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Factors influence the outcome and duration of the treatment with removable orthodontic treatment

A project Submitted to the council of the College of Dentistry, of Dentistry, Department of Orthodontic University of Baghdad in partial fulfilments of Requirements for B.D.S Degree

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Certification of the Supervisor

I certify that this project ""Factors influence the outcome and duration of the treatment with removable orthodontic treatment."" was prepared by the fifth-year student (NOUR ALHUDA ALI KAREEM) under my supervision at the College of Dentistry/University of Baghdad.

Dr. ESRAA SALMAN JASIM

Date: 2022/4

Dedication

I would like to dedicate this project to **my family**, especially To **the soul of my grandmother** who used to support me by praying for me and **my parents**, who have supported me throughout my life as a student, and especially during these past five years as I pursued my dream to become a dentist.

Dad, thanks for being the role model that every daughter wants and deserves. Your hard work has inspired me to be the best person I could be.

Mom, your patience and self-less nature were always comforting during my times of stress, and every day . I hope one day I can repay you for all the opportunities you've allowed me to experience. I'm truly blessed to have such amazing parents.

I would like to dedicate this project to **Dr. Huda shaker.**

My dear best friends who have encouraged me to finish this project, and especially dear **Hajer** & **Saja** They was always willing to help me with many things even things that I felt were a bit easy, and **Nour** who helped me with solving many problems I faced during finishing this project, thank you

Acknowledgment

My faithful thanks and all gratefulness to "**Allah**", God of the world, Most Gracious, Most Merciful for leading and helping me to perform this project.

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The spirit of high morals that always encourages and advises me to the rig **Dr. Huda shaker .**

I would to thanks for supported me and finally thanks my family

Thank you

Introduction

The goal of this research was to determine and quantify the impact of various factors on orthodontic therapy. One of the first inquiries new orthodontic patients have is how long they would have to wear their braces. The answer to this question could be influenced by a variety of variables. Goal aimed to determine some of the most important elements that influence the length of orthodontic therapy. Only a few research have attempted to assess these variables. There has been no agreement on the length of orthodontic therapy. Similarly, the elements that determine the latter have yet to be fully explained. I was supposed to expand on the primary elements that influence orthodontic treatment duration, as well as describe some tactics that have been shown to be effective in managing and reducing it.

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Aim of this study .

- To determine the factors that affect on the duration and outcome of removable orthodontic treatment

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chapter one

1.1 **Occlusion**: Is defined as the contact relationship of the maxillary and mandibular teeth when the mouth is fully closed (**Darby, 2015)**.

1.2 **Normal occlusion**: The term 'normal occlusion' encompasses minor deviations from the ideal that do not constitute aesthetic or functional problems. It is not possible to specify precisely the limits of normal occlusion and so there can be disagreement even between experienced clinicians about the categorization of borderline cases (**Houston** and **Tulley**, **1986**)

six keys of normal occlusion are: (**Andrew's, 1972; Warotayanont, 2011).**

1. **Molar relationship :**The distal surface of the distobuccal cusps of the upper first permanent molar made contact and occluded with the mesial surface of the mesiobuccal cusps of the lower second molar.
2. **Crown angulation** "The mesiodistal tip :" The gingival portion of the long axis of each crown was distal to the incisal portion varying with the individual tooth type but within each type the tip pattern was consistent from individual to individual.
3. **Crown inclination** (labiolingual or buccolingual inclination) : The inclination of all the crowns has a consistent scheme

-**Anterior teeth** (central and lateral incisors) :Upper and lower anterior crown inclination is sufficient to resist over eruption of anterior teeth.

-**Upper posterior teeth** (canines through molars) :A lingual crown inclination existed in the upper posterior crown was a constant and similar from the canines through the second premolar and was a constant, similar and slightly more pronounced in the molars.

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-**Lower posterior teeth** (canines through molars): The lingual crown inclination in the lower posterior teeth progressively increases from the canine through the second molar.

4. **Rotation**: There are no rotations.
5. **Spaces**: There are no spaces with tight contact point.
6. **Occlusal planes**: The plane of occlusion varied from generally flat to a slight curve of spee.

The above six keys contribute individually and collectively to the total scheme of occlusion and therefore are viewed as essential to successful orthodontic treatment (**Ireland and Albert, 2020)**.

1.3 **Ideal occlusion**: This concept refers both to an aesthetic and a physiologic ideal. In recent times, emphasis has moved from aesthetic and anatomic standards to the current concern with function, health and comfort. Hence now the important aspect of ideal occlusion includes functional harmony and stability of masticatory system and the neuromuscular harmony in the masticatory system (**Singh, 2015)**.

1.4 **Malocclusion**: Is a developmental condition where there is a deflection from the normal relation or alignment of the teeth to other teeth in the same arch and/or to the teeth in the opposing arch, the evaluation of malocclusion is the essential component in establishing the diagnosis and treatment need of the orthodontic patient. One of the major problems in studying malocclusion is the availability of a suitable objective method for recording the occurrence and severity of orthodontic problem, thus, Orthodontic Indices are used in clinical and epidemiological studies of malocclusion(**Kumar** and **Bhagavatula**, **2021**).

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1.3.1 **Overjet and Overbite** If you look at the human skull, the maxilla is larger than the mandible. This anatomy makes the maxillary arch larger than the mandibular arch and in turn creates a natural overjet/overbite that we will discuss in this section.

Overjet: It is the horizontal overlap of the maxillary central incisors over the mandibular central incisors. The amount of overjet is measured using the probe horizontally. The normal overjet is considered to be 2-3mm.

Overbite: It is the vertical overlap of the maxillary central incisors over the mandibular central incisors. The amount of overbite is measured using the probe vertically. The normal overbite is considered to be 2-3mm, or approximately 20–30% of the height of the mandibular incisors (**Fattahi et al., 2014)**

1.5 Classification of the malocclusion .

Angle (1899) classified malocclusion, after which numerous classification methods evolved. However, qualitative methods of classifications were found to be not suitable for measuring the severity and treatment needs, the WHO/FDI basic method recorded symptoms of malocclusion with carefully defined criteria, this method was essentially derived from the principle developed for recording individual traits of malocclusion.

- **Angle's Classification (1899)**
- **Canine Classification**
- **Incisor Classification (1964, 1983)**
- **Skeletal Classification (1993)**

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Angle's classification

Angle (1899) classified malocclusion, after which numerous classification methods evolved, However, by far the most universally accepted classification in use today is Angle's method, which was developed a century ago. Edward Angle in 1899 presented his classification based on antero-posterior relationship of first permanent molars.

Class I: The mandibular dental arch is in normal relation to the maxillary dental arch as evidenced by the occlusion of the mesiobuccal cusp of maxillary first permanent molars lies in the mesiobuccal grooves of the mandibular first permanent molars.

Class II: The distobuccal cusps of the maxillary first permanent molar occluding in the mesiobuccal grooves of the mandibular first permanent molar. There are two divisions of Class II:

Division 1: Narrow maxillary arch, with lengthened and prominent maxillary incisors; lack of nasal and lip function. Mouth-breathers.

Subdivision 1: Only one lateral half of the arch is involved, the other being normal. Mouth-breathers.

Division 2: Slight narrowing of the maxillary arch; bunching of the maxillary incisors, with overlapping and lingual inclination; normal lip and nasal function.

Subdivision 2: Only one lateral half of the arch is involved, the other being normal.

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Class III: Protrusion of the mandibular jaw, with mesial occlusion of the mandibular teeth; mandibular incisors and cuspids inclined lingually.

Subdivision: Only one lateral half of the arch is involved, the other being normal **(Figure 1) (Angle, 1899).**

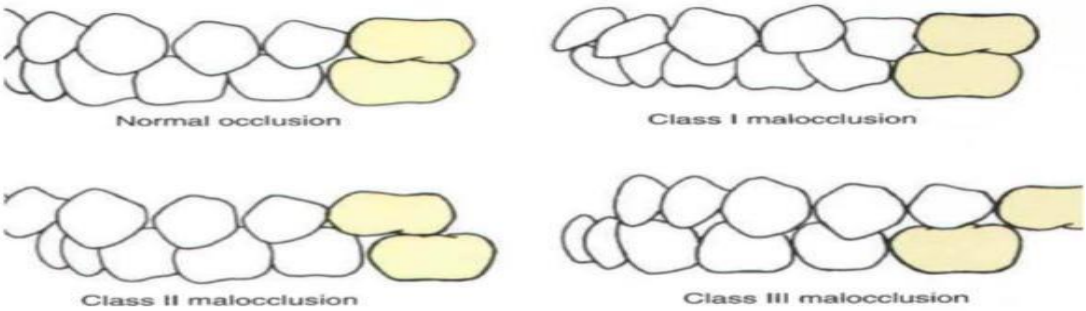

Figure.1 Angle's classification of malocclusion (Angle, 1899)

Canine classification

It includes three basic classes similar to Angle's classification:

Class I: The tip of the maxillary canine lies in the embrasure between the mandibular canine and the first premolar.

Class II: The tip of the maxillary canine lies one half of a cusp mesial to the embrasure between the mandibular canine and the first premolar.

Class III: The tip of the maxillary canine lies one half of a cusp mesial to the embrasure between the mandibular canine and the first premolar (**Figure 2) (Foster and Day, 1974)**

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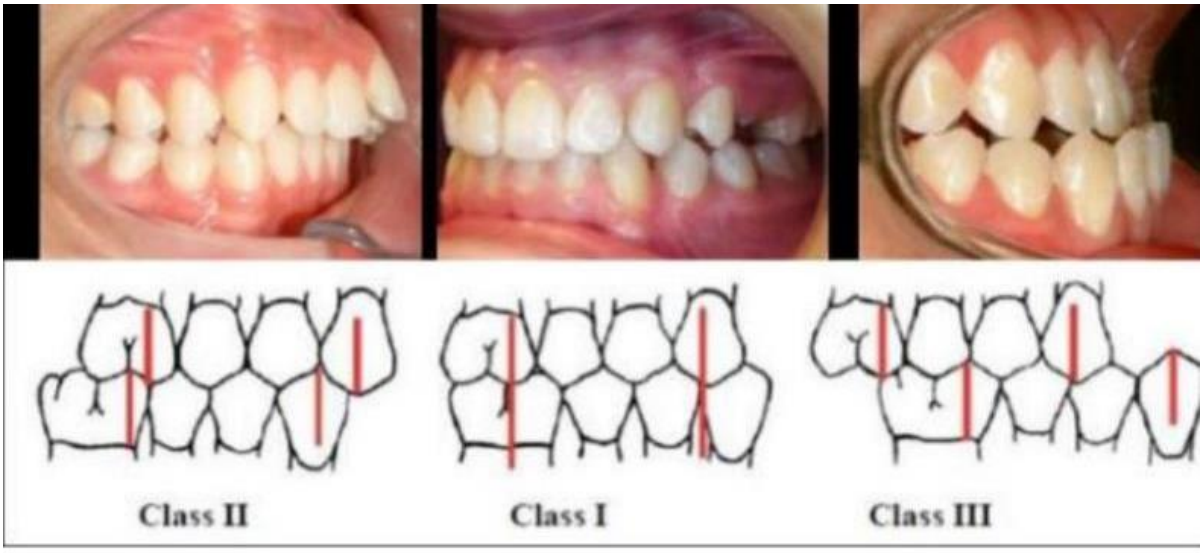

Figure.2 Canine classification (Foster and Day, 1974)

Incisor classification

The British Standard Institute classified dental malocclusion in 1983 according to the maxillary and mandibular incisors relationship.

Class I: When the mandibular incisor edges lie or are below the cingulum plateau of the maxillary incisors.

Class II: When the mandibular incisor edges lie posterior to the cingulum plateau of the maxillary incisors, it's subdivided in to two groups:

Class II div 1: There is increased overjet and the maxillary incisors are usually proclined.

Class II div 2: Retroclined maxillary centrals and proclined laterals, or both central and lateral incisors are retroclined.

Class III: Where the mandibular incisor edges lie anterior to the cingulum plateau of the maxillary central incisors **(Figure 3) (Mageet, 2016)**

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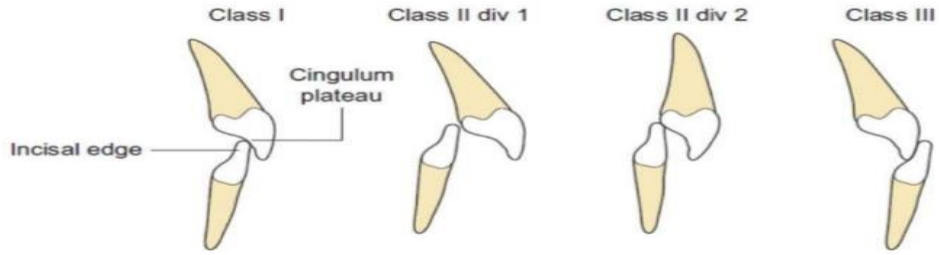

Figure.3 Incisor classification (Mageet, 2016)

4. Skeletal classification

Usually assessed by lateral cephalometric radiographs, it considered relationship between maxilla and mandible in anteroposterior position.

Class I: Maxilla and mandible are in harmony with each other, ANB 2-4.

Class II: Maxilla lies ahead to the mandible in reference to the anterior cranial base in other words maxilla is prognathic, ANB >4.

Class III: Maxilla lies posterior to the mandible in reference to the anterior cranial base in other words maxilla is retrognathic, ANB<2 **(Figure 4) (Gasgoos et al., 2007).**

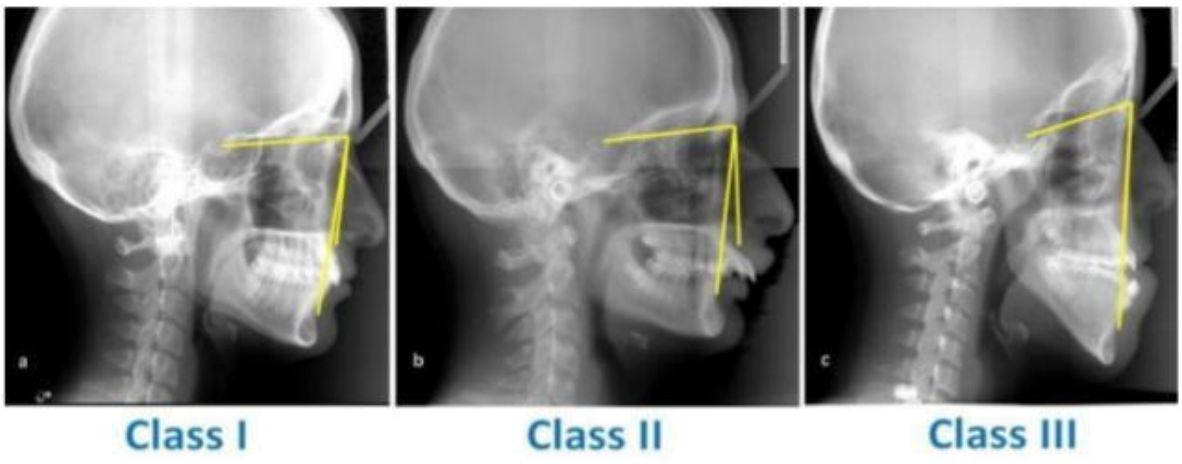

Fig.4 Skeletal classification (Gasgoos et al., 2007).

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General factors affecting occlusal development

1 Skeletal factors. The size, shape and relative positions of the upper and lower jaws.

2 Muscle factors. The form and function of the muscles which surround the teeth, i.e. the muscles of the lips, cheeks and tongue.

3 Dental factors. The size of the dentition in relation to the size of the jaws.

Local factors affecting occlusal development

1 Aberrant developmental position of teeth.

2 The presence of supernumerary teeth.

3 Hypodontia—the congenital absence of certain teeth.

4 The effects of certain habit activities.

5 Localized soft tissue anomalies—the labial frenum.

The skeletal factor of orthodontic treatment

The skeletal relationship is not only important in the part it plays in occlusal development. It also plays a major part in orthodontic treatment. It seems likely that orthodontic treatment is confined to tooth movement has little effect on the size, shape or relative positions of the basal parts of the jaws. Its only direct effect is on tooth position and on alveolar bone position and form. Therefore, as the teeth must be positioned on the basal bones, the skeletal relationship must limit the amount of tooth movement which can be achieved. In particular, the which skeletal relationship limits the amount of anteroposterior movement of the incisor teeth, and it may not be possible to correct incisor positions in Class 2 or Class 3 occlusal relationship if they are based on severe Class 2 or Class 3 skeletal discrepancies. **Foster et al. (1969**)

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Muscular factors affecting occlusal development

The teeth erupt into an environment of functional activity governed by the muscles of mastication, of the tongue and of the face. The muscles of the tongue, lips and cheeks are of particular importance in guiding the teeth into their final position, and variation in muscle form and function can affect the position and occlusion of the teeth. It must be remembered that all muscles exert their influence by virtue of the site of their origins and insertions. The muscles of the lips, cheeks and tongue have their main origins on the basal parts of the jaws, and therefore the position of the jaws must affect the position and action of the muscles which function on the teeth. It is thus not realistic to consider the muscles in isolation without reference to the bony structures with which they interrelate in guiding the erupting teeth. **Foster and Day (1974**)

Dental factors affecting occlusal development

The size of the dentition in relation to jaw size The third major factor affecting the development of the occlusion of the teeth is the relationship between the size of the dentition and the size of the jaws which have to accommodate the teeth. Ideally, there should be adequate space for the teeth to erupt into the mouth without crowding or overlap. It has already been shown that in the primary dentition the ideal situation exists when there is spacing between the anterior teeth, there being then a better chance that the permanent teeth will not be crowded. In the permanent dentition, contact between adjacent teeth is regarded as correct, though slight spacing is usually accepted as satisfactory. In present day mixed populations these ideals are realized all too seldom, particularly in the permanent dentition. In the primary dentition, actual overlapping of the teeth is unusual, and a disproportion between jaw size and tooth size is usually manifested as a lack of spacing rather than as actual crowding. (**Foster et al. (1969**) found that the mean primary dentition size was very slightly less than the mean dental

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arch size in a population of 2 1/2 year-old British children, and **Foster and Hamilton (1969**) found only 1% of primary dentitions with no spaces in the dental arch in a similar population. These findings agree with those of other investigators, who have generally found that the mean dental arch length slightly exceeded the mean mesio-distal dimension of the primary dentition. In the permanent dentition, however, crowding of the teeth is much more common. **Lavelle and Foster (1969)** in a quantitative assessment of dentition and dental arch size in an adult British population, found that more than 65% of the population had a larger dentition than dental arch, and therefore had crowding of the teeth. **Foster and Day (1974**) in a clinical study of crowding in 11-12 year old British children found that 60% had actual or potential crowding of the permanent dentition

-The effects of excessive dentition size : Excessive dentition size in relation to dental arch size can have the following effects:

1 Overlapping and displacement of teeth.

2 Impaction of teeth.

3 Space closure after extractions.

Orthodontic appliance: the appliance mean mild pressure may be applied to tooth or group of the teeth predetermined direction (**Luhàkare, 2008**) .

Classification of Orthodontic Appliances

According to White and Gardener it is classified in two groups.

1. Mechanical Appliances.

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2. Functional Appliances.

- A mechanical appliance exerts pressure on the alveolar bone, through the medium of teeth in a predetermined direction, by means of screw, spring or elastics.
- A functional appliance harnesses natural forces exerted by muscular medium which it transmits to the teeth and alveolar bone in a predetermined direction.

Mechanical appliances are further classified in two groups.

1. Removable appliance.

2. Fixed appliance.

- Removable appliance: It is the appliance, one which is removed by the patient for cleaning, activation but when it is in the mouth firmly attached to the anchor teeth so that controlled pressure may be brought to bear on teeth to be moved.
- Fixed appliances: It is the appliance which consists of bands with brackets which are cemented to the teeth having arch wire, elastics, axillary springs as an active components to move the teeth. These appliances can not be removed by the patient.

Classification of Removable Appliances

1. According to **Graber and Neumann**

a. Active appliance: It uses forces within the appliance.

b. Functional appliance: It uses muscular forces.

2. According to **TM Graber (1975)**

a. Appliances that effect actual tooth movement through adjustment of springs or attachments within that appliance.

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b. Appliances that stimulate reflex muscular activity which in turn produces desired tooth movement.

3. According to **Haupl and Roux (1983)**

a. Active appliance: A mechanical force producing elements are necessary to bring in dentoalveolar structure. Example: Labial bow, springs, screws.

b. b. Passive appliance: Mode of transmission of force is passive. Mechanical force producing elements are unnecessary to bring about changes in dentoalveolar structure. For example, myofunctional appliances, habit breaking appliances.

INDICATIONS

1. When skeletal pattern is normal and malocclusion is only due to changes in incisor inclination means dentoalveolar only.
2. When it is possible to treat each arch individually with removable appliances.
3. Malposed teeth should have their apices fairly well in line.
4. Narrow arches, mild crowding, can be treated with simple expansion appliances.
5. Unilateral crossbite, single malpositioned tooth treated with tipping movement using removable appliance.
6. Mild bite correction, intrusion of incisors and extrusion of posteriors is possible with bite plane.
7. To maintain the corrected positions of the teeth.
8. To prevent and intercept the effects of abnormal habits.(**mandall et al., 2002; singh , 2007)**

CONTRAINDICATIONS

1. If a noticeable skeletal discrepancy exists.

2. There is need to correlate treatment in both upper and lower arches. For example, anchorage problems requiring intermaxillary traction and more severe

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discrepancies in arch width or shape.

3. Presence of apical malpositions, severe or multiple rotations.

4. Bodily movements are required.

5. Presence of vertical discrepancies such as deep overbite, an open bite or height discrepancies between teeth.

6. Where severe crowding or spaces exist.7. Bone is very dense and tooth movement requires more time.(**mandall et al., 2002; singh , 2007)**

Mode of action of removable appliances

Removable appliances are capable of the following types of tooth movement:

• Tipping movements – because a removable appliance applies a single point contact force to the crown of a tooth the tooth tilts around a fulcrum which in a single-rooted tooth is approximately 40 per cent of the root length from the apex.

• Movements of blocks of teeth – because removable appliances are connected by a baseplate they are more efficient at moving blocks of teeth than fixed appliances. Influencing the eruption of opposing teeth – this can be achieved either by use of:

• a flat anterior bite-plane which frees the occlusion of the lower incisors allowing their eruption. This is useful in overbite reduction

• buccal capping, which frees the contact between the buccal segment teeth This may also be of value when intrusion of the buccal segments is required (Laura Mitchell, 2013)

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Factors that effect to success of removable appliance

The factor depended to(**Julie C Williams, 2013**)

A. Operator factors

B. Patient factors

C. Appliance factors

A// operator factors(number of operators & Operator experience) :

1.*Operator experience* The total number of attendances, rather than treatment time, was found to be associated to the experience or grade of the hospital orthodontist (**O'Brien, 1993)** This could be attributed to a variety of variables, such as improved treatment mechanics, better time and patient management, or lower appliance failure rates.

2. *Number of operators* : Hospital orthodontic departments are often involved in the training of orthodontic clinicians, which may lead to any one patient receiving treatment from multiple operators(**McGuinness, 1998)**. A study which looked at the effect of such practice on treatment efficiency and outcome found that, on average, treatment duration was extended by around 8.43 months as a result of multiple operators(**McDonald, 1998**).Reassuringly, the standard of

orthodontic treatment, as assessed by the change in PAR score, was unaffected. There does not appear to be any published data on the possible effect of the

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transfer of patients from one department or practice to another on the treatment duration, but it could be expected to increase both the total time in treatment and the number of appointments required to complete treatment.(**Ireland, 1997**)

B. ***Patient factors//*** For all the patients, taken relevant data namely: age at which treatment was started, gender، Angle's classification of malocclusion, types of orthodontic appliance used and types of treatment , need to extractions or not A number of potential limiting factors will relate directly to the patient:

- **Medical health** – certain medical conditions will preclude complex appliance therapy
- **Dental health** – excellent oral hygiene and an absence of active dental disease are prerequisites prior to orthodontic treatment. Fixed appliances,in particular, can exacerbate dental problems. This does not mean precluding patients with a history of periodontal disease from treatment. However, the disease must be controlled and in a period of remission before treatment can be considered (**Boyd et al, 1989).** If tooth movement is carried out in the presence of active periodontal disease it will hasten bone loss;
- **Age** of the patient – growth can be utilized in adolescent patients to help correct a skeletal discrepancy; however, in adults the orthodontist must rely upon tooth movements or surgery. A deep bite in a growing individual can be corrected using a bite plane, which allows extrusion of the posterior

dentition. In an adult this is unstable because there will be no potential for compensatory growth at the condyle as the lower face height increases; and

- **Patient compliance –** the success of orthodontic treatment is very much dependent on good patient compliance, but this is difficult to measure. It cannot be predicted based on personality or demographics, although

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patient perception of their own malocclusion and the relationship between patient and orthodontist may give some indication. It is important to tailor treatment to the level of compliance a patient is perceived to be capable of achieving If appliances that require high-level compliance, such as extraoral traction, are going to be used, these should be fitted initially to assess the patient response prior to the extraction of teeth. It should also be borne in mind that compliance will decline over treatment and is affected by negative experiences in treatment such as pain and discomfort.

- . **gender** Males were found to have significantly higher pre-treatment PAR than females- This could be due to males seeking orthodontic treatment only when the malocclusion is more severe. It could also be due to Asian males' psychological perceptions where they are generally less concerned about aesthetics as compared to females. However, multiple studies have found no difference in severity of malocclusion, or treatment outcomes between genders. so ' that females had better treatment outcomes-
- **Clinical conditions** The treatment must be selected according to the severity of the malocclusion: the more serious the clinical condition, the longer and more complex the treatment will be(**sergl**, **1998**). The following clinical parameters, among others, must be considered:

facial pattern, sagittal canine relationship (**Melo**, **2013**) 'molar relationship, anterior crowding, overbite, the Bolton index(**Guo, 2014**) incisor angulations(**Flores-Mir, 2014**) . The best treatment must be selected according to the degree of alteration(**Espinar, 2013)** .In this way, both the duration and complexity of the orthodontic treatment will largely vary depending on the severity of the occlusal alterations. For instance, the treatment will be longer if an extraction protocol is necessary (. **Leon-**

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Salazar, 2017) . Likewise, extraoral forces can be used in more complex situations such as significantly increased overjet, or when it is necessary to retract all the teeth in the arch, to limit mesial tooth displacement caused by premature extraction of temporary teeth, to redirect the growth pattern or to correct intermaxillary relationships(**Sergl, 1998**) . In cases that are even more complex, such as facial dimorphism,orthognathic surgical procedures are necessary, as it is impossible to solve the problem with conventional orthodontics or by modifying the growth pattern(**González , 2015**)

- . **Psychological factors (Cooperation patient)** The patient's psychological profile has a major role, as it determines the extent to which results can be achieved(**Grembowski, 1988)** . This is because certain personality traits or the patients' psychological condition might affect how they adapt to the treatment (**Cooper**, **2013**). There is ample evidence that the patient's cooperation, compliance and motivation has a significant role in the final result of orthodontic treatments: the lack of one of these aspects might endanger the treatment, extend its duration and lead the clinician and the patient to frustration. Therefore, by assessing personality traits, orthodontists can predict how a patient will react to different treatments (**HansenK, 2013)**which is useful when selecting a therapeutic

modality (**Grembowski, 1988)**It has also been found that patients with a greater awareness of the severity of their 1malocclusion seem to adapt more quickly and have less discomfort Therefore, they respond better to the treatment

- . **Dentist-patient relationship** A favorable relationship, based on respect for the patient's autonomy, allows for joint decision-making, where the clinician helps the patient decide, and is also willing to accept help from the patient and to consider their opinion regarding possible diagnostic

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or therapeutic options (**Costa, 2008**) It is also clinically important for orthodontists to understand how patients perceive their need for orthodontic treatment to select the best therapeutic approach, considering treatment preference and setting personalized objectives (**Murakami, 2013)**

*** Limiting factors relating to the malocclusion:** A number of limiting factors can also be influenced by the presenting malocclusion:

• The more severe the skeletal discrepancy, the harder it is to correct the underlying malocclusion with orthodontic tooth movement alone. Tooth movement to camouflage a severe discrepancy may be physically impossible (**Handelman, 1996**) or may result in an unacceptable compromise to the soft tissue profile. This is especially truein class III malocclusion and when there is a marked vertical growth pattern, such as an anterior open bite, as any further growth will often not be favorable;

• A tooth size discrepancy can compromise the attainment of an ideal occlusal fit, especially between the anterior teeth. To obtain a good occlusal fit and an ideal static occlusion, the total mesiodistal dimension of the mandibular dentition should be approximately 92% of that in the maxilla. The ratio of these dimensions

was ascertained from ideal occlusions and is called the Bolton ratio after its originator, Wayne Bolton (**Bolton, 1958)**. One of the commonest manifestations of a tooth size discrepancy is a diminutive upper lateral incisor. This can be clinically masked by a composite build up of the diminutive teeth or reducing the width of teeth in the opposing arch; and

• Tooth agenesis has implications for space management, especially when there is accompanying microdontia and/or an absence of crowding, and space closure can be difficult, especially if numerous teeth are missing.

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C. *appliance factores* When assessing appliance factors and how they might affec treatment efficiency and occlusal outcome(**Tang, 1999),** it is important to consider how the various components will behave in the clinical environment. Whilst laboratory tests are useful for characterizing materials, the results of such testing do not always correlate well with clinical performance.(**Eliades, 2005)**

2. Number of treatment phases The duration of treatment has been shown to increase with an increase in the number of treatment phases, for example two-phased treatment (**Beckwith, 1999)** , such as functional therapy followed by fixed appliances to correct Class II malocclusions, increases the total duration of treatment. (**Tulloch, 1998)** However, such treatments can lead to an overall reduction in the duration of the fixed appliance phase when preceded by the use of a functional appliance or headgear.Although not a distinct phase necessarily, the timing of certain parts of the overall treatment will also havean effect. For example, the banding of maxillary second molars within the first 12 months of treatment can decrease the mean treatment time by almost 2 months when compared with banding the same teeth later on in treatment(**Skidmore**, **2006**) . This might be explained by the fact that, in the latter case, the alignment of

these teeth is considered part of finishing rather than initial alignment, or perhaps their later alignment has almost been considered an afterthought.(**Cook ,2005**)

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Discussion

The goal of this study was to search the literature for articles that specifically addressed the length of orthodontic treatment and the many factors that could influence it. The age of the patients; the types of malocclusions; the presence/absence of extractions; the use of removable or fixed appliances; techniques used with fixed appliances; the method of ligation; one- or two-phase treatment; provision of orthodontic services in a private office, public clinics, or university faculty, postgraduate and undergraduate health care environments; the involvement of surgery for the management of dentofacia were among the factors. Obviously, such a study can't cover everything.

There is presently no evidence-based data on the length of treatment. innovative orthodontic techniques (e.g., Invisalign and orthodontic mini-implants; **Djeu et al., 2005).** Furthermore, in circumstances where non-conventional supplementary treatments are used, there is little scientific information to determine treatment time (**Iseri et al. , 2005)**.

There were forty-one papers that met the search criteria, indicating that more conclusive research is needed to assess the length of various types of orthodontic treatment. As previously stated, several of the reports have methodological flaws, skewed findings, and inconclusive results. Prospective studies are in the minority and are plainly more difficult to carry out, but they may help to avoid some of these issues in future study.

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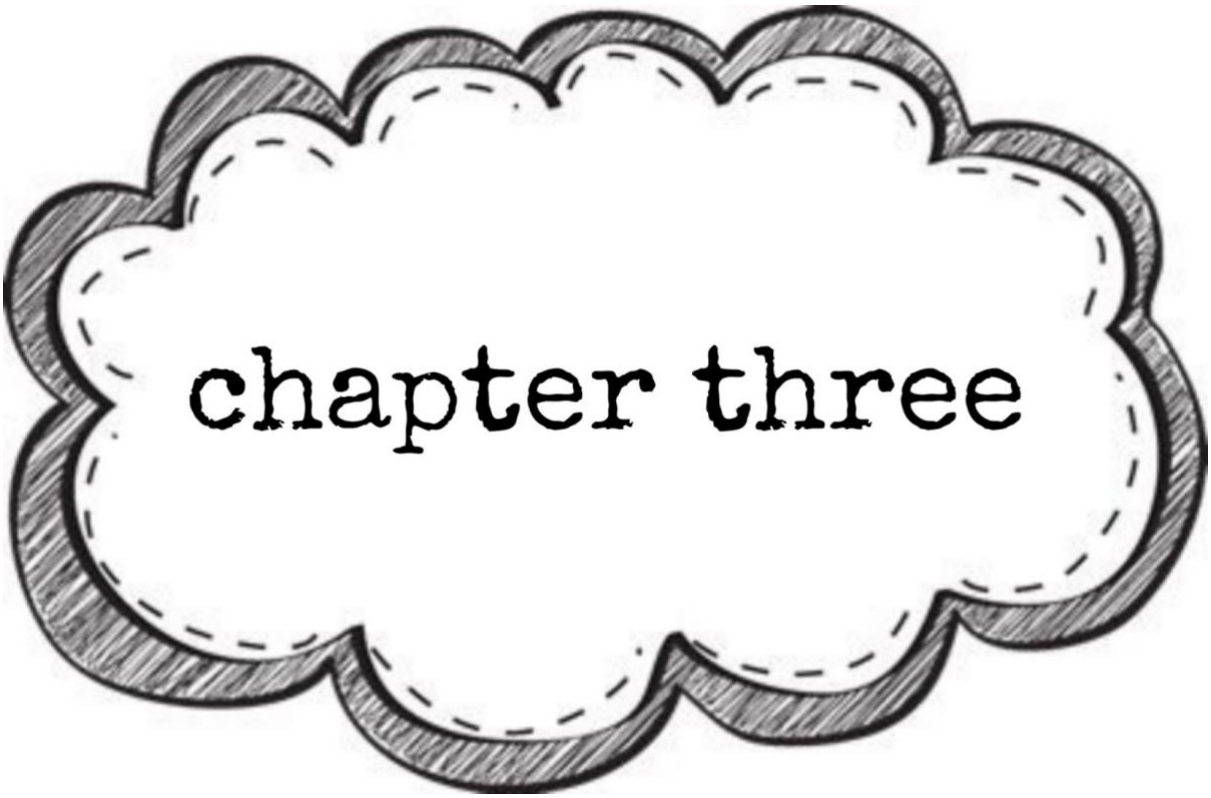

Conclusion

1. Extraction treatments appear to be more time consuming than non-extraction treatments. The number of extracted teeth appears to have an effect on the length of treatment.

2. It is impossible to draw valid conclusions about the duration of removable appliance treatment.

3. As long as patients are in their permanent dentition, age differences do not appear to affect the length of treatment.

4. When it comes to Class II division 1 malocclusions, there is strong evidence that the earlier orthodontic treatment is started, the longer the treatment lasts.

5. There is little evidence that different malocclusions require different treatment durations.

6. Information on the length of treatment in public health systems is contradictory in the literature.

7. The length of combined orthodontic and surgical treatment varies and appears to be operator dependent. Operators who perform a high number of surgical cases appear to finish them faster.

8. The duration of treatment appears to be influenced by a number of factors, including the technique used, the skill and number of operators involved, patient compliance, and the severity of the initial malocclusion. The contribution of each element, however, is uncertain,

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and this is an area that needs to be investigated.

9. There is some evidence that self-ligation can speed up treatment times.

10. Treatment time is extended due to impacted maxillary canines. Treatment length may be linked to the severity of the impaction as well as the patient's age.

11. Before precise answers can be given, new studies with robust research techniques are required.

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