GRADUATION PROJECT

Degree in Dentistry

EVALUATION OF PATIENT SATISFACTION WITH ORTHODONTIC TREATMENT

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RESUMEN

Introducción: La ortodoncia es una especialidad clave que ha revolucionado la odontología, corrigiendo maloclusiones y mejorando tanto la función como la estética. Esta tesis investiga el impacto del tratamiento ortodóncico en la salud oral y la calidad de vida, con un énfasis específico en los factores que afectan la satisfacción de los pacientes, tales como la duración del tratamiento, los niveles de dolor y/o molestias, el costo y la comunicación con el ortodoncista. **Objetivos:** El objetivo de este estudio es determinar los factores que influyen en la satisfacción de los pacientes con el tratamiento ortodóncico, comparando los niveles de satisfacción entre los usuarios de brackets y alineadores. **Metodología:** Se distribuyó una encuesta mediante un formulario de Microsoft en España, dirigido a personas que se sometieron a tratamiento ortodóntico. Los participantes respondieron preguntas sobre su elección del aparato ortodóncico, su historial y su satisfacción con varios aspectos del tratamiento. **Resultados:** Se obtuvieron 90 respuestas. El 60% optó por brackets tradicionales, el 28% por alineadores y el 12% usó ambos. En cuanto a la duración del tratamiento, el 64% de los usuarios de alineadores estaban satisfechos, frente al 51% de los que usaron brackets. La satisfacción con el dolor fue similar (24% en ambos grupos). En relación al costo, el 47% de los pacientes con brackets y el 44% de los de alineadores estaban satisfechos. La satisfacción con la sonrisa post-tratamiento fue alta en ambos grupos (80% para alineadores y 78% para brackets). **Conclusión:** La satisfacción del paciente influye en la experiencia general del tratamiento, siendo similar en ambos grupos, lo que sugiere que ambas modalidades pueden lograr resultados efectivos con satisfacción.

PALABRAS CLAVE

Odontología, Ortodoncia, Satisfacción del paciente, Brackets, Alineadores

ABSTRACT

Introduction: Orthodontics is a key specialty that has revolutionized dentistry by correcting malocclusions and enhancing both function and aesthetics. This thesis investigates the impact of orthodontic treatment on oral health and quality of life, with a specific emphasis on factors influencing patients' satisfaction, such as treatment duration, pain/discomfort levels, cost, and communication with the orthodontist. **Objectives:** The purpose of this study is to determine the factors that influence patient satisfaction with orthodontic treatment, while comparing satisfaction levels between braces and aligners users. **Methodology:** A Microsoft form survey was distributed in Spain through university networks, targeting individuals who underwent orthodontic treatment. Participants responded to questions about their background, choice of orthodontic appliance, and satisfaction with various aspects of their treatment. **Results:** Applying the established inclusion and exclusion criteria, a total of 90 answers to the survey were obtained. Most respondents (60%) opted for traditional braces, 28% chose clear aligners, and 12% were treated with both. When comparing the selected factors between both groups, only minimal discrepancies were observed. Regarding treatment duration, 64% of aligner users were satisfied or very satisfied, compared to 51% of braces users. Pain/discomfort satisfaction levels were similar at 24% in both groups. Regarding cost, 47% of braces patients and 44% of aligner patients were satisfied, with a slightly higher dissatisfaction in the aligner group. Post-treatment smile satisfaction was high in both groups, with 80% in the aligner group and 78% in the braces group. **Conclusion:** Patient satisfaction with orthodontic treatment plays an important role in the overall experience. It is influenced by factors such as pain, treatment duration, cost, communication, and aesthetics. Although some differences were observed between aligners and braces, the disparities were minimal, suggesting both treatments achieve effective outcomes with patient satisfaction.

KEYWORDS

Dentistry, Orthodontics, Patients Satisfaction, Braces, Aligners

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1. INTRODUCTION

1.1 Overview of orthodontics

1.1.1 Definition

Orthodontics is a term that originates from the Greek term "Orthos" that signifies normal or correct, and from the term "Odontos" that means teeth (1). It is a key specialty that has been introduced by Lefoulon into the dental field in the late nineteenth century (1841) (2). This branch of dentistry has a functional, as well as an aesthetic impact on teeth. It is related to an individual´s facial growth, jaw disproportional relationship, malocclusion and development of the dentition. Orthodontics treatments can be applied on both children and adults in order to achieve an ideal occlusion, meaning that the teeth are in the most favourable anatomical position between the maxillary and the mandibular arches (1). Any abnormalities in occlusion exceeding the standard range is considered as a malocclusion (1). These irregularities can be caused by environmental factors, such as atypical harmful oral habits (thumb sucking, mouth breathing and lip biting) and hereditary factors, or in most cases by both simultaneously (3).

1.1.2 Importance of orthodontic treatment on oral health

Being the third most prevalent dental issue after dental caries and periodontal diseases, malocclusion has a negative impact on oral health, ranging from minor aesthetic problems to serious craniofacial deformities and other functional problems (4). If left untreated, malocclusion can cause the development of tooth decays, the risk of periodontitis, the risk of dental trauma, as well as TMJ disorders (3). In addition to that, it can compromise the normal functioning of the oral cavity, leading to difficulties in breathing, speaking or masticating properly (4). Altered masticatory function is in fact related to patients affected by an important discrepancy between the upper and the lower arch, such as anterior open bites, significantly increased overjet and severe hypodontia (1). These unfortunate consequences will indeed affect the patients quality of life, social interactions, as well as their psychological well-being (4).The unesthetic features related to these anomalies, especially in severe malocclusions; have a negative

impact on an individual´s self-image and are related to a lower self-esteem. (1). In fact, malocclusion can be characterized by overcrowded teeth, an excessively increased overjet, deep overbite, anterior/posterior crossbites, ectopic erupting canines, extreme hypodontia and an intermaxillary discrepancy in relation to the size or alignment (5,6). This teeth misalignment allows the accumulation of dental plaque in the oral cavity, thus, it will result in a poor oral hygiene maintenance and a difficult mechanical removal with the toothbrush, leading to an increase of dental caries (7). Even though the association between malocclusion and tooth decays is still debatable, the use of an orthodontic treatment in caries-susceptible individuals, such as those with special needs is undeniably beneficial, as it decreases the risk of food retention in the oral cavity (1).This plaque accumulation due to the hindered removal and the irregular tooth positioning is also related to periodontitis, which is defined as an inflammatory disease of the gums and the supporting structures of the teeth (8). In fact, it is a multifactorial disease caused mainly by the bacterial biofilm around the tooth, as well as other factors such as plaque and calculus build-up, systemic health and the environment (9). Therefore, this accumulation will lead to the penetration and progression of the inflammation into the periodontal tissues; resulting in the irritation and loss of connective tissue, as well as the alveolar bone destruction (8). In addition to that, malocclusion can produce trauma in the oral cavity, which is potentially linked to the development of periodontal pockets, as a result of the weakening of the periodontium. Consequently, infra-bony or supra-bony pockets with occlusal trauma are more susceptible to become deeper and more affected than those without trauma (10).

1.1.3 Aim of orthodontics

The rising incidence of malocclusions worldwide has led to an increasing for orthodontic treatment demand (11). An orthodontic treatment consists in the proper diagnosis of an individual´s malocclusion and a treatment plan to correct it, by the means of light and continuous corrective forces (6). Functionally, its aim is to improve the patient´s overall dental health and amplify the efficiency of the oral function, meaning, the ability to masticate, swallow and speak normally (1). Whereas aesthetically, it is used to treat dental anomalies that affect the alignment and the appearance of the teeth and, in some

extreme cases, it can even influence the movement of the entire dental arch (1). The purpose in that case is to achieve an aesthetic harmony, making the patient more visually appealing (12). Nevertheless, the need for orthodontic treatment is contingent upon the severity and the impact of the malocclusion on teeth (1).

1.2 Different types of orthodontic appliances

Throughout the years, orthodontic appliances have significantly evolved, whilst being the mainstay of each treatment and the sole source of the force production mechanism (13). Different types of appliances exist in order to manage malocclusions and can be used individually or in conjunction (1).

1.2.1 Fixed appliances

Fixed orthodontic appliances are firmly attached to the patient´s teeth, by the means of fixing attachments, also called brackets or by being bonded to the enamel surface with a composite cement (12). Designed to remain in a stable position and not be removed by the patient, fixed orthodontic appliances are ideal for managing cases involving multiple tooth movements, such as rotations and bodily tooth repositioning in order to treat malocclusions (12). In fact, these appliances have gone through an evolution, from being known as Begg´s approach to being preadjusted multiple times into other techniques, such as Edgewise, modified Edgewise, straight wire and lingual technique (12). Regardless of the technique used, they have to be easy to place, activate as well as straightforward when it comes to movements like tooth rotation, pulling or pushing. The aim is to remain stationary while allowing applied forces and avoiding any damage to the tissues, be it during the appliance´s placement or during its voluntary removal.

1.2.2 Removable appliances

Being able to be taken off and placed back by the patient, removable appliances are considered as ideal to manage lesser complex cases that require mild to moderate orthodontic tooth movements , such as tipping movements (12,14). These appliances have been introduced to the orthodontic field in the late 1990s and involve clear aligners; such as Invisalign (Align Technology) and retainers (14). Due to its comfort and

aesthetic, Invisalign is the one that stands out the most (15). Indeed, it is the first orthodontic device developed based on three-dimensional (3D) digital technology to correct different malocclusions.

1.3 Factors affecting patients' satisfaction

Although the clinical outcome of an orthodontic treatment, such as correcting malocclusion or improving the overall appearance is a primary determinant when seeking orthodontic care, patients´ satisfaction with the overall experience is a key indicator (16). In fact, it is an important benchmark of the quality of healthcare services provided by the orthodontist and his staff (16). Among the most prominent factors affecting the patient´s fulfillment is enhanced dental function and aesthetics, the level of pain and/or discomfort perceived, the treatment period, and the quality of communication between the patient and the orthodontist (17). Extending beyond clinical factors, psychological aspects, such as improved self-esteem and enhancement in overall quality of life, have a great importance in shaping patients´ perception regarding the success of their treatment and can have significant impact on their general experience, whether positive or a negative (16,17).

1.4 Justification

Patient satisfaction is a key element when assessing the success of orthodontic treatment. While clinical outcomes such as correcting malocclusion and aligning teeth are important, the patient´s perspective regarding aesthetics, comfort, treatment cost, communication with the orthodontist, and the overall experience are crucial components that tend to be overlooked. With the increasing variety of traditional braces and clear aligners, evaluating patient fulfilment promotes treatment adherence and enhances patient-centred care.

1.5 Research question

The primary research question for this investigation is: "To what extent do factors such as aesthetic, comfort, cost and treatment duration impact patient satisfaction in

orthodontic treatment with traditional braces compared to clear aligners?". This question will be addressed through a survey distributed to patients in Spain.

2. OBJETIVES

2.1 Primary objective

The main objective of this empirical research is to compare the level of satisfaction between patients who have been treated with orthodontic braces and aligners (Invisalign).

2.2 Secondary objective

The secondary objective of this empirical research is to determine the factors that affect patient satisfaction with orthodontic treatment.

3. MATERIAL AND METHODS

3.1 Survey creation

3.1.1 Data collection

In order to investigate the factors affecting patient satisfaction with orthodontic treatment, a cross-sectional survey of 18 questions was designed, of which the data processing authorization was presented through an informed consent (Annex 1). The platform chosen for this empirical study is Microsoft Forms, due to its several advantages. Microsoft Forms provides an easy access for participants, allowing them to complete the survey on any device with an internet connection, while ensuring data protection and preserving their confidentiality. The survey was developed following a comprehensive literature review on patient satisfaction with orthodontic treatment, conducted through PubMed. The research was limited to peer-reviews studies, including systematic reviews, observational studies, and clinical guidelines, published within the last 10 years, with the exception of two articles from 2010 and 2011 which were included due to the importance of information they contained.

3.1.2 Criteria of Inclusion and Exclusion

The study participants were restricted to patients who have had an orthodontic treatment or are still in the process of it, in Spain. Patients aged below 18 years old were excluded from this survey. Patients who were treated with appliances other than braces or aligners were as well not included.

3.1.3 Survey Design

The survey was designed into two main parts:

- Part 1: General questions such as the gender, the age and the types of braces used were asked to the patient.
- Part 2: Questions about patients' experience were addressed, in order to have a better understanding of the possible factors affecting their satisfaction.

3.2 Survey Distribution

The survey´s link was distributed through QR codes and placed thoughtfully in various points of access, such the Universidad Europea de Madrid and its affiliated policlinic.

3.3 Ethical Considerations

Prior to initiating this empirical research, relevant ethical approvals were obtained from the appropriate institutional authorities (Annex 2). All participants were fully informed about the study´s purpose and their voluntary participation. In order to participate, they had to sign an informed consent (Annex 1). In addition to that, their privacy was carefully maintained and no confidential information was collected.

4. RESULTS

A response from 93 participants was achieved with this study. However, from the initial 93 participants, 3 of them have failed to answer all the questions regarding the factors affecting patients´ satisfaction with their orthodontic treatment. Therefore, they are not included in this descriptive analysis. The answers to the questions of the Microsoft Form survey are as follows:

4.1 Patient´s background

From the patients who have completed this survey, 73% of them are females and 27% of them are males. Within the female group, 32% have had an orthodontic treatment with aligners (Invisalign), 59% have had braces (buccal and/or lingual) and 9% have had a combination of both braces and aligners. Regarding the male group, 17% of them have been treated with aligners, 62% with braces (buccal and/or lingual) and 21% with a combination of both.

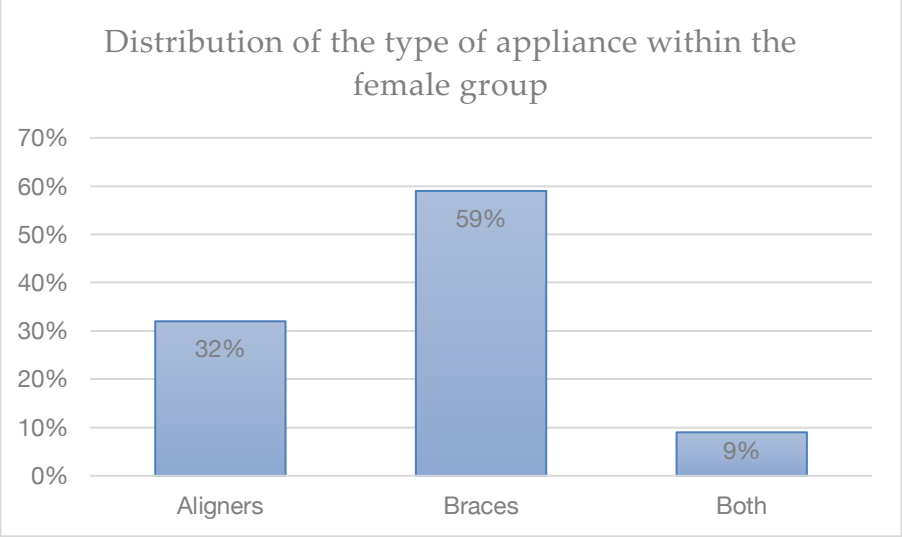

Figure 1: Distribution of the type of appliances within the female group

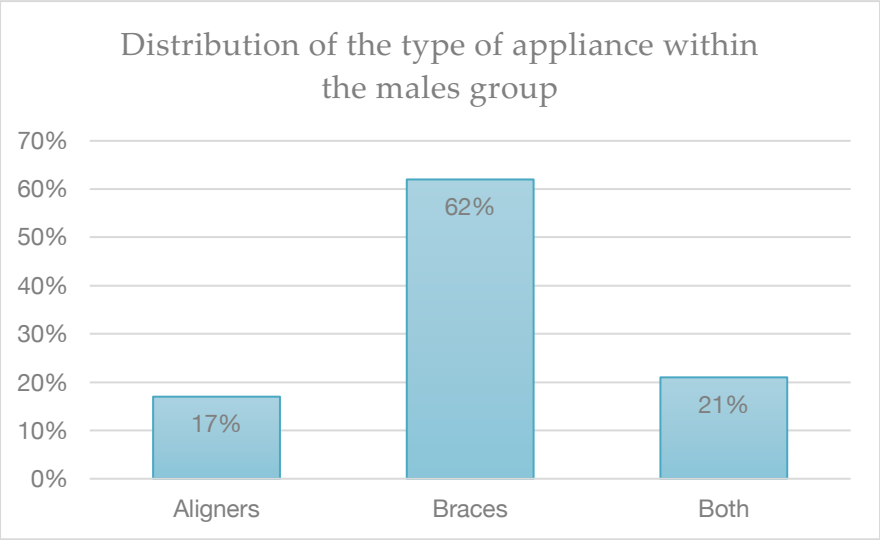

Figure 2: Distribution of the type of appliance within the male group

The survey was designed to target different age groups. As highlighted in figure 3, 80% of the participants are aged between 18-24 years old, whereas 19% of them are between 25-30 years old. Only 1% are aged between 31-40 years old. These results are expected, as the survey has been mainly distributed at the Universidad Europea de Madrid and its policlinic.

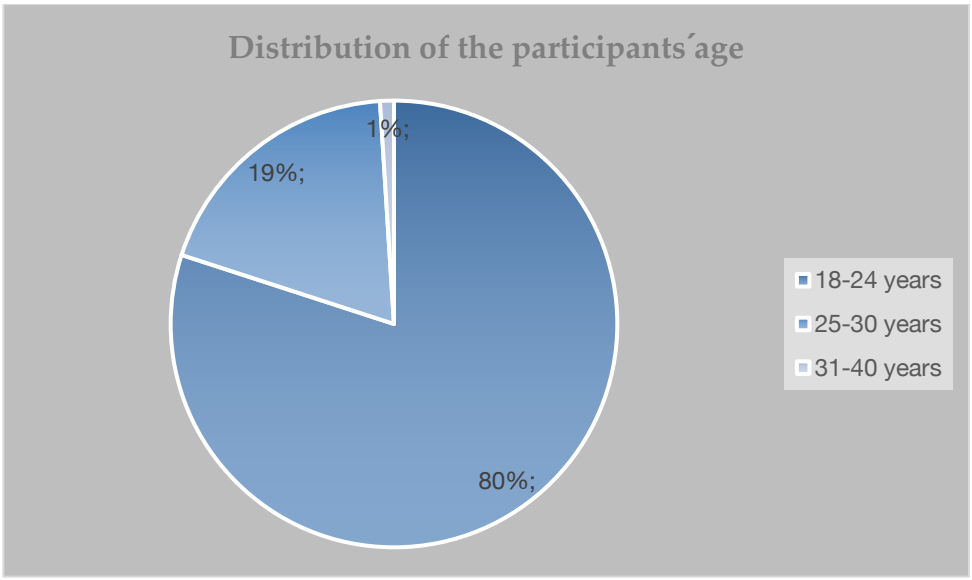

Figure 3: Distribution of the participants ´age

Regarding the type of orthodontic appliances selected for treatment, the majority of patients (60%) opted for traditional braces (buccal and/or lingual). A smaller portion (28%) chose clear aligners (Invisalign), while 12% reported undergoing a treatment that

involved a combination of both braces and aligners. In terms of the reasons that led patients to initiate orthodontic treatment, the majority (54%) reported aesthetic concerns as the primary reason. Functional reasons accounted for 16% of cases, while 24% of patients began their treatment following professional recommendations, either from a dentist or an orthodontist. Finally, only 6% reported that personal influence, such as advice from family members or friends, as their main motivation.

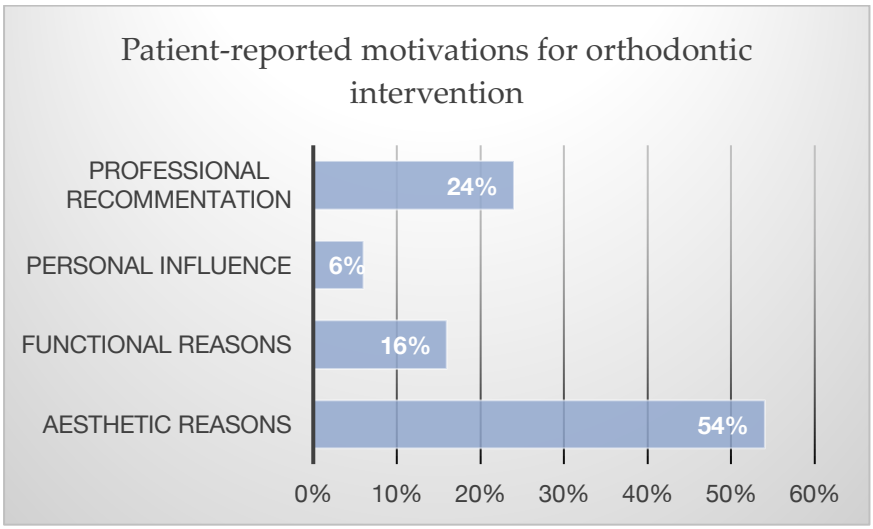

Figure 4: Distribution of orthodontic patients by motivation for treatment Initiation

4.2 Factors affecting patients' satisfaction with their orthodontic treatment

In this descriptive analysis, it was decided to focus on patients who underwent orthodontic treatment using either braces or clear aligners (Invisalign). Table 1 and 2 represent the percentage distribution of satisfaction levels regarding the factors addressed in the survey, using a Likert scale ranging from 1 (lowest satisfaction) to 5 (highest satisfaction).

4.2.1 Clinical and procedural determinants of satisfaction

Survey questions	Levels of satisfaction	Aligners	Braces (Buccal and lingual)
7. How satisfied are you with the alignment of your teeth?	1	0%	2%
	2	0%	4%
	3	16%	11%
	4	52%	48%
	5	32%	35%
8. How satisfied are you with the quality of care provided by your orthodontist?	1	0%	4%
	2	8%	2%
	3	20%	9%
	4	36%	44%
	5	36%	41%
9. How would you rate the clarity of the treatment process explained by your orthodontist before starting?	1	0%	4%
	2	4%	9%
	3	32%	27%
	4	24%	30%
	5	40%	30%
10. How satisfied are you with the duration of your treatment?	1	4%	9%
	2	12%	17%
	3	20%	23%
	4	44%	34%
	5	20%	17%
11. How would you rate the level of pain or discomfort during the treatment?	1	0%	2%
	2	32%	33%
	3	44%	41%
	4	20%	20%
	5	4%	4%
12. How would you rate the quality of communication with your	1	0%	2%
	2	4%	6%
	3	24%	20%

orthodontist and their staff?	4	56%	37%
	5	16%	35%
14. How satisfied are you with the cost of your orthodontic treatment?	1	8%	0%
	2	12%	9%
	3	36%	44%
	4	28%	30%
	5	16%	17%

Table 1: Answers of participants regarding the factors that affect orthodontic treatment

4.2.2 Aesthetic and psychosocial impact of orthodontic treatment

Survey questions	**Level of satisfaction**	**Aligners**	**Braces (Buccal and lingual)**
6. How satisfied are you with the overall outcome of your orthodontic treatment?	1	0%	4%
	2	0%	4%
	3	4%	7%
	4	64%	52%
	5	32%	33%
15. How satisfied are you with the overall appearance of your smile post-treatment?	1	0%	2%
	2	8%	5%
	3	12%	15%
	4	48%	37%
	5	32%	41%
16. How would you rate the impact of the orthodontic treatment on your self-esteem?	1	0%	0%
	2	4%	2%
	3	8%	13%
	4	48%	47%
	5	40%	38%
17. Have you experienced any changes in your social interactions and/or quality	1	8%	6%
	2	0%	2%
	3	44%	41%
	4	20%	31%

of life as a result of your orthodontic treatment?	5	28%	20%
18. Would you recommend this treatment to a friend or a relative?	Positive	64%	61%
	Neutral	32%	30%
	Negative	4%	9%

Table 2: Answers of participants regarding their overall experience and outcomes with orthodontic treatment

4.3 Factors selected for further investigation

When evaluating the different factors affecting patient´s satisfaction with orthodontic treatment, particular focus was placed on four main aspects: levels of pain and/or discomfort, the cost of the treatment, treatment duration and patient´s overall fulfillment with the post-treatment smile. These factors were chosen over the others as they tend to appear more prominent in daily experiences and are usually a recurrent topic of discussion among patients when mentioning getting an orthodontic treatment, whether with their orthodontist or with their relatives.

4.3.1 The duration of the treatment

Table 1 and figure 5 illustrate the level of satisfaction regarding the treatment duration among participants treated with clear aligners and those with braces. On one hand, among the clear aligner group, 4% expressed dissatisfaction, 12% were somewhat dissatisfied, while 20% remained neutral. A majority, 44%, reported being satisfied with the duration, while 20% indicated they were very satisfied. On the other hand, patients treated with traditional braces reported a slightly higher dissatisfaction rate, with 9% being dissatisfied, and 17% somewhat dissatisfied. In addition to that, 23% of these patients remained neutral, while 34% were satisfied, and 17% were very satisfied with the treatment period. These results highlight some small differences regarding the satisfaction levels between the two treatment options, with the clear aligners group leaning towards greater satisfaction overall.

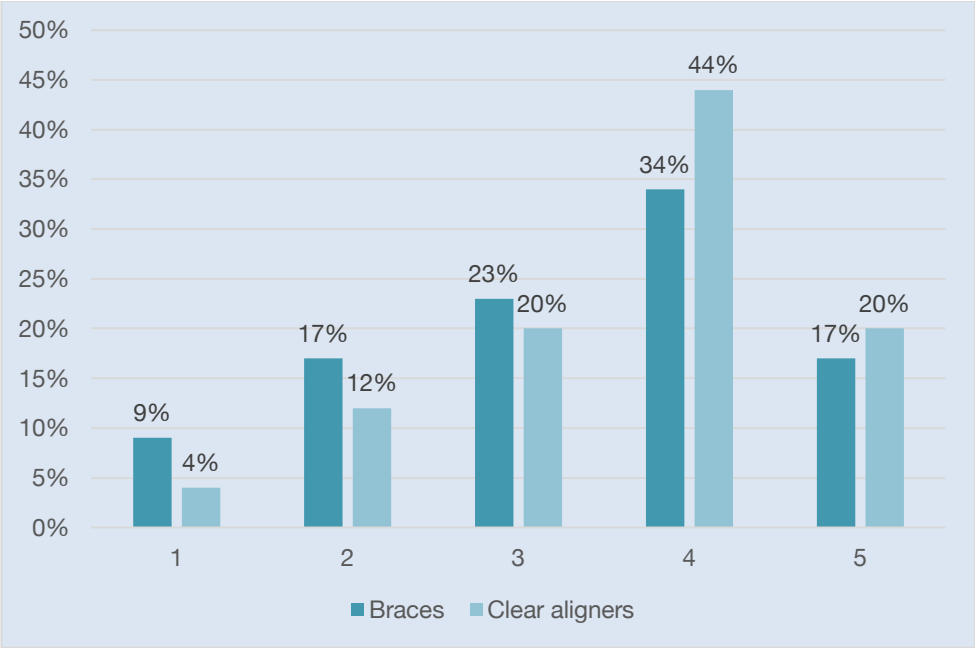

Figure 5 : Comparative distribution of patient satisfaction with treatment duration in braces and clear aligners groups

4.3.2 Pain and/or discomfort during orthodontic treatment

As shown in Table 1 and figure 6, the level of pain and/or discomfort experienced during treatment is nearly identical between participants who chose braces and those who opted for clear aligners. Nevertheless, only 24% of candidates in both groups reported total satisfaction, while the remaining 76% of braces users expressed varying degrees of discomfort, including occasional (41%), moderate (33%) and severe pain (2%).

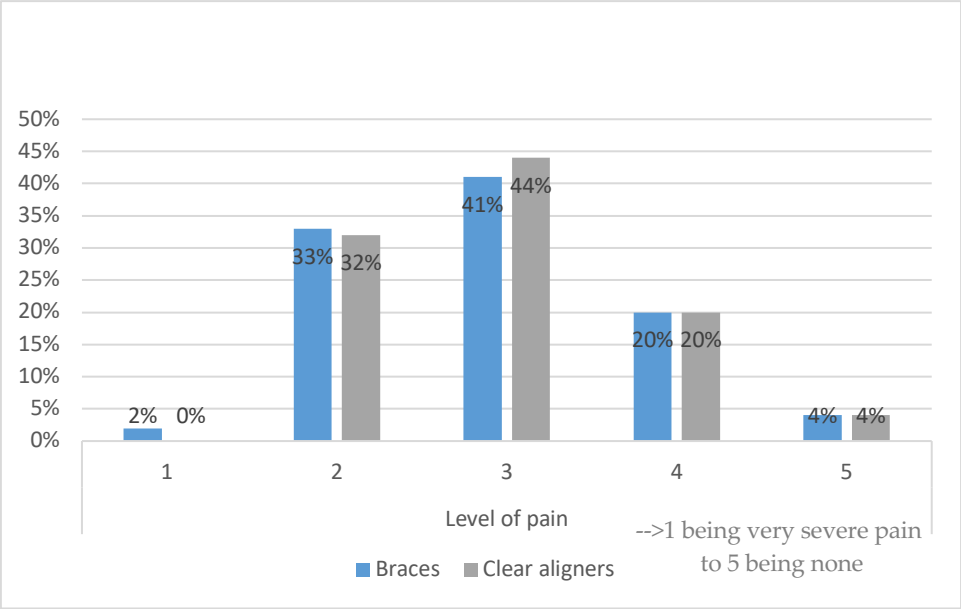

Figure 6: Comparative distribution of patient satisfaction regarding the level of pain and/or discomfort experienced during the treatment in braces and clear aligners groups

4.3.4 The cost of the treatment

Table 1 and figure 7 outline the satisfaction levels regarding the cost of treatment for patients who opted for clear aligners and those treated with braces. Among participants managed with aligners, 8% were dissatisfied with the cost, while 12% were somewhat dissatisfied. A larger proportion, 36%, expressed a neutral stance on the cost, indicating neither satisfaction nor dissatisfaction. In terms of satisfaction, 28% of clear aligners patients were satisfied with the cost, and 16% reported being very satisfied. In contrast, among patients that underwent a treatment with braces, none reported a dissatisfaction with the cost, and only 9% were somewhat dissatisfied. The majority, 44% remained neutral, while 30% were satisfied, and 17% very satisfied with the cost. These findings point out a minor discrepancy in satisfaction levels between the two treatment groups, with a slightly higher proportion of patients with clear aligners expressing dissatisfaction in comparison to those with braces.

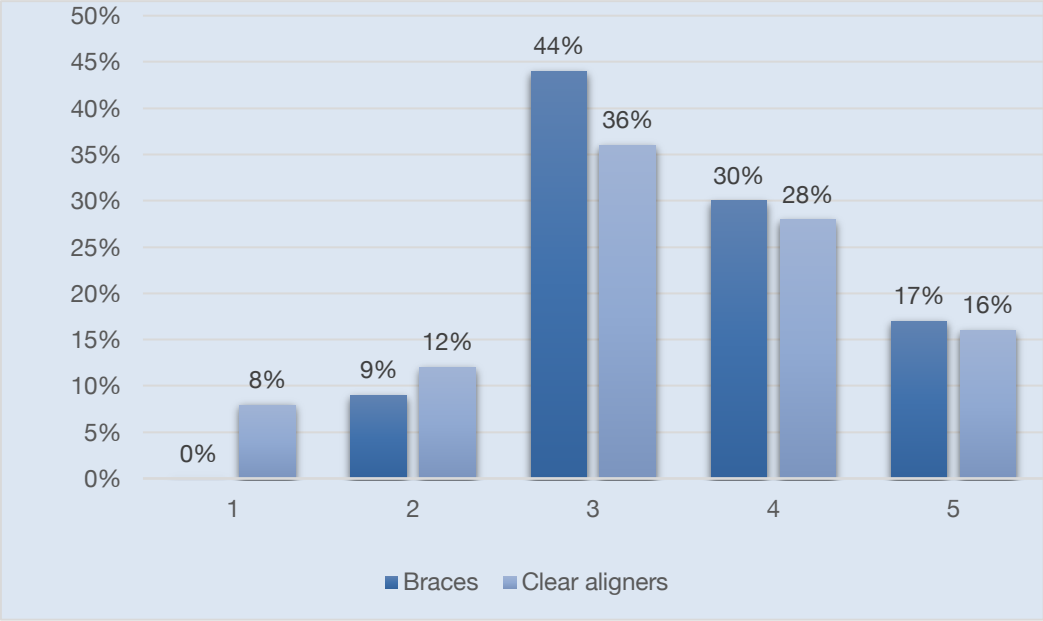

Figure 7: Comparative distribution of patient satisfaction with treatment cost in braces and clear aligners groups

4.3.5 Satisfaction with the overall smile appearance post-treatment

Table 2 and figure 8 highlight the level of satisfaction regarding the overall smile appearance following orthodontic treatment, comparing patients treated with clear aligners to those treated with braces. Within the clear aligner group, none of the participants reported dissatisfaction, while 8% were somewhat dissatisfied and 12% expressed a neutral stance. However, most of the patients displayed favorable outcomes, with 48% indicating satisfaction and 32% reporting a very high level of satisfaction with their post-treatment smile. Meanwhile, in the braces group, 2% of the patients reported dissatisfaction, and 5% were somewhat dissatisfied. Nevertheless, 15% expressed neutrality, 37% reported satisfaction, and a slightly higher proportion, 41%, were very satisfied with the final appearance of their smile. These findings outline general levels of high satisfaction across both treatment modalities, with an incrementally greater proportion (1%) of dissatisfaction among those managed with clear aligners.

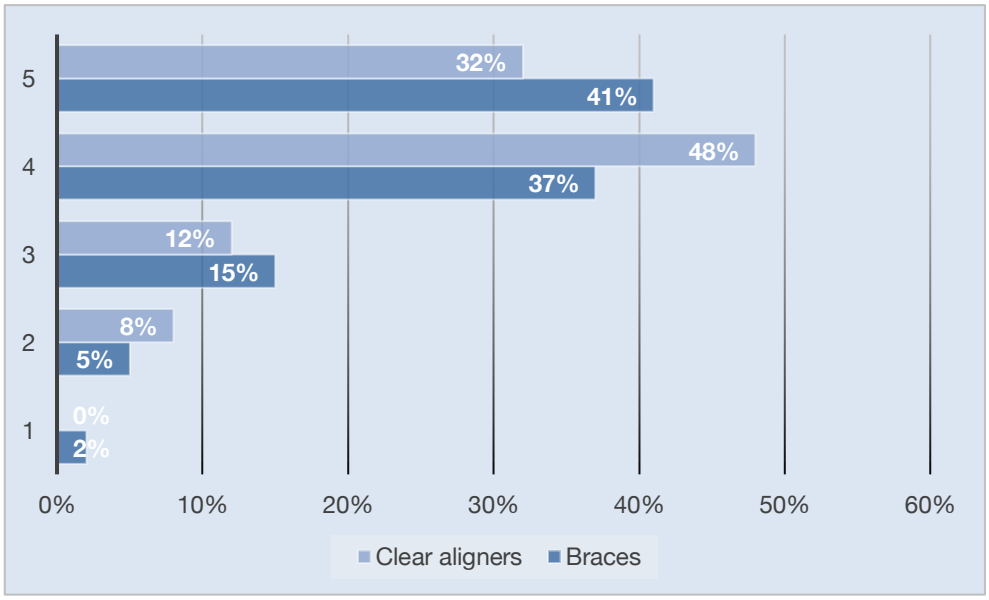

Figure 8: Distribution of patients ´satisfaction with the overall appearance of their smile post treatment in braces and aligners group

5. DISCUSION

5.1 Patients background

5.1.1 Gender disparities in orthodontic treatments

According to the findings of this study, a considerably higher percentage of females (73%) underwent an orthodontic treatment compared to males (27%). This gender disparity is consistent with a previous research conducted in the United States, highlighting a greater rate of orthodontic treatment among female participants. Several factors might promote the fact that women tend to exhibit a higher proactivity in pursuing orthodontic treatment compared to men, including a greater awareness to aesthetic, self-image and concern regarding dental appearance (18). In addition to that, cultural and societal norms might influence the perception of dental attractiveness, which encourage females to seek orthodontic treatment more frequently than males. Another previous study analyzing data from 12,422 individuals supports the following findings, reporting that 61% of the participants who underwent orthodontic treatment were females (18). These results resemble our findings and suggest a higher prevalence of orthodontic intervention among women.

5.1.2 Type of appliances selected in orthodontic treatment

Most respondents (60%) opted for traditional braces compared to clear aligners (28%). This preference for braces might be related to different factors, such as their established effectiveness in treating a wide variety of orthodontic concerns. Although clear aligners have gained a certain popularity over the last years, traditional braces might be viewed as more reliable and stable in the long-term, especially in complex cases compared to aligners (19). In fact, conventional braces are better at restricting tooth movement and allowing its precise regulation through the use of brackets and wires, while maintaining a continuous force (19).

5.2 The duration of the treatment

The difference in the treatment period between traditional braces and clear aligners is attributed to the tooth movement and its mechanics. In fact, braces allow a slower tooth placement, yet with a steady pressure, allowing a meticulous control at the expense of

an extended treatment period (19).The results from the survey highlight a certain difference at the level of satisfaction regarding the duration of orthodontic treatment, between the group of participants treated with traditional braces and those treated with clear aligners. Interestingly, while the rate of patients expressing neutrality was quite the same between both groups (aligners 20% vs braces 23%), patients who opted for clear aligners (Invisalign) seem to experience a greater sense of satisfaction and have a more positive experience, with 44% indicating satisfaction and 20% being very satisfied. In contrast, with a marginally lower percentage of satisfied patients in the braces group (34% expressing satisfaction and 17% being very satisfied), participants appeared to exhibit a mild sense of frustration regarding the duration of their treatment. These results might be related to the fact that clear aligners are usually correlated with a shorter treatment period and more flexible in-office appointments. This difference in treatment duration between both groups is supported by a previous study that emphasizes the gradual alignment of teeth using a series of clear aligners, in a comfortable and a reduced timeframe, making aligners appear more appealing to individuals with a professional or social commitment (20). Another study conducted in 2024 reports a treatment duration of 24 months for the braces group compared to 18 months for the Invisalign group (19). This finding might reinforce our results, suggesting that patients treated with Invisalign tend to be more satisfied with the treatment period, despite the relatively minor discrepancy between the two groups (19).

5.3 Pain and/or discomfort during orthodontic treatment

The data obtained from the study demonstrates that both treatment options seem to be associated with a certain degree of pain and/or discomfort. While both groups reported a total level of satisfaction of 24% (20% satisfied and 4% very satisfied), the braces group experienced slightly higher levels of discomfort, with 2% expressing dissatisfaction and 33% somewhat dissatisfied, compared to the aligners group, where none of the patients reported being dissatisfied and 32% being somewhat dissatisfied. As a matter of fact, pain sensation and discomfort are commonly reported outcomes of orthodontic treatment caused by the force application on teeth, leading to a compression of the periodontal ligament (21). This negative perception can affect the patient´s experience

by negatively impacting their compliance, hindering their oral hygiene habits, and in some cases, it may even instill a fear in them leading to missed appointments or discontinuation of their treatment program (22). Although this survey´s findings show very similar rates of satisfaction, this minor difference of 3% regarding dissatisfaction between both groups is supported by a previous study that emphasizes the fact that braces are associated with a greater pain due to the presence of metal brackets and wires, which increase oral irritation, particularly affecting the cheeks, tongue or lips (19). In addition, compared to traditional braces, clear aligners are perceived to cause less damage to the periodontal health, resulting in less root resorption (23). A recent study conducted in 2024 shows that clear aligners are often associated with a better patient compliance and acceptance, which may be attributed to the greater comfort provided by this type of appliance (24).

5.4 The treatment cost of orthodontic treatment

On the whole, these findings highlight an overall high satisfaction across both groups, with 44% of individuals treated with aligners expressing satisfaction (28% satisfied and 16% very satisfied), in comparison to 47% in the braces group (30% being satisfied and 17% very satisfied). This relatively similar outcome might be to some extend due to the demographic characteristics of the surveyed population, as the questionnaire was mainly administered to students from the Universidad Europea de Madrid (UEM) and its affiliated polyclinic. These participants are presumed to have a relatively favorable financial background, which may influence the perception of the financial burden associated with orthodontic treatment, despite its recognition for being expensive. In fact, a previous study that surveyed dentists, dental students, and orthodontic residents reinforces our findings by revealing no statistically significant differences in treatment preferences among the students and residents (23). However, it demonstrated as well that treatment choices among dentists were influenced by their income levels, with low-income dentists preferring braces (100%), while middle-income dentists favored clear aligners (46%) (23). Therefore, these findings could suggest that the variation in satisfaction levels regarding the cost of orthodontic treatment between traditional braces and clear aligners might be impacted by patient´s financial perceptions.

5.5 Satisfaction with the overall smile appearance post-treatment

The data obtained from this study show that the overall satisfaction regarding the post-treatment smile was quite high among both groups and almost similar, with a total of 78% in the braces group and 80% in the aligners group. However, when comparing the rate of dissatisfaction between them, a minor discrepancy of 1% exists, being slightly higher in the aligners group. These findings might suggest that both treatment options are equally effective in correcting malocclusion and enabling patients to be satisfied with their post-treatment appearance, although this might depend the complexity of the case. Interestingly, a previous study shows that this effectiveness is consistent when dealing with mild to moderate cases (19). Furthermore, a previous study conducted in 2023 comparing the clinical performance of clear aligners and fixed appliances in managing complex cases highlights that fixed appliances (including traditional braces) allow a better precision and outcome reliability in difficult cases, notably in relation to buccolingual inclination and occlusal contact (25). Thus, this minor 1% rate of dissatisfaction in the aligners group might be related to the complexity of these patient's cases, which could slightly affect their satisfaction with their post-treatment smile.

6. CONCLUSION

This study was designed to determine and compare the factors affecting patient satisfaction with orthodontic treatment between patients treated with traditional braces and aligners (Invisalign). The conclusion drawn from this study are:

1. The results show that effective and desirable orthodontic outcomes can be attained with both treatment modalities; however, there are some differences in satisfaction between the two groups. While the aligner group reported higher satisfaction in terms of aesthetics and comfort, the braces group expressed as well a sense of fulfilment, despite experiencing higher levels of discomfort and/or pain. Satisfaction in braces users may be related to the effectiveness of traditional braces in treating more complex cases, as they persist as a trusted and cost-effective alternative for several patients.

2. The findings demonstrate as well that patient satisfaction is impacted not only by clinical outcomes of the treatment, but also by factors such as communication with the orthodontist, levels of pain and/or discomfort, treatment duration, cost, and overall post-treatment aesthetics, each playing an important role in the patient´s overall experience.

7. SUSTAINABILITY

The consistent use of braces and clear aligners in orthodontics requires a critical evaluation of their sustainability. This analysis can be approached from three key perspectives: economic, environmental and social.

From a financial perspective, both treatment modalities imply different costs, which influence their accessibility. In one hand, clear aligners often cost more in the initial stages of the treatment, but they might be more cost-effective in the long run, as they usually require a shorter treatment duration and fewer visits to the orthodontist. On the other hand, traditional braces are usually more affordable and effective in addressing a variety of complex orthodontic cases, making them not only a cost-effective alternative, but also a more accessible option for low-income patients.

From an environmental point of view, the materials employed in each treatment are important and different. Clear aligners are generally fabricated using plastic and are single-use, which brings up concerns regarding waste and environmental impact. In contrast, braces are made of metal and can be recycled, which makes them potentially more environmentally sustainable. Minimizing waste by using biodegradable or reusable materials in aligners are crucial considerations for the future.

The accessibility and social impact of orthodontic care are important when it comes to aspects of social sustainability. Treatments that are effective, affordable and adjustable to suit diverse needs can enhance patients' dental health as well as improve their quality of life and self-esteem. Maintaining high satisfaction levels for patients from different backgrounds aligns with broader goals such as improving health and reducing inequality.

A comprehensive sustainability of orthodontic treatment requires evaluating their economic, environmental, and social influences. By taking these factors into consideration, orthodontist can make informed decisions regarding the most sustainable and effective treatment approach for their patients and the environment.

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9. ANNEXES

Informed consent and questionnaire **(Annex 1)**

Evaluation of patient satisfaction with orthodontic treatment

This survey collects insights from patients who have had an orthodontic treatment and about their experience. The aim of this survey is to evaluate the factors that affect the patient satisfaction with their treatment, such as the duration, the level of pain, the appearance of the teeth and the cost.

Each statement is rated on a scale from 1 to 5, 1 being the lowest and 5 the highest.

* Obligatoire

1. INFORMED CONSENT: This survey is part of the Graduation Project in Dentistry at Universidad Europea of Madrid titled: EVALUATION OF PATIENT SATISFACTION WITH ORTHODONTIC TREATMENT. The purpose of this work is to determine, analyse and compare the results obtained from the research regarding the factors that affect the patient satisfaction with their orthodontic treatment, and the information will be collected through a brief survey. Your participation in this study is voluntary. You may request to be withdrawn from the study without prior justification or prejudice to you. The information collected will be kept confidential and will not be used for any other purpose outside this research and research dissemination purposes. The data collected will be completely anonymous. No personal identifying information will be requested. Information collected in the survey will be treated in accordance with the provisions of Organic Law 3/2018, of December 5, Protection of Personal Data and Guarantee of Digital Rights. For the purposes of the provisions of the regulation of the Organic Law 3/2018, of 5 December, on the Protection of Personal Data and Guarantee of Digital Rights, you are informed and expressly consent that the data provided in the survey may be used for the aforementioned purposes. This consent is granted without prejudice to all the rights that you have in relation to the aforementioned regulations, with the possibility of accessing the information provided, rectification, cancellation and opposition at any time you wish. Do you give your consent to participate in the survey as a volunteer for the results to be used in the Final Degree Project EVALUATION OF PATIENT SATISFACTION WITH ORTHODONTIC TREATMENT? *

- ◯ Yes
- ◯ No

2. What is your gender?

- ◯ Male
- ◯ Female
- ◯ Non-binary

3. What is your age group?

- ◯ 18-24 years old
- ◯ 25-30 years old
- ◯ 31-40 years old
- ◯ 41-50 years old
- ◯ Over 50 years old

4. What types orthodontic appliances have you used or are still using during your treatment?

- ☐ Buccal braces
- ☐ Lingual braces
- ☐ Aligners (Invisalign)

5. What were the reasons that have led you to begin your orthodontic treatment?

- ◯ Aesthetic reasons
- ◯ Functional reasons
- ◯ Personal influence (from family or friends)
- ◯ Professional recommendation from your dentist or orthodontist

6. How satisfied are you with the overall outcome of your orthodontic treatment?

	Very dissatisfied	Somewhat dissatisfied	Neither satisfied nor dissatisfied	Satisfied	very satisfied
	◯	◯	◯	◯	◯

7. How satisfied are you with the alignment of your teeth after the treatment?

	Very dissatisfied	Somewhat dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Very satisfied
	◯	◯	◯	◯	◯

8. How satisfied are you with the quality of care provided by your orthodontist?

Very dissatisfied	Somewhat dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Very satisfied
◯	◯	◯	◯	◯

9. How would you rate the clarity of the treatment process explained by your orthodontist before starting?

Very unclear	Unclear	Neutral	Clear	Very clear
◯	◯	◯	◯	◯

10. How satisfied are you with the duration of your treatment?

Very dissatisfied	Somewhat dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Very satisfied
◯	◯	◯	◯	◯

11. How would you rate the level of pain or discomfort during the treatment?

Severe	Moderate	Occasional	Minimal	None
◯	◯	◯	◯	◯

12. How would you rate the quality of communication with your orthodontist and their staff?

Very poor	Poor	Average	Good	Excellent
◯	◯	◯	◯	◯

13. How satisfied are you with the post-treatment care and follow up?

Very dissatisfied	Somewhat dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Very satisfied
◯	◯	◯	◯	◯

14. How satisfied are you with the cost of your orthodontic treatment?

Very dissatisfied	Somewhat dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Very satisfied
◯	◯	◯	◯	◯

15. How satisfied are you with the overall appearance of your smile post-treatment?

	Very dissatisfied	Somewhat dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Very satisfied
	◯	◯	◯	◯	◯

16. How would you rate the impact of the orthodontic treatment on your self-esteem?

	Very poor	Poor	Medium	Good	Excellent
	◯	◯	◯	◯	◯

17. Have you experienced any changes in your social interactions and/or quality of life as a result of your orthodontic treatment?

	Negative	Slightly negative	Neutral	Positive	Very positive
	◯	◯	◯	◯	◯

18. Would you recommend this orthodontic treatment to a friend or a relative?

On a 1-10 scale, a result up to 6 is considered negative, 7 or 8 neutral. Only 9 and 10 are considered positive.

0	1	2	3	4	5	6	7	8	9	10

Absolutely not — Undoubtedly

Approval from the commission of investigation (OD.041/2425) **(Annex 2)**

Universidad Europea

Comisión de Investigación

Villaviciosa de Odón, 24 de enero de 2025

Estimado/a investigador/a,

La Comisión de Investigación de la Escuela de Doctorado e Investigación, una vez revisada la documentación e información, remitida por el investigador responsable con fecha 10/01/2025, relativa al proyecto abajo indicado, autoriza su desarrollo en la Universidad Europea.

Título del proyecto:	EVALUATION OF PATIENT SATISFACTION WITH ORTHODONTIC TREATMENT
Tipo de proyecto:	TFG
Investigador/a responsable:	[redacted]
Código CI:	2025-103
Código OTRI:	Sin especificar
Código Departamento:	OD.041/2425
Dictamen:	APROBADO

Atentamente,

Universidad Europea
ESCUELA DE DOCTORADO E INVESTIGACIÓN

Fdo. Óscar García López

Director de la Escuela de Doctorado e Investigación