laypersons. **Materials and methods:** The sample comprised 25 patients of both sexes (female 13, male 12) who were treated with the Jasper Jumper device with an initial mean age of 12.64 years, final mean age 14.0 years and mean long-term control age of 21.0 years, for a period of 20 months or mean of 1.83 years. Three lateral telerradiographs were obtained at different times: initial, after treatment with the Jasper Jumper device and 2 years later the removal of the appliance. The 75 resulting profile silhouettes were evaluated by 120 examiners divided into 3 groups: orthodontists, general dentists, and laypersons. The examiners were instructed to choose their preferred profile and note how much change they perceived across profiles using a visual analog scale. **Results:** All groups of examiners evaluated the silhouettes of the facial profiles similar in the three times: pre-treatment, post-treatment and long-term, not succeeding differences in results, demonstrating that the changes in profile silhouettes were appreciable, although the magnitude of the improvement was quite small, there was no difference. **Conclusion:** Although Jasper Jumper conceives some soft tissue changes, a magnitude of the changes cannot be perceived clinically relevant as statistically significant.

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## INTRODUCTION

Class II malocclusion is one of the most frequent among patients seeking orthodontic treatment.<sup>1</sup> They usually present a skeletal component representing great difficulty for the orthodontist, since it has different etiologies, therefore requires different approaches.<sup>2</sup> One of its most important characteristics is mandibular deficiency that produces a convex and retrognathism profile, especially the retracted mental and lower lip in relation to the middle third of the face.<sup>3</sup>

In the Class II molar relationship, the lower first permanent molar is more distal in relation to the upper one, due to class II malocclusion characterized by maxillary prognathism, mandibular deficiency or the involvement of both.<sup>4</sup> There are different characteristics between Class II division 1 (characterized by upper incisor lip version and increased horizontal overbite), and Class II division 2 (characterized by labioversion of the upper incisors and overbite), and Class II division 2 (characterized by linguoversion of the upper incisors and overbite and overbite) vertical increased).<sup>5</sup>

Among the various treatment options for Class II malocclusion functional devices are recognized for their effectiveness reflected in skeletal, dentoalveolar effects and in the facial profile.<sup>6</sup> In the concept of functional appliances is included a variety of fixed or removable devices designed to alter the position of the jaw in order to favor its development by stimulating growth at the level of the cartilage of the condyle in cases of retrognathism mandibular.<sup>7</sup>For this fact, treatment with fixed functional appliances is often indicated in class II correction during growth. The common point among functional orthopedic appliances for the correction of Class II malocclusion is the forced anterior displacement of the mandible, varying only the intermittent or continuous nature of this advance.

The Herbst appliance, introduced in 1905 by Emil Herbst, and its variations are the most well-known and studied fixed functional appliances.<sup>3</sup> The literature reports that about 70% of the effects of treatment are dentoalveolar, with the primary skeletal effect being a short-term increase in mandibular growth, sagittal skeletal relationships, reduced oversorgency and molar relationship.<sup>8</sup>

More recently, in 1987, the Jasper Jumper appliance was developed by James Jasper, with a mechanism similar to that of the Herbst appliance, with a lower cost.<sup>9</sup> The Jasper Jumper appliance has a fixed device consisting of a flexible force module allowing a light and continuous force through the mandibular feed with the possibility

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A systematic review of changes in the soft tissues of the face after the use of fixed functional appliances in patients with Class II malocclusion was conducted by Flores-Mir.<sup>12</sup> Even though fixed functional appliances result in significant soft profile changes; the magnitude of the changes may not be perceived as clinically significant. It is concluded that they should be considered with caution because only a secondary level of evidence was found. Three-dimensional quantification of soft tissue alterations is necessary to overcome the current limitations in our understanding of soft tissue changes obtained, with the use of fixed functional appliance.<sup>12</sup>

The use of functional devices has been related to a significant esthetic improvement of the facial profile.<sup>13</sup> Esthetics is currently the reason for greater demand for orthodontic treatment, and every day it is increasingly sought to identify the factors that alter facial balance and harmony.<sup>14</sup>

Evidence related to profile attractiveness in patients treated with Jasper Jumper and long-term is scarce in the literature. In view of the above, the objective of this study will be to evaluate the perception of laypeople, orthodontists and dentists in relation to the attractiveness of the facial profile of patients after treatment with Jasper Jumper appliance in the long term.

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## MATERIALS E METHODS

This study was submitted to the Research Ethics Committee FACULDADE DE ODONTOLOGIA DE BAURU, UNIVERSIDADE DE SÃO PAULO, under the number CAAE 37148020.1.0000.5417.

The sample consisted of 25 patients of both genders (12 boys and 13 girls) presenting Class II malocclusion, initial mean age of 12.64 years (D.P= 1.29), (minimum age of 10.1 years and maximum of 14.7 years.) Final mean age 14.0 years (D.P=1.22), (minimum age 12.0 years and maximum of 17.0 years). Mean long-term control age 21.0 years (D.P= 2.08), (minimum age 16.0 years and maximum of 24.0 years). The mean treatment time in these patients was 1.83 years (D.P=0.93). (minimum time 0.4 years and maximum of 4.8 years). All sample belonging to the archive of the Graduate Course in Orthodontics of FOB (Faculty of Dentistry of Bauru), Bauru-SP.

The sample of this retrospective study consisted of 75 lateral facial profile teleradiographs of patients treated with jasper jumper device. All radiographs used in this study were x-rayed at the maximum habitual intercuspitation (MHI). Patients were evaluated pre-treatment (T1), post-treatment (T2) and long-term 2-year (T3). From the teleradiographies, silhouettes of the facial profile of each patient were obtained totaling 75 silhouettes.

Regarding the cephalometric points to obtain the silhouettes of the facial profile were made from the cotorno of the soft tissues (N'), Nasio soft tissue; (Pn) Pro Nasal, (Cm) Columela; (Sn) SubNasal; (Ls) Supeior lip; (Li) Lower lip; (Pg) Mole Pogonium. beyond Frankfurt plane correctly orienting the horizontal plane (Po), Porio;(Or) Orbital; and others (S), Turkish Saddle; (N), Nasius. (Table I, II).

Data collection was performed through the medical records of each FOB patient and full name, date of birth, gender, initial and final age, treatment time were recorded.

The sample size of the teleradiographies was calculated with statistical power of 0.80 and an alpha of 5%, to detect an average difference of 0.5 mm for the ANB angle with standard deviation of 0.5°. <sup>14</sup> The result showed the need for 10 patients in each group. To further increase the power of the test, we chose to select 25 patients for the treatment group.

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Meanwhile, the sample size of evaluators was calculated with beta of 20% and alpha of 5%, to detect an average difference of 1 cm for vas with standard deviation of 1.88 cm. The result showed the need for at least 30 evaluators in each group.

## **INCLUSION CRITERIA**

As inclusion criteria, we selected patients who presented class II skeletal pattern, determined by an ANB angle of 5° or greater, with a minimum molar ratio of 1/2 Class II, overjet equal to or greater than 5mm and without previous orthodontic treatment.

## **EXCLUSION CRITERIA**

Patients with vertical growth pattern, craniofacial development syndromes or abnormalities, dental agenesis and anterior open bite were excluded from the study.

## **LATERAL NORM TELERADIOGRAPHY ANALYSIS**

All teleradiographies were scanned to JPEG format using a ScanMaker i800 scanner with 300dpi resolution to allow the acquisition of images by dolphin imaging 11.5.

All lateral teleradiographies were digitized and analyzed by Dolphin Imaging 11.5 software (Patterson Dental Supply, Inc., Chatsworth, California, USA) by a single examiner (A.V).

The profile silhouettes were obtained using the lateral radiographs scanned by Dolphin Imaging 11.5 (figure 1). In order to minimize the influence of external factors such as age, skin color, hair and other individual characteristics that may affect the response of the evaluators, all images were colored in black and white to obtain only the silhouette of each patient's facial profile. Therefore, the final image was the silhouette of the patient's profile with the Frankfurt plane correctly oriented horizontally and with white background. This all radiographs were edited using the PowerPoint Office 2019 program for Windows 10 (Figure 2).

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## **SILHOUETTE ASSESSTMENT**

Evaluation of the attractiveness of the facial profile was performed from the silhouettes that were obtained from the facial profile of each patient. Three groups of evaluators: Group 1: lay (40), Group 2: orthodontists (43) and Group 3: dentists (41), a total of 124 evaluators participated in the research to evaluate the facial silhouettes of each patient.

The invitation to participate in this study was sent by e-mail and Whatsapp giving access to the address of the respective website for orthodontists, dentists and lay people. They had to register name, year of birth, email, gender, academic background, and the group of orthodontists how many years of experience.

An album was prepared with all the facial silhouettes of the patients. Each page of the album featured a silhouette individually and randomly vertically. As previously suggested, the assessment was performed through a Google form, created exclusively for this search.

A total of 124 examiners participated in the evaluation in the album of access to the address of the respective website containing the 75 silhouettes of the facial profiles divided into three groups of 41 orthodontists, 43 dentists and 40 lay men, the examiners were instructed to choose their preferred profile and note the attractiveness of each silhouette presented at random. they perceived by marking on a visual analog scale (EVA) from 1 to 10, score 1 represents "the least attractive" and "the 10 most attractive" (figure 3).

## **ERROR STUDY**

After 30 days of the first evaluation, the entire sample was evaluated by 38 evaluators (12 dentists, 13 laypeople and 13 orthodontists) and the intraclass correlation coefficient (ICC) was calculated to verify the intra-rater concordance in the EVA scores.

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## STATISTICAL ANALYSIS

All tests will be done on statistical 10.0 software.

To verify the compatibility between the three groups regarding the distribution between genders and ages, the Kruskal-Wallis and Chi-square tests were used.

The data regarding the attractiveness of the profile were described through the means and standard deviations. The evaluation of normality was performed by the Kolmogorov-Smirnov test. In case of normality, the intergroup comparisons related to the attractiveness of the profile had as comparison in the three follow-up times by the analysis of variance for measurements (ANOVA), followed by the Tukey test. In the case of a non-normal distribution, the Kruskal-Wallis test was performed. For intragroup comparisons, ANOVA was performed for repeated measurements or Friedman's test in the absence of normality.

## RESULTS

Table III of the three groups of evaluators were not statistically compatible with gender ( $p=0.027$ ) and age ( $p=0.001$ ).

Table IV shows the mean and standard deviation of aesthetic perception between groups. There was no statistically significant difference in the perception between the groups in T1 ( $p=0.64$ ), T2 ( $p=0.25$ ) and T3 ( $p=0.93$ ).

Table V presents a comparison of intragroup aesthetic perception. Regarding orthodontists, there was no statistically significant difference when compared to the three times ( $p=0.063$ ).

Table VI presents a comparison of intragroup aesthetic perception. Regarding dentists, there was no statistically significant difference when compared to the three times ( $p=0.402$ ).

Table VII presents a comparison of intragroup aesthetic perception. In relation to laypeople, there was no statistically significant difference when compared to the three times ( $p=0.567$ ).

The results of the difference in the perception of attractiveness (T1) initial phase of treatment (T2) final phase of treatment and (T3) in the long term, between the three orthodontist groups, dentists and lay people there was no difference, they evaluated similar. As expected, intragroup comparisons of changes in aesthetic perception. The

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values show that there was no statistically significant difference when compared to the three times performed by the Repeated Measures ANOVA test. When the value in relation to orthodontists ( $p=0.063$ ), dentists ( $p=0.402$ ) and lay people ( $p=0.567$ ), there was no lack of normality. (Table V, VI, VII).

The IIC values were 0.912, 0.887 and 0.764 for dentists, laypeople and orthodontists, respectively, indicating excellent intra-rater agreement.

## DISCUSSION

To quantify the examiner's perceptions of the similarity or difference between profiles T1, T2 and T3, a visual analog scale (VAS) was used. This method has been used in several studies for its simplicity, convenience and agility.<sup>18,19</sup> The analysis of VAS scores for pre-treatment, post-treatment and long-term profiles of 2 years demonstrated that the attractiveness of profiles at all times was similar, indicating that there were no appreciable changes in profile silhouettes. (Table IV)

The literature has already seen some studies evaluating fixed mandibular thrusters by the method of analysis of facial profile silhouettes.<sup>11</sup> Few studies have observed the treatment with the Jasper Jumper appliance and its results of long-term facial profile attractiveness, but none with groups of orthodontists, dentists and lay people as examiners by the method of silhouette analysis.

Foncatti et al (2017)<sup>20</sup> analyzed the long-term stability of Class II treatment with the Jasper Jumper appliance, reporting that the treatment did not cause significant changes in facial profile angles, Despite significant dentoskeletal changes during correction of the anteroposterior discrepancy, there was no significant change in the nasolabial angle; this has also been observed in other studies.<sup>21</sup> Consequently, one should not worry about unfavorable soft tissue changes after treatment with jasper jumper.

A previous study<sup>12</sup> showed that contradictory results were found because the meaning of changes in lip positions depended on the reference plane used, the alteration of the upper lip was associated with increased nasolabial angle, but no direct comparison with other Jasper Jumper studies was feasible.

A study comparing the control group and patients treated with Jasper Jumper devices showed no difference in the mandibular component between the groups, the study concludes that the group treated with Jasper Jumper was effective in restricting

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maxillary growth, protrusion and intrusion of the lower incisors and extrusion of the lower molars.<sup>22</sup> It is noted that there was no significant protrusion of the mandible or a significant increase in its effective length with the use of the Jasper and Jumper appliance therefore, that mandibular growth occurred due to normal growth and development. This is in line with previous studies, which also did not find significant changes in the mandibular component with the use of this device.<sup>23–25</sup>

After the data analyzed, a complement to the existing studies in the literature showed that there are no evident cephalometry alterations in the facial profile after treatment such as Jasper Jumper, and that they are not visually reflected in attractiveness, although stability over time is a positive point. Therefore, the indication of the studied device should take into account the need to change the aesthetic profile of the patient and the prudence of limiting its use to cases with little skeletal discrepancy, caused by mandibular retrognathism.

The intergroup comparisons regarding the attractiveness of the profile compared in the three follow-up times by the analysis of variance for measurements (ANOVA), did not require tukey testing, due to the absence of normality, its values did not show statistically significant difference.

When the treatment phases were evaluated individually by the chosen groups, which were Orthodontists, Dentists and laypeople in the subject, there was no difference in any of them for the attractiveness in each of these treatment phases. According to the evaluators, the profile remained the same as the beginning after treatment and in the long term, in the intragroup tests. This data is interesting considering that not only orthodontists were part of the research and that it may mean that patients themselves, as well as colleagues in other areas, are able to identify whether the profile changes or not after orthodontic treatments. Therefore, the patient's desire and the final prediction of the profile shown in this study, at the time of treatment choice, and in the initial conversation with the patient and/or guardians about the results should be taken into account. Another interesting data is the note given by the participants of the research, and can classify it as an average note for the attractiveness of the profile. We can translate those patients already had an average attractiveness before treatment and that it remained even long-term.

Although the data do not show advantages in the attractiveness of the profile with this type of device in the correction of Class II, it does not mean that the use of it is invalidated. The literature shows that it is indeed effective in class II correction, but has

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limitations such as all orthodontic mechanics. It is up to the professional to know indicated in the most appropriate case. Likewise, we make the caveat that retrospective studies are a great assistant as a guide in cases where there is no possibility of conducting prospective studies, and an indicator of possible future studies. Further studies evaluating the profile prospectively, using Jasper Jumper as a treatment for Class II malocclusion with mild mandibular retrognathism, but with three-dimensional analyses are suggested.<sup>26</sup>

## **CONCLUSIONS**

There was no difference in the perception of attractiveness in the three times of the facial profile T1 pre-treatment, T2 after treatment and T3 in the long term, evaluated among the 3 orthodontist groups, dentists and laypeople.

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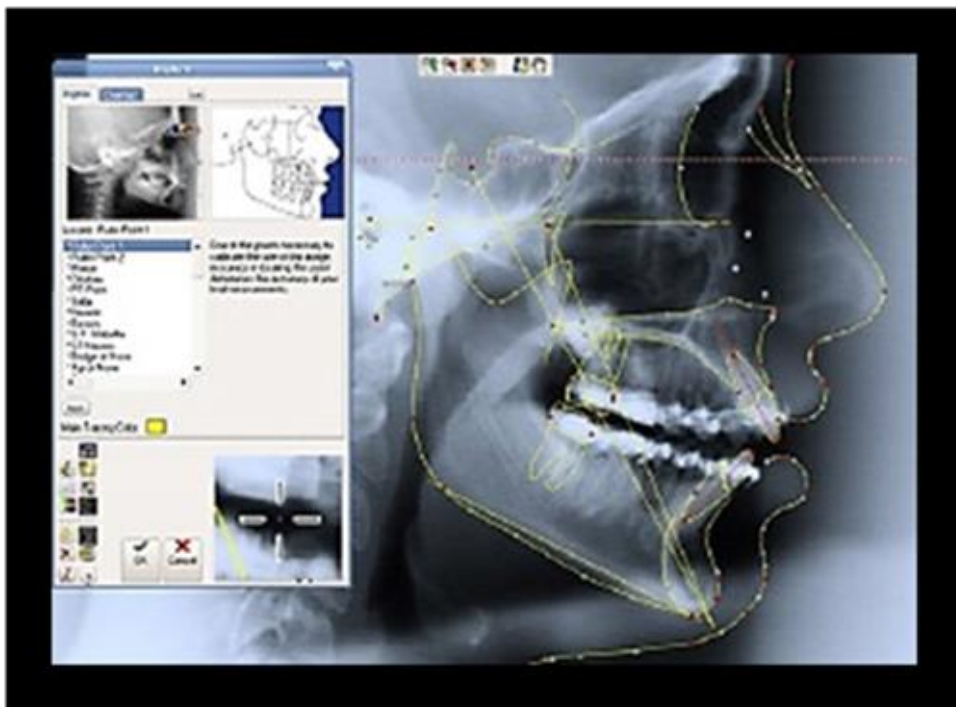
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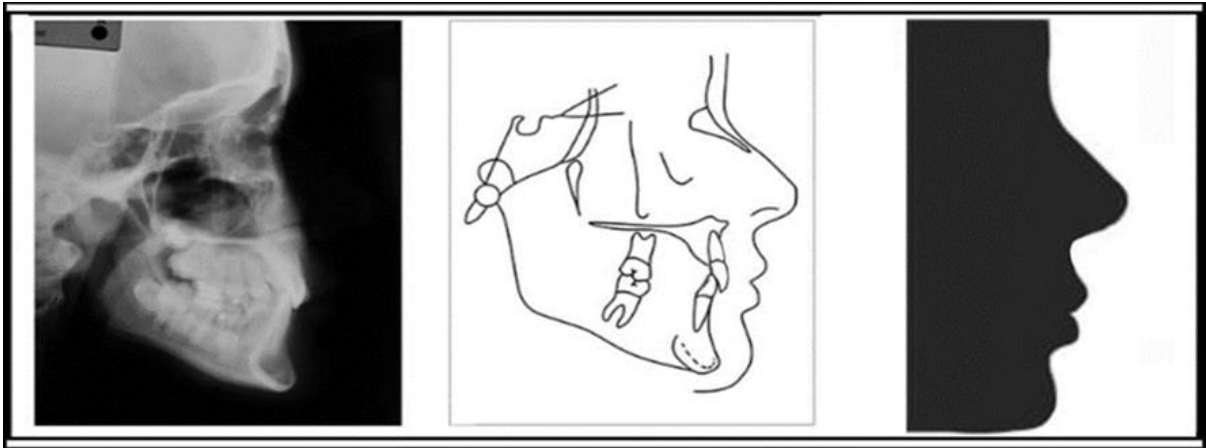
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Figure 1. Software Dolphin Imaging Premium 10.5



**Figure 2.** Steps to get the silhouette of each patient's facial profile





**Table I. Cephalometric Points**

<b>1. N'</b> (Tegumentary Nasius)	Anterior point of the frontonasal suture in the integumentary profile.
<b>2. Prn</b> (Pronasal)	Anterior point of the nasal extremity.
<b>3. Cm</b> (Columela)	Anterior and lower point of the nose.
<b>4. Sn</b> (Subnasal)	Point of intersection between the nose and the upper lip.
<b>5. Ls</b> (Upper lip)	Anterior point of the curvature of the upper lip.
<b>6. Li</b> (Lower lip)	Anterior point of the curvature of the lower lip.
<b>7. Pg</b> (Tegumentary Pogonium)	Anterior ment point in the integumentary profile.
<b>8. N</b> (Nasius)	Anterior point of the frontonasal suture.
<b>9. Or</b> (Orbitary)	Lower midpoint of infraorbital margins.
<b>10. S</b> (Sela)	Point at the center of the bony concavity of the turtid sela.



**Table II. Cephalometric planes, lines and angles.**

(a) Frankfurt Plan	Union of The Pório and Orbitary points.
(b) Nasolabial Angle (ANL) (°)	Angle formed between the line that joins the subnasal points (Sn) and nasal columela (Cn) and another that extends from the subnasal point to the upper lip (Ls). The decreased angle represents a superior dentoalveolar protrusion and the increased angle, a retrusion.

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Table III. Comparison of rater groups (Kruskal Wallis and Chi-square test)

Variable	Orthodontist (n=41)	General Dentists (n=43)	Laypeople (n=40)	P value
Male	12	10	20	0.027*
Female	29	33	20	
Age(y)	30.7 ± 5.06	27 ± 3.21	26.8 ± 3.60	<0.001*

\* Statistically significant at P <0.05

**Table IV. Comparison of attractiveness between raters (One-Way ANOVA)**

Variable	Orthodontist (n=41)		General Dentists (n=43)		Laypeople (n=40)		P value
	Mean	SD	Mean	SD	Mean	SD	
Attractiveness T1	4.27	1.48	3.98	1.26	4.09	1.30	0.64
Attractiveness T2	4.53	1.63	4.08	1.40	4.00	1.31	0.25
Attractiveness T3	4.32	1.63	4.22	1.52	4.20	1.52	0.94

\* Statistically significant at P <0.05

**Table V. Intragroup comparison of attractiveness between orthodontists (Repeated Measures ANOVA)**

Variable	Orthodontist (n=41)		P value
	Mean	SD	
Attractiveness T1	4,27	1,48	0,063
Attractiveness T2	4,53	1,63	
Attractiveness T3	4,32	1,63	

\* Statistically significant at  $P < 0.05$

**Table VI. Intragroup comparison of attractiveness between general dentists (Repeated Measures ANOVA)**

Variable	General Dentists (n=43)		P value
	Mean	SD	
Attractiveness T1	3.98	1.26	0.402
Attractiveness T2	4.08	1.4	
Attractiveness T3	4.22	1.52	

\* Statistically significant at P <0.05

**Table VII. Intragroup comparison of attractiveness between Laypeople (Repeated Measures ANOVA)**

Variable	Laypeople (n=40)		P value
	Mean	SD	
Attractiveness T1	4.09	1.3	0.567
Attractiveness T2	4	1.31	
Attractiveness T3	4.2	1.52	

\* Statistically significant at  $P < 0.05$

## **4 DISCUSSION**

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## **4 DISCUSSION**

This study evaluated the perception of changes in soft tissue profile after treatment with Jasper Jumper appliance by comparing facial profile silhouettes before treatment, after treatment and 2 years after treatment, as examined by orthodontists, general dentists and lay patients.

The sample of this retrospective study consisted of 75 lateral facial profile teleradiographs of patients treated with jasper jumper device. All radiographs used in this study were x-rayed at the maximum habitual intercuspitation (MHI). Patients were evaluated pre-treatment (T1), post-treatment (T2) and long-term 2-year (T3). From the teleradiographies, silhouettes of the facial profile of each patient were obtained totaling 75 silhouettes.

The profile silhouettes were obtained using the lateral radiographs scanned by Dolphin Imaging 11.5 (figure 1). In order to minimize the influence of external factors such as age, skin color, hair and other individual characteristics that may affect the response of the evaluators, all images were colored in black and white to obtain only the silhouette of each patient's facial profile. Therefore, the final image was the silhouette of the patient's profile with the Frankfurt plane correctly oriented horizontally and with white background. This all radiographs were edited using the PowerPoint Office 2019 program for Windows 10 (Figure 2).

A total of 124 examiners participated in the evaluation in the album of access to the address of the respective website containing the 75 silhouettes of the facial profiles divided into three groups of 41 orthodontists, 43 dentists and 40 lay men, the examiners were instructed to choose their preferred profile and note the attractiveness of each silhouette presented at random. they perceived by marking on a visual analog scale (EVA) from 1 to 10, score 1 represents "the least attractive" and "the 10 most attractive" (figure 3).

To quantify the examiner's perceptions of the similarity or difference between profiles T1, T2 and T3, a visual analog scale (VAS) was used. This method has been used in several studies for its simplicity, convenience and agility.<sup>18,19</sup> The analysis of VAS scores for pre-treatment, post-treatment and long-term profiles of 2 years

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demonstrated that the attractiveness of profiles at all times was similar, indicating that there were no appreciable changes in profile silhouettes. (Table IV)

The literature has already seen some studies evaluating fixed mandibular thrusters by the method of analysis of facial profile silhouettes.<sup>11</sup> Few studies have observed the treatment with the Jasper Jumper appliance and its results of long-term facial profile attractiveness, but none with groups of orthodontists, dentists and lay people as examiners by the method of silhouette analysis.

Foncatti et al (2017)<sup>20</sup> analyzed the long-term stability of Class II treatment with the Jasper Jumper appliance, reporting that the treatment did not cause significant changes in facial profile angles, Despite significant dentoskeletal changes during correction of the anteroposterior discrepancy, there was no significant change in the nasolabial angle; this has also been observed in other studies.<sup>21</sup> Consequently, one should not worry about unfavorable soft tissue changes after treatment with Jasper Jumper.

A previous study<sup>12</sup> showed that contradictory results were found because the meaning of changes in lip positions depended on the reference plane used, the alteration of the upper lip was associated with increased nasolabial angle, but no direct comparison with other Jasper Jumper studies was feasible.

A study comparing the control group and patients treated with Jasper Jumper devices showed no difference in the mandibular component between the groups, the study concludes that the group treated with Jasper Jumper was effective in restricting maxillary growth, protrusion and intrusion of the lower incisors and extrusion of the lower molars.<sup>22</sup> It is noted that there was no significant protrusion of the mandible or a significant increase in its effective length with the use of the Jasper and Jumper appliance therefore, that mandibular growth occurred due to normal growth and development. This is in line with previous studies, which also did not find significant changes in the mandibular component with the use of this device.<sup>23-25</sup>

After the data analyzed, a complement to the existing studies in the literature showed that there are no evident cephalometry alterations in the facial profile after treatment such as Jasper Jumper, and that they are not visually reflected in attractiveness, although stability over time is a positive point. Therefore, the indication of the studied device should take into account the need to change the aesthetic profile

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of the patient and the prudence of limiting its use to cases with little skeletal discrepancy, caused by mandibular retrognathism.

The intergroup comparisons regarding the attractiveness of the profile compared in the three follow-up times by the analysis of variance for measurements (ANOVA), did not require tukey testing, due to the absence of normality, its values did not show statistically significant difference.

When the treatment phases were evaluated individually by the chosen groups, which were Orthodontists, Dentists and laypeople in the subject, there was no difference in any of them for the attractiveness in each of these treatment phases. According to the evaluators, the profile remained the same as the beginning after treatment and in the long term, in the intragroup tests. This data is interesting considering that not only orthodontists were part of the research and that it may mean that patients themselves, as well as colleagues in other areas, are able to identify whether the profile changes or not after orthodontic treatments. Therefore, the patient's desire and the final prediction of the profile shown in this study, at the time of treatment choice, and in the initial conversation with the patient and/or guardians about the results should be taken into account. Another interesting data is the note given by the participants of the research, and can classify it as an average note for the attractiveness of the profile. We can translate those patients already had an average attractiveness before treatment and that it remained even long-term.

Although the data do not show advantages in the attractiveness of the profile with this type of device in the correction of Class II, it does not mean that the use of it is invalidated. The literature shows that it is indeed effective in class II correction, but has limitations such as all orthodontic mechanics. It is up to the professional to know indicated in the most appropriate case. Likewise, we make the caveat that retrospective studies are a great assistant as a guide in cases where there is no possibility of conducting prospective studies, and an indicator of possible future studies. Further studies evaluating the profile prospectively, using Jasper Jumper as a treatment for Class II malocclusion with mild mandibular retrognathism, but with three-dimensional analyses are suggested.<sup>26</sup>

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# **5 CONCLUSIONS**

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## **5 CONCLUSIONS**

There was no difference in the perception of attractiveness in the three times of the facial profile T1 pre-treatment, T2 after treatment and T3 in the long term, treated with Jasper Jumper appliance, evaluated among the 3 orthodontist groups, dentists and laypeople.

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# **ANNEXES**

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**ANNEX A** - Research Institutional Board approval, protocol number 37148020.1.0000.5417

USP - FACULDADE DE  
ODONTOLOGIA DE BAURU DA  
USP



**PARECER CONSUBSTANCIADO DO CEP**

**DADOS DO PROJETO DE PESQUISA**

**Título da Pesquisa:** Percepção estética das alterações do perfil facial em pacientes tratados com aparelhos funcionais fixos

**Pesquisador:** ALEXANDRE VINICIUS VIEIRA GONCALVES BATISTA

**Área Temática:**

**Versão:** 3

**CAAE:** 37148020.1.0000.5417

**Instituição Proponente:** Faculdade de Odontologia de Bauru

**Patrocinador Principal:** Financiamento Próprio

**DADOS DO PARECER**

**Número do Parecer:** 4.650.362

**Apresentação do Projeto:**


A amostra deste estudo retrospectivo será constituída de telerradiografias em norma lateral de 24 pacientes avaliados ao início (T1), pós-tratamento (T2) e a longo prazo (T3). A partir das telerradiografias serão obtidas silhuetas do perfil facial de cada paciente, totalizando 72 silhuetas. Leigos (20) ortodontistas (20) e cirurgiões-dentistas (20) avaliarão um álbum contendo as silhuetas de perfil facial através de um formulário Google, atribuindo notas de 0 (pouco atraente) a 10 (muito atraente) usando uma escala visual analógica. Na avaliação serão apresentadas as imagens das silhuetas de perfil facial aleatoriamente. A percepção estética de cada grupo de indivíduos será comparada nos três tempos de acompanhamento. Além disso, será realizada uma comparação intragrupo para avaliar as mudanças na percepção de cada um dos grupos de avaliadores. Caso as variáveis apresentem distribuição normal as comparações intergrupo serão realizadas através da análise de variância (ANOVA) a um critério, seguida do teste Tukey. No caso de uma distribuição não normal o teste de Kruskal-Wallis será realizado. Para as comparações intragrupo será realizada a ANOVA para medidas repetidas ou o teste de Friedman na ausência de normalidade.

**Objetivo da Pesquisa:**

Avaliar a percepção estética de leigos, ortodontistas e cirurgiões-dentistas em relação as

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mudanças no perfil facial de pacientes após o tratamento com aparelhos funcionais fixos e a longo prazo.

**Avaliação dos Riscos e Benefícios:**

A pesquisa apresenta riscos mínimos por utilizar apenas dados secundários. O risco a exposição dos dados e imagens dos participantes (pacientes e avaliadores) deve ser ressaltado, logo os pesquisadores serão responsáveis pelo controle e armazenamento devidos, para assegurar a confidencialidade e a privacidade, a proteção da imagem e a não estigmatização, garantindo a não utilização das informações em prejuízo das pessoas e/ou das comunidades, inclusive em termos de autoestima, de prestígio e/ou econômico – financeiro.

Os participantes serão beneficiados diretamente com o ganho do conhecimento dos ortodontistas e cirurgiões-dentistas com relação à estética facial com os resultados desta pesquisa e conclusão da mesma.

Esta pesquisa pode oferecer incômodos mínimos aos participantes, principalmente em relação ao tempo que deverá ser disponibilizado para o preen

**Comentários e Considerações sobre a Pesquisa:**

A pesquisa visa, pela análise de 72 telerradiografias em norma lateral, bem como os seus respectivos resultados (análises cefalométricas), por 60 avaliadores, sendo 20 leigos, 20 ortodontistas e 20 cirurgiões-dentistas,

avaliar a percepção estética de leigos, ortodontistas e cirurgiões-dentistas em relação as mudanças no perfil facial de pacientes após o tratamento com aparelhos funcionais fixos, a médio e longo prazo. Essa análise será realizada por meio digital, on line e o TCLE dos participantes será um formulário do Google Forms.

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Cartão de Parecer - 4.030.302

**Considerações sobre os Termos de apresentação obrigatória:**

Estão adequados

**Recomendações:**

Corrigir formatação dos TCLEs antes de solicitar assinatura dos participantes

**Conclusões ou Pendências e Lista de Inadequações:**

Projeto aprovado

**Considerações Finais a critério do CEP:**

Esse projeto foi considerado **APROVADO** na reunião ordinária do CEP de 07/04/2021, via Google Meet, devido à pandemia da COVID-19 e por orientações da CONEP, com base nas normas éticas da Resolução CNS 466/12. Ao término da pesquisa o CEP-FÓB/USP exige a apresentação de relatório final. Os relatórios parciais deverão estar de acordo com o cronograma e/ou parecer emitido pelo CEP. Alterações na metodologia, título, inclusão ou exclusão de autores, cronograma e quaisquer outras mudanças que sejam significativas deverão ser previamente comunicadas a este CEP sob risco de não aprovação do relatório final. Quando da apresentação deste, deverão ser incluídos todos os TCLEs e/ou termos de doação assinados e rubricados, se pertinentes.

**Este parecer foi elaborado baseado nos documentos abaixo relacionados:**

Tipo Documento	Arquivo	Postagem	Autor	Situação
Informações Básicas do Projeto	PB INFORMAÇÕES_BASICAS_DO_PROJETO_1608794.pdf	24/02/2021 23:30:10		Aceito
Outros	Documento.pdf	24/02/2021 23:27:45	ALEXANDRE VINICIUS VIEIRA GONCALVES BATISTA	Aceito
TCLE / Termos de Assentimento / Justificativa de Ausência	TCLEpaciente.docx	04/02/2021 15:28:07	ALEXANDRE VINICIUS VIEIRA GONCALVES BATISTA	Aceito
TCLE / Termos de Assentimento / Justificativa de Ausência	TCLEexaminador.docx	04/02/2021 15:27:50	ALEXANDRE VINICIUS VIEIRA GONCALVES BATISTA	Aceito
Outros	PARECERCONSUBSTNCIADODOCEP.pdf	20/10/2020 22:21:41	ALEXANDRE VINICIUS VIEIRA GONCALVES BATISTA	Aceito
Projeto Detalhado	ProjetoDePesquisa.pdf	20/10/2020	ALEXANDRE	Aceito

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Continuação do Parecer: 4.650.362

7 Brochura Investigador	Projeto de Pesquisa.pdf	22:19:55	VINICIUS VIEIRA GONCALVES BATISTA	Aceito
Outros	Checklist CEP.pdf	20/10/2020 22:07:00	ALEXANDRE VINICIUS VIEIRA GONCALVES BATISTA	Aceito
Declaração de Pesquisadores	Declaracao de compromisso Pesquisador.pdf	19/08/2020 16:26:22	ALEXANDRE VINICIUS VIEIRA GONCALVES BATISTA	Aceito
Declaração de Instituição e Infraestrutura	Termo de Aquisição.pdf	19/08/2020 16:24:54	ALEXANDRE VINICIUS VIEIRA GONCALVES BATISTA	Aceito
Folha de Rosto	folhadeRosto.pdf	14/08/2020 15:43:25	ALEXANDRE VINICIUS VIEIRA GONCALVES BATISTA	Aceito

**Situação do Parecer:**

Aprovado

**Necessita Apreciação da CONEP:**

Não

BAURU, 14 de Abril de 2021

Assinado por:

**Juliana Fraga Soares Bombonatti  
(Coordenador(a))**

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