Do postural exercises aiming to reduce forward head posture help reduce pain in chronic temporomandibular disorder patients ? A randomized controlled trial.

-Final project-

BERTHON ELISABETH

Mentor: DONEGAN Tony, Clinical Research Physiotherapist

Degree: International Degree in Physiotherapy from EUSES-UdG and ENTI-UB

Barcelona, 2024/2025

Table of content

Acknowledgment

I would like to express my deepest gratitude to Tony Donegan, my mentor in this final project. You are a wonderful teacher and this school is lucky to have you.

Je voudrais aussi remercier ma sœur, Marianne, pour son soutien à travers mes années d'études.
Je ne pourrais pas souhaiter avoir une meilleure sœur, tu es une femme formidable. Ta passion pour les arts et la persévérance dont tu as toujours fait preuve m'inspirent tous les jours à continuer à faire ce que j'aime.

Merci également à ma Maman, merci d'avoir toujours été là pour moi. J'espère te faire honneur en utilisant les "mains de kiné" que tu m'as donné.

Je remercie aussi mon Papa, pour m'avoir appris les os du corps si jeune et avoir cru en mon projet. La biomécanique du membre supérieur n'a plus de secret pour moi si elle est utilisée pour manger des bonbons au miel.

Je désire aussi exprimer ma gratitude envers mes grands-parents, piliers de notre famille. Vous avez été indispensable dans la réalisation de mes études et je vous en remercie du fond du cœur.

I would also like to thank the members of the jury, professors of this school, for taking the time to appreciate my final project.

Abstract

Introduction: Chronic temporomandibular disorders (TMD) are defined as a group of conditions affecting the temporomandibular joint (TMJ) and the related structures. They affect a considerable part of the population and create pain, discomfort and an overall difficult day to day life. Usually, the more common treatments are centered around the jaw and disregard the different structures that may affect the symptoms too, like the posture.

Objective: The goal of this study is to define whether or not adding an intervention aiming to reduce forward head posture (FHP) helps reduce the pain in chronic TMD patients. The function of the masticatory system, the quality of life and the craniovertebral angle (CVA) are also outcomes that will be measured. The participants will be divided into 2 randomized groups to test the effectiveness of an 8 weeks treatment program targeting the jaw and the posture with scapular stabilization exercises.

Methods: This randomized controlled trial will include patients with chronic TMD presenting FHP. The main outcome is pain, the secondary outcomes are function, quality of life and the craniovertebral angle to measure the FHP. The patients will be evaluated using the Graded Chronic Pain Scale version 2 (GCPS), the Jaw Functional Limitation Scale (JF-20), the CVA and the Short Form 12 Items Version 2 Health Survey (SF-12v2). There will be 4 assessments: at baseline (one day before the beginning of the intervention), at 4 weeks, at 8 weeks (one day after the final session) and at 6 months for the follow up. The mixed Anova test will be used for the data analysis with a p value <0.05 for significance. The investigators will be blinded during the study and the patients randomized.

Discussion: The results expected are: significant differences between the intervention group and the control group in terms of reduction of pain, as well as a better function of the masticatory system and quality of life. The FHP is expected to be reduced significantly for the intervention group and seen through an augmentation of the CVA.

Key words: temporomandibular disorder, scapular stabilization exercise, posture, physiotherapy, chronic pain

I. Introduction

The temporomandibular joint (TMJ) is one of the most solicited articulation in the body, necessary for breathing, eating and speaking, it is constantly working. This makes any issues related to the joint worrying and very uncomfortable for the patients. The group of conditions affecting the TMJ fit under the term of temporo-mandibular disorder (TMD) **(1)**. It indicates dysfunctions to the TMJ but also to the associated structures like the masticatory muscles. The condition can be acute but also has a potential of becoming chronic (≥3 months of symptoms). **(2)**

Due to the different facets and uniqueness of TMD in each patient, the causes are considered multiples. The literature is not consistent on what could be the main cause, whether it be acute or chronic. One of the most popular idea corresponds to malocclusion but generally speaking TMD qualifies to the biopsychosocial model of an illness, this means that the symptoms of TMD emerge from a multiple of contexts. **(1,3)** Despite this fact, some risk factors have been identified and they relate to psychological factors (depression and anxiety symptoms), the anamnesis (history of trauma or smocking) and also genetics (being of the female sex) **(1,3,4).** Specifically, the chronic aspect of TMD is often related to its comorbidities such as fibromyalgia, IBS, back pain or depression. **(1,2,3)**

TMD is a common disorder that affects between 6 to 9% of adults **(5)**, it is present globally with a higher prevalence in South America **(6)**. It tends to affect females more but is nonetheless quite present in males **(6)**. As said before, TMD has the potential to become chronic (≥3 months) as 30% of acute TMDs end up affecting the patient chronically **(5)** and it is very debilitating. The struggles of TMD patients have been highlighted in the literature, they relate to the work experiences of patients being affected, their social life disrupted and their self-perception degrading. The overall sentiments are the lack of legitimacy of the patients and the difficulties related to the chronic aspect of the disorder. **(7)** Another point is that the patient's experience with TMD is also severely diminished in the medical and paramedical sphere. Often, the patients mention the failure of practitioners to validate their pain and to find solutions to their issues. **(8)**

In this study, the control treatment will include some jaw centered care. Indeed, jaw stretching, supervised jaw exercises and trigger points therapy have been shown to be efficient and are included in the strong recommendations of the current guideline for management of chronic pain associated with TMD. **(2,5)** Despite the efficacy of this type of treatment, it is isolated from the rest of the body, as it targets only the masticatory muscles and does not take into consideration the rest of the body. On that account, treatments that focus on the overall body position have been considered in the guidelines and are seen as

efficient. Supervised postural exercises are considered more effective than placebo/sham in terms of relieving pain. **(2,5,9)**

By definition, the posture of the body depends on the way it perceives the information and how the body reacts according to it. Disturbances in this system can result in alterations of perception of the information along with the body's reaction and can cause biomechanical problems and thus pain to the related joints. **(10)**

In the case of TMDs, it has been shown that patients show a disturbance in posture, presenting a forward head posture (FHP). **(11)** Indeed, multiple studies have shown a correlation between the FHP and TMD patients, showing an unbalanced cervical posture as well as an altered center of gravity **(12,13)**. The FHP can accentuate the differences in lengths between the anterior and posterior cervical muscles, creating pressure and pain onto the neck muscles on top of affecting the curvature of the cervical spine. This particular change may affect mandible movement and function of the muscles in the TMJ. **(11,12,13)**

In this intervention we will tackle the FHP of patients with the goal of improving the symptoms of TMD. As the TMJ works in coordinated fashion with the rest of the body, especially the neck **(11)**, improving the posture could bring back function and soothe the pain of the patients. One of the ways to improve the FHP is to do scapular stabilization exercises (SSE), as it plays an important role in the position of the head and neck with the rest of the body. FHP is also related to an imbalance in the scapular muscles and working on this disequilibrium with SSE can reduce the inadequate posture. **(14,15,16)** This has been demonstrated through the augmentation of the craniovertebral angle (CVA) after the exercises, showing a reduction in the FHP. **(14,16)**

Although the link between TMD and postural treatment has been made in literature, there doesn't seem to be a clear assessment related to the reduction of the FHP being made in the treatment plan of most articles. Furthermore, SSE is almost non-existent in the literature when mentioning TMD. The intervention described in this article has the ambition of showing a proven relation between FHP correction, using SSE, and the relief of TMD symptoms (pain as the principal assessment). Additionally, it describes an indirect way of approaching the TMD symptoms in comparison to usual treatments within the TMJ sphere.

More importantly, the purpose of this randomized controlled trial is to raise the question on whether or not adding FHP reduction to jaw-centered treatment helps reduce pain in adults with chronic temporomandibular joint disorder compared with jaw-centered treatment alone.

II. Hypothesis

The null hypothesis of this study is " Postural exercises do not improve the pain of chronic TMD patients when coupled with jaw-centered treatment compared with jaw-centered treatment alone".

The alternative hypothesis of this study is "Postural exercises do improve the pain of chronic TMD patients when coupled with jaw-centered treatment compared with jaw-centered treatment alone".

III. Objectives related to outcomes

- The primary objective of the study is to determine whether postural exercises help reduce the pain in chronic temporomandibular patients when coupled with jaw-centered treatment compared with jaw-centered treatment alone.

- The secondary objective of the study is to determine whether postural exercises help improve the function in chronic temporomandibular patients when coupled with jaw-centered treatment compared with jaw-centered treatment alone.

- The third objective of the study is to determine whether postural exercises help reduce the forward head posture in chronic temporomandibular patients when coupled with jaw-centered treatment compared with jaw-centered treatment alone.

- The fourth objective of the study is to determine whether postural exercises help improve the quality of life in chronic temporomandibular patients when coupled with jaw-centered treatment compared with jaw-centered treatment alone.

IV. Methods Section

1. Study design

This study will be a randomized controlled trial, a type of research that tests a specific intervention onto a population and compares it to an existing treatment or a placebo **(17)**. The study will happen in a single center and will include 2 study arms, a control group that will receive a jaw-centered treatment and an intervention group that will receive jaw-centered treatment coupled with postural exercises. The Spirit guideline will be followed.

2. Flow chart

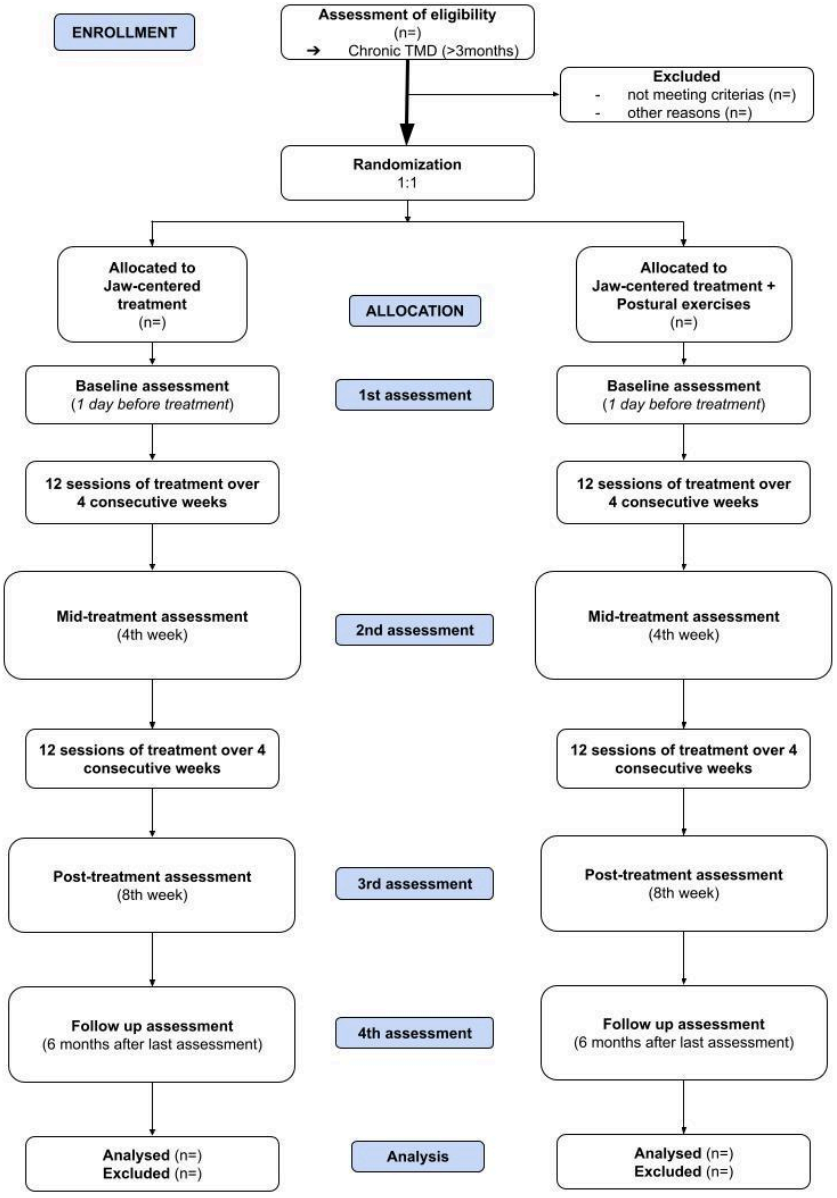

Fig 1. Flow Chart

3. Eligibility criteria

Inclusion and exclusion criteria were defined to increase the homogeneity of patients within the study.

Inclusion:

- Adult, above the age of 18 years old
- Individuals with a diagnosis of TMD
  - Fonseca amnestic index for identifying pain-related and/or intra-articular Temporomandibular Disorders **(18)**
    - cut off for Pain related to TMD → 27.50 for PT
- Individuals with a diagnosis of chronic TMD with no amelioration of pain and affected function for at least 3 continuous months
  - Anamnesis of patients should mention pain and affected function for at least 3 months
- Individuals who present a FHP
  - measurement of the CVA using a digital camera and Photoshop (Adobe Inc.)
    - cut off for FHP is 53°, above the cut off is considered not having a FHP and under is considered having one

Exclusion:

- Surgery to the TMJ in the last year
- Current odontological treatment for the last 3 months
  - Braces, fillings, crowns, root canal issues
- Current infection
- Comorbid fibromyalgia diagnosis
- Scoliosis
  - Cobb angle above 10° **(19)**
- History of surgery related to scoliosis (spinal fusion)

4. Sample size

The sample size is usually measured by using the minimally clinical important difference (MCID) but as a precise MCID has not yet been described for the Graded Chronic Pain Scale version 2 (GCPS) (used to measure the main outcome) we will use the one of a similar study. A mean difference of 2.6 was chosen, the sample size should be based on this measure. **(20)**

5. Outcomes

The primary outcome of this study is pain but function, quality of life and the craniovertebral angle will also be measured.

Pain will be measured using the Graded Chronic Pain Scale version 2 (GCPS) of the DC/TMD, in particular the 1-month version, as it is recommended in the guideline document to use this version for an outcome measure **(21)**. It is a self-reported questionnaire with 8 items answered on a scale of 0 (no pain) to 10 (unbearable pain). The results are computed to have the characteristic pain intensity (CPI) score and interference score. The disability points result from the disability days and the interference score. The final grade is decided depending on the disability points and the CPI score. There are 5 different resulting grades for Chronic pain in patients with TMD. This questionnaire has shown a good clinical validity for pain intensity in the literature for this population **(21, 22)**.

Interpretation

Determination of Chronic Pain Grade

Grade	Label	CPI	Disability Points
0	None	0	N/A
I	Low intensity pain, without disability	< 50	< 3
II	High intensity pain, without disability	≥ 50	< 3
III	Moderately limiting	N/A	3 - 4
IV	Severely limiting	N/A	5 - 6

Fig 2. Interpretation of the GCPS **(21)**

Function will be measured by the Jaw Functional Limitation Scale-20 (JFLS-20) from the DC/TMD with the global score for the chronic TMD. It is a self-reported questionnaire measuring the overall limitation in the function of the masticatory system. It has 20 items that are computed and divided by the number of items answered to form a mean score. The cut off is 1,74 for people with chronic TMD. This questionnaire has shown a good clinical validity in literature for this population **(21, 22)**.

	No lifetime TMD		Chronic TMD	
Scale	Mean	SE	Mean	SE
Mastication limitation	0.28	0.02	2.22	0.13
Mobility limitation	0.18	0.02	2.22	0.13
Verbal and Emotional Expression Limitation	0.14	0.02	0.72	0.10
Global	0.16	0.02	1.74	0.11

Fig 3. Interpretation of the JFLS-20 **(21)**

Quality of life will be measured by the Short Form 12 Items Version 2 Health Survey (SF-12v2), it is a self reported questionnaire composed of 12 items measuring physical and mental health. The mean is set at 50, a score superior to it equals to a better physical or mental health than the mean while a score inferior to 50 indicates the contrary. The SF-12v2 has been proven to be clinically valid in multiple contexts in the literature, including chronic pain **(23)**. There hasn't been an evaluation in the literature of the reliability for chronic pain patients with TMD specifically.

The craniovertebral angle will be measured using Photoshop (Adobe Systems Inc.), a computer program for image processing. The CVA corresponds to the angle between the horizontal line traced at the level of C7 and the line from the tragus to the spinous process of C7 **(16, 24, 25)**. Pictures will be taken of the lateral profile of patients, standing up, in a relaxed position, 3m away from the patient **(24)**, on a tripod 1 meter away from the ground (at the same height in every assessment). The pictures will be taken with a digital camera. The cut-off angle to decide if one has a FHP will be 53°, above the cut off is considered not having a FHP and under is considered having one **(26)**. Photographic evidence is considered a reliable way of measuring the CVA and a valid tool to assess forward head posture **(14, 16, 27)**.

6. Assessments

The outcomes will be measured 4 different times during the study: at baseline, midway through the treatment, post treatment and at a follow up. The baseline assessment will happen one day before the beginning of treatment and the midway assessment will happen at week 4 during an "off" day. The post-treatment assessment will happen one day after the final session and the follow up 6 months after that.

7. Ethics

This study's project will be evaluated by the Research Ethics Committee (CRE) with medicines (CREm) at Bellvitge University Hospital in order to go further as the study will take place there. This group of researchers will ensure that the rules of good clinical practice will be followed, as well as the principles set in the Helsinki Declaration (World Medical Association, 1989). The researchers will also inform the patients of the study procedures through the informed consent that will be requested for all participants and can be found in the annex 1.

8. Study setting and recruitment

Our population will be recruited within the outpatients physiotherapy clinics and the dentistry outpatients clinics of Barcelona's metropolitan area. Leaflets with information about the study will be left in voluntary health centers of the city by the researcher in charge of recruitment so that patients can learn of the study and consider it. The recruitment will be based on voluntary participation only. After offering their participation to the study, the patients will go through the screening process to see if they fit the eligibility criteria. The screening process consists of assessing each potential patient to see if they fit the eligibility criteria, the physiotherapist in charge will do a thorough anamnesis of the patient, measure the CVA and explain how the Fonseca amnestic index for identifying pain-related and/or intra-articular Temporomandibular Disorders works to the patient before they complete it. After a successful screening process, the eligible patient will be sent to randomization.

9. Randomization

This clinical trial process will include a randomization, as it is necessary to separate the patients into the 2 study arms while limiting the bias. Like said above, after a successful screening process the patient is sent to randomization. The participant will be located into 2 groups (A or B) randomly, with a 1:1 ratio. To do so, one researcher will generate an allocation sequence using https://ctrandomization.cancer.gov/tool/. The letter corresponding to the group will be put in sealed opaque envelopes to be opened by another researcher who did not participate in the randomization process. The researcher in charge of the randomization will not have another input in the study, this will be their only role to ensure allocation concealment. When the envelopes are opened and the patients are allocated, the groups will then be sent to treatment, a task completed by another group of researchers/physiotherapists.

10. Blinding

To go further, this study will include blinding on different levels: recruitment, allocation, assessment and statistical analysis. For every step mentioned, the assessors will be blinded. Those precautions will limit bias.

11. Intervention for the control group

As mentioned before, the control treatment will be jaw-centered and will include: jaw stretching, supervised jaw exercises and trigger points therapy. The treatment will have a duration of 8 weeks with 3, 30 minutes long, sessions per week (monday, wednesday and friday). For a total of 24 sessions where treatment will be applied by a licensed physiotherapist who has a formation in TMJ treatment. The sessions will be realized in a room at the Bellvitge University Hospital, equipped with the necessary tools. All exercises will be monitored by the physiotherapist face to face to ensure a good realization and adherence to the program.

The jaw stretching technique will be a post-isometric relaxation treatment (PIR), a form of muscle energy technique **(28)**. The physiotherapist will target the muscles responsible for elevating the jaw and the ones responsible for the lateral movements. Respectively: temporalis (anterior and middle), masseter, medial pterygoid and lateral pterygoid, medial pterygoid **(29)**. The technique will be performed 3 times per muscle group in one session **(30)**, it will consist of an isometric contraction (20% of the maximum force of the patient) with a resistance applied by the therapist upon the patient's mandible according to the group targeted. The resistance will last no more than 8 seconds and when removed the physiotherapist will reach for a bigger range of motion, passively. There will be a rest period of 1 minute between the sets. **(30, 31, 32)**

The trigger point therapy will also target the muscles mentioned above. Trigger points are believed to be hypersensitive points of the muscle band that are palpable. Compressing them can create referred pain that will slowly decrease with time, it brings relief to the symptoms of the patient **(33)**. The physiotherapist will target the points on the temporalis, masseter, lateral and medial pterygoid. **(34)** The physiotherapist will apply a pressure of 2 Kg/cm² during 90 seconds with a digital algometer **(35)**. There will be a rest period of 90 seconds between the trigger points.

The jaw exercises will be done with supervision of the physiotherapist during the sessions. Jaw exercises include strengthening, mobility and coordination **(36, 37)**.

A) Coordination and mobility: The patient will open their jaw in a straight line, using a ruler as a guide in front of a mirror. The jaw should not deviate from the guide. The position should be held for 10 seconds and repeated 8 to 10 times **(38, 39)**. Next, the patient should lateralize the jaw from the midline to the canine guide (if possible), hold the position for 10 seconds then do the other side. This exercise should also be done 8 to 10 times. There will be a rest period of 1 minute between the movements. **(38, 40)**.

B) Strengthening: For this exercise, the patient will be in a supine position and will open the jaw slowly while the physiotherapist maintains an elastic band under the chin, creating a resistance. Along the study the patient can and should be able to increase the resistance by changing to a different elastic band with more resistance. The exercise will be performed in 2 sets of 12 repetitions **(9, 38, 41)**. There will be a rest period of 1 minute between the sets.

12. Intervention for the study group

The intervention will be postural exercises aiming to reduce forward head posture paired with jaw-centered treatment. The intervention group will have 24 sessions of treatment applied, spaced out over 8 weeks with 3, 60 minutes long, sessions per week (monday, wednesday and friday). The sessions will be conducted by another licensed physiotherapist, also trained in TMJ treatment. It will happen in the same hospital as the control group, in a room equipped with the necessary tools. The jaw-centered treatment part will be the same as the control group, with PIR, trigger points and jaw exercises (mobility, strengthening and coordination). All exercises will be monitored by the physiotherapist, face to face, to ensure a good realization and adherence to the program.

The scapular stabilization exercises will target the serratus anterior, rhomboids, lower and upper trapezius muscles. All 3 exercises and their variations will be executed on an inclined and/or unstable surface: on an inclined bench or on a swiss ball. The swiss ball is positioned between the chest and stomach and the knees of the patient are on the ground with a 90° flexion, forming a straight line between the pelvis, acromion of scapula and ear **(16)**.

A) The scapular protraction exercise is done on the inclined bench (45°), chest up, with an elastic behind and on the ground to create tension while the patient executes the movement. **(25, 42, 43)**
B) The Y to W exercise is done on the swiss ball, chest down and is done as described in the literature. To get to the Y position, the patient starts in a T position (shoulder abducted to 90°), then goes to a Y position (flexion of elbow to 90°, retraction of scapula and external rotation of the arms, abduction of shoulder to 120° and extended elbows) and finally to the W position (flexion of elbow so the hands are at ear level while maintaining the retraction to form the shape of a W). **(16, 25, 43)**
C) The dynamic scapular stabilization exercise described in the literature: on the swiss ball, chest down, raising one arm and pushing the other one out behind the back and switching them. **(42)**

Exercise A, B and C will be performed in 2 sets of 12 repetitions with a 10 seconds hold per rep **(41, 42)** with a progression in time of the elastic band resistance. The patients will be briefed to choose an elastic band for the intervention that will challenge them: “You must be able to complete the sets entirely with a good form and without compensation and yet still feel challenged”. They should adapt their choices throughout the study depending on the changes in their strength. There will be a rest period of 1 minute between the sets.

13. Data analysis

To compare the data within and between the groups we will use a mixed methods ANOVA test for the quantitative continuous outcomes (function, quality of life, craniovertebral angle) and for the quantitative ordinal outcome (pain). A p value of 5% (<0.05) will be considered statistically significant.

V. Calendar

The calendar includes the steps taken in the study from the enrollment to the follow up assessment.

	Study period													
	Enrollment	**Allocation**	**Baseline Assessment**	**4 weeks of treatment**				**Mid-study Assessment**	**4 weeks of treatment**				**Post-treatment assessment**	**Follow up assessment**
Time point	T-1	0	T0					T1					T2	T3
Enrollment	X													
Eligibility screen	X													
Informed consent	X													
Allocation		X												
Intervention														
Jaw-centered treatment only				X	X	X	X		X	X	X	X		
Jaw-centered + Postural exercises				X	X	X	X		X	X	X	X		
Assessment														
Pain			X					X					X	X
Function			X					X					X	X
Quality of life			X					X					X	X
CVA			X					X					X	X

Fig 4. Calendar

VI. Role of the investigators

There will be 14 researchers in total in the study, they each have a specific role. Researcher 1 will be in charge of recruitment within the different outpatient clinics mentioned above and through the contacts gained by the leaflets left in health centers. The job of this researcher is not specified. Researcher 2 will be in charge of assessing the potential patients by going through the eligibility criteria and the resulting list will be sent to allocation. This researcher will be a physiotherapist in charge of doing a thorough anamnesis of each potential patient, measure the CVA and explain how the Fonseca amnestic index for identifying pain-related and/or intra-articular Temporomandibular Disorders works to the patient before they complete it. This physiotherapist must be familiar with the assessment process in TMJ related conditions. Then, just as explained before, the allocation concealment process will limit selection bias and send the correct patients to their group for treatment. It will be done by researcher 3. The job of this researcher is not specified. Later, researchers 4 and 5, 2 physiotherapists will be assigned 1 group of patients each, not aware of the other group's treatment and will carry out the sessions during 8 weeks. The physiotherapists must be trained in TMJ related treatment. For the assessment, 4 pairs of researchers (researcher 6 to 13) will be in charge of assessing the patients, they will be physiotherapists that are familiar with the assessment process in TMJ related

conditions. Each set will execute the assessment during the study at different points and within the sets, they will be dispatched between the control group and the intervention group, unaware of the other's intervention. Finally, researcher 14 will be in charge of statistical analysis of the data.

VII. Resources

Some materials will be needed for the study, including human resources and tools for the interventions and assessments.

In terms of human resources, the group study will be composed of 14 researchers in total:

- 11 physios
    - 9 familiar with the assessment process in TMJ related conditions
    - 2 trained in TMJ treatment
- 3 others without a specified job.

The fungible material needed will be:

- Dumbbells from 500g to 5 Kg
- Elastic bands with multiple resistances
- Digital algometer
- Rulers
- Mirrors
- Inclined benches
- Swiss balls
- Physiotherapy tables
- Digital camera
- Tripod
- Graded Chronic Pain Scale version 2 (GCPS) of the DC/TMD
- Jaw Functional Limitation Scale-20 (JFLS-20) from the DC/TMD
- Short form 12 items version 3 Health survey (SF-12v2)
- Fonseca amnestic index for identifying pain-related and/or intra-articular Temporomandibular Disorders.

The non-fungible material needed will be:

- Photoshop

VIII. Limitations

This study may encounter certain limitations related to the methodology. In this research project, the intervention group has more overall treatment than the control, it is therefore more likely that the intervention group improves more relative to the control group, irrespective of the treatment choices. This limitation is mitigated by the fact that the patients are unaware of the treatment in the other groups. This is the main limitation with this study's design, there is no non-intervention control group. Furthermore, this study will not use X-ray to measure the CVA even though it is considered more accurate than photographic evidence. This was decided to limit the impact of X-rays on patients. Moreover, the primary outcome of this study is a subjective assessment, making it difficult to assess and compare between groups, even though the evaluation tools are validated in literature.

IX. References

1. Palmer J, Durham J. Temporomandibular disorders. BJA education [Internet]. 2021 Feb 1;21(2):44–50. Available from: https://pubmed.ncbi.nlm.nih.gov/33889429/
2. Busse JW, Casassus R, Carrasco-Labra A, Durham J, Mock D, Zakrzewska JM, et al. Management of chronic pain associated with temporomandibular disorders: a clinical practice guideline. BMJ [Internet]. 2023 Dec 15;383:e076227. Available from: https://www.bmj.com/content/383/bmj-2023-076227
3. Ohrbach R, Sharma S. Temporomandibular disorders: Definition and Etiology. Seminars in Orthodontics. 2023 Dec 1;
4. Cecília Doebber Da-Cas, Lígia Figueiredo Valesan, Pereira L, Cristina A, Januzzi E, Fernandes G, et al. Risk factors for temporomandibular disorders: a systematic review of cohort studies. Oral Surgery Oral Medicine Oral Pathology and Oral Radiology. 2024 Jun 19;138(4):502–15.
5. Yao L, Behnam Sadeghirad, Li M, Li J, Wang Q, Crandon HN, et al. Management of chronic pain secondary to temporomandibular disorders: a systematic review and network meta-analysis of randomised trials. BMJ [Internet]. 2023 Dec 15;383. Available from: https://www.bmj.com/content/383/bmj-2023-076226
6. Grzegorz Zieliński, Pająk-Zielińska B, Michał Ginszt. A Meta-Analysis of the Global Prevalence of Temporomandibular Disorders. Journal of clinical medicine. 2024 Feb 28;13(5):1365–5.
7. Taimeh D, Leeson R, Fedele S, Ni Riordain R. A meta‐synthesis of qualitative data exploring the experience of living with temporomandibular disorders: The patients' voice. Oral Surgery. 2022 Jul 7;16(1):152–68.
8. Ilgunas A, Anncristine Fjellman‐Wiklund, Birgitta Häggman‐Henrikson, Lobbezoo F, Visscher CM, Durham J, et al. Patients' experiences of temporomandibular disorders and related treatment. BMC Oral Health. 2023 Sep 8;23(1).
9. Ciuraj M, Lipowicz A, Graja K, Zwolska P, Myśliwiec A. Physiotherapeutic methods of treatment of mandibular distal occlusion and the progress of therapy: A case report. Journal of Bodywork and Movement Therapies [Internet]. 2022 Jan 1;29:26–32. Available from: https://pubmed.ncbi.nlm.nih.gov/35248280/
10. Sambataro S, Cervino G, Bocchieri S, La Bruna R, Cicciù M. TMJ Dysfunctions Systemic Implications and Postural Assessments: A Review of Recent Literature. Journal of Functional Morphology and Kinesiology. 2019 Aug 19;4(3):58.

11. Xiao CQ, Wan YD, Li YQ, Yan ZB, Cheng QY, Fan PD, et al. Do Temporomandibular Disorder Patients with Joint Pain Exhibit Forward Head Posture? A Cephalometric Study. Fernández-de-las-Peñas C, editor. Pain Research and Management. 2023 Feb 2;2023:1–11.
12. Minervini G, Franco R, Maria Maddalena Marrapodi, Crimi S, Almir Badnjević, Cervino G, et al. Correlation between Temporomandibular Disorders (TMD) and Posture Evaluated trough the Diagnostic Criteria for Temporomandibular Disorders (DC/TMD): A Systematic Review with Meta-Analysis. 2023 Apr 2;12(7):2652–2.
13. M. Hölzl, Behrmann R, Biesinger E, W. von Heymann, Hülse R, Goessler UR, et al. Selected ENT symptoms in functional disorders of the upper cervical spine and temporomandibular joints. Hno. 2019 Mar 1;67(S1):1–9.
14. Kang JI, Choi HH, Jeong DK, Choi H, Moon YJ, Park JS. Effect of scapular stabilization exercise on neck alignment and muscle activity in patients with forward head posture. Journal of Physical Therapy Science. 2018;30(6):804–8.
15. Sepehri S, Sheikhhoseini R, Piri H, Sayyadi P. The effect of various therapeutic exercises on forward head posture, rounded shoulder, and hyperkyphosis among people with upper crossed syndrome: a systematic review and meta-analysis. BMC musculoskeletal disorders [Internet]. 2024 Feb 1;25(1):105. Available from: https://pubmed.ncbi.nlm.nih.gov/38302926/
16. Yang S, Mathieu Boudier‐Revéret, You Gyoung Yi, Kee Yong Hong, Hee Jin Lee. Treatment of Chronic Neck Pain in Patients with Forward Head Posture: A Systematic Narrative Review. Healthcare. 2023 Sep 22;11(19):2604–4.
17. National Institute on Aging. What Are Clinical Trials and Studies? [Internet]. National Institute on Aging. 2023. Available from: https://www.nia.nih.gov/health/clinical-trials-and-studies/what-are-clinical-trials-and-studies
18. Yap AU, Zhang MJ, Lei J, Fu KY. Accuracy of the Fonseca Anamnestic Index for identifying pain-related and/or intra-articular Temporomandibular Disorders. Cranio: The Journal of Craniomandibular Practice [Internet]. 2021 Jul 14;1–8. Available from: https://pubmed.ncbi.nlm.nih.gov/34259594/
19. Archana Nandibewoor, Qazi A, Pawar N, Pushpalatha Nikkam, Hegde A. Detection of scoliosis in human spine using Cobb angle. BLDE University Journal of Health Sciences [Internet]. 2023 Jan 1 [cited 2024 Dec 9];8(2):249–9. Available from: https://journals.lww.com/blde/fulltext/2023/08020/detection_of_scoliosis_in_human_spine_using_cobb.8.aspx

20. Izabela A, De Oliveira-Souza S, Ribeiro L, Sales V, Daniele De Fontes Coutinho A, Araújo De Oliveira D, et al. Effectiveness of an 8-week neck exercise training on pain, jaw function, and oral health-related quality of life in women with chronic temporomandibular disorders: a randomized controlled trial. J Oral Facial Pain Headache [Internet]. 2024;38(1):40–51. Available from: https://files.jofph.com/files/article/20240312-312/pdf/OFPH3321.pdf
21. Diagnostic Criteria for Temporomandibular Disorders (DC/TMD) Scoring Manual for Self-Report Instruments [Internet]. 2017 Jan. Available from: https://ubwp.buffalo.edu/rdc-tmdinternational/wp-content/uploads/sites/58/2017/01/DC-TMD-Self-report-Instrument-Scoring-Manual_2017_01_09.pdf
22. Taimeh D, Rícheal Ní Ríordáin, Fedele S, Leeson R. Validity and internal consistency of four scales in patients with TMD: PHQ8, GAD7, PHQ15 and JFLS20. Oral Diseases. 2023 Oct 5;
23. Tawiah AK, Al Sayah F, Ohinmaa A, Johnson JA. Discriminative validity of the EQ-5D-5 L and SF-12 in older adults with arthritis. Health and Quality of Life Outcomes. 2019 Apr 17;17(1).
24. Bon Wook Goo, Jin Hee Oh, Ju Sang Kim, Mi Young Lee. Effects of cervical stabilization with visual feedback on craniovertebral angle and proprioception for the subjects with forward head posture. Medicine. 2024 Jan 12;103(2):e36845–5.
25. Abd El-Azeim AS, Mahmoud AG, Mohamed MT, El-Khateeb YS. Impact of adding scapular stabilization to postural correctional exercises on symptomatic forward head posture: a randomized controlled trial. European journal of physical and rehabilitation medicine [Internet]. 2022 Oct 1;58(5):757–66. Available from: https://europepmc.org/article/med/35673945
26. Khan A, Khan Z, Bhati P, Hussain ME. Influence of Forward Head Posture on Cervicocephalic Kinesthesia and Electromyographic Activity of Neck Musculature in Asymptomatic Individuals. Journal of Chiropractic Medicine. 2020 Dec;19(4):230–40.
27. Mostafaee N, HasanNia F, Negahban H, Pirayeh N. Evaluating Differences Between Participants With Various Forward Head Posture With and Without Postural Neck Pain Using Craniovertebral Angle and Forward Shoulder Angle. Journal of Manipulative and Physiological Therapeutics. 2022 Mar;45(3):179–87.
28. Chaitow L. Muscle Energy Techniques. Manual Therapy. 2008 Feb;13(1):e12.

29. Basit H, Eovaldi BJ, Siccardi MA. Anatomy, Head and Neck, Mastication Muscles [Internet]. PubMed. Treasure Island (FL): StatPearls Publishing; 2020. Available from: https://www.ncbi.nlm.nih.gov/books/NBK541027/
30. Tariq M, Fatima K, Khan A, Mahmood W, Mahmood T, Sarma Khurshaid, et al. Efficacy of massage versus massage with post isometric relaxation in temporomandibular disorders: a randomized controlled trial. BMC sports science, medicine & rehabilitation. 2024 May 16;16(1).
31. Urbański P, Trybulec B, Pihut M. The Application of Manual Techniques in Masticatory Muscles Relaxation as Adjunctive Therapy in the Treatment of Temporomandibular Joint Disorders. International Journal of Environmental Research and Public Health [Internet]. 2021 Dec 8;18(24):12970. Available from: https://pubmed.ncbi.nlm.nih.gov/34948580/
32. Zieliński G, Suwała M, Szkutnik J, Ginszt M, Gawda P. Evaluation of the effectiveness of selected physiotherapeutic techniques at trigger point in myalgia form of temporomandibular disorders - randomized controlled trial. Cranio : the journal of craniomandibular practice [Internet]. 2024 Winter;1–11. Available from: https://pubmed.ncbi.nlm.nih.gov/39283004/
33. Barbero M, Schneebeli A, Koetsier E, Maino P. Myofascial pain syndrome and trigger points: evaluation and treatment in patients with musculoskeletal pain. Current Opinion in Supportive & Palliative Care [Internet]. 2019 Sep;13(3):270–6. Available from: https://journals.lww.com/co-supportiveandpalliativecare/Abstract/2019/09000/Myofascial_pain_syndrome_and_trigger_points_.20.aspx
34. Kostopoulos D, Konstantine Rizopoulos. The Manual of Trigger Point and Myofascial Therapy. Taylor & Francis; 2024.
35. Ginszt M, Zieliński G, Berger M, Szkutnik J, Bakalczuk M, Majcher P. Acute Effect of the Compression Technique on the Electromyographic Activity of the Masticatory Muscles and Mouth Opening in Subjects with Active Myofascial Trigger Points. Applied Sciences. 2020 Nov 2;10(21):7750.
36. Shimada A, Ogawa T, Sara Reda Sammour, Taichi Narihara, Shigeo Kinomura, Koide R, et al. Effectiveness of exercise therapy on pain relief and jaw mobility in patients with pain-related temporomandibular disorders: a systematic review. Frontiers in oral health [Internet]. 2023 Jul 12;4. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10382173/

37. Shimada A, Ishigaki S, Matsuka Y, Komiyama O, Torisu T, Oono Y, et al. Effects of exercise therapy on painful temporomandibular disorders. Journal of Oral Rehabilitation. 2019 Feb 19;46(5):475–81.
38. Ricca Chairunnisa, Hubban Nasution, Uma Maheswari. The Difference in Severity of Temporomandibular Joint Disorders Before and After Jaw Exercises. COMSERVA Jurnal Penelitian dan Pengabdian Masyarakat. 2024 Mar 26;3(10):4075–85.
39. Ricca Chairunnisa, Siti Dyah Fadilla. Effectiveness of telemedicine approach as a treatment to reduce severity of temporomandibular disorders. Dental Journal: Majalah Kedokteran Gigi. 2022 Oct 13;55(4):204–8.
40. Maria. Oral Motor Treatment of TMD. Springer eBooks. 2019 Jan 1;149–65.
41. Schoenfeld BJ, Contreras B, Krieger J, Grgic J, Delcastillo K, Belliard R, et al. Resistance Training Volume Enhances Muscle Hypertrophy. Medicine & Science in Sports & Exercise. 2018 Aug;51(1):1.
42. Nitayarak H, Charntaraviroj P. Effects of scapular stabilization exercises on posture and muscle imbalances in women with upper crossed syndrome: A randomized controlled trial. Journal of Back and Musculoskeletal Rehabilitation. 2021 Nov 3;34(6):1031–40.
43. Im B, Kim Y, Chung Y, Hwang S. Effects of scapular stabilization exercise on neck posture and muscle activation in individuals with neck pain and forward head posture. Journal of Physical Therapy Science. 2015;28(3):951–5.

V. Annexes

Annexe 1 - Informed consent

Informed Consent form for patients

This informed consent is for the patients we are inviting to participate in our research study. The title of our research project is **Do postural exercises aiming to reduce forward head posture help reduce pain in chronic temporomandibular disorder patients ? A randomized controlled trial.** You will be given a copy of the full informed consent form.

I. Introduction

Our team of researchers is working for the Barcelona research institute. We are doing research on postural exercises to reduce forward head posture in chronic temporomandibular patients. The goal of this information sheet is to give you all of the information needed to be a part of this study. You do not have to decide today whether or not you will participate in the research. Before you decide you can talk to anyone you feel comfortable with about the research. You are encouraged to ask questions about any aspects of the study or informed consent form.

II. Purpose of the research

Temporomandibular disorder affects a considerable part of the population and has consequences on multiple aspects of the life of patients. Currently, the main treatment used in physiotherapy is focused on the jaw itself. The goal of this study is to see if by adding another component to this treatment such as exercises to improve posture, it will reduce the pain of the patients.

III. Type of Research Intervention

This research will involve 8 weeks of treatment with a physiotherapist in face to face sessions, 3 times a week and 4 assessment sessions at different points in the study (before, midway, after and a follow up in 6 months). It will be in a single center.

IV. Participants selection

We are inviting adults with chronic (more than 3 months) temporomandibular disorder and a forward head posture to participate in this research on this treatment. However, the patients

that have a current infection or an odontological treatment in the last 3 months such as braces, fillings, crowns or root canal issues do not meet the inclusion criterias and cannot participate in the study. The same applies to patients with a comorbid fibromyalgia diagnosis, a scoliosis with a cobb angle superior to 10° and a history of surgery related to scoliosis (spinal fusion).

V. Voluntary participation

The participation in this study is entirely voluntary. It is your choice whether to participate or not. You are allowed to change your mind and stop participating even if you agreed earlier.

VI. Information on study participation

Patients will participate in a 8 weeks long face to face treatment with a physiotherapist. The sessions will include jaw exercises, stretching and trigger points reliefs. The experimental intervention will include postural exercises. There will be 4 different research interactions that will occur to assess the pain, the function, the quality of life and the forward head posture. The participants will be separated in two groups, intervention and control, to evaluate the effects of postural exercises on the training outcomes. Participants will have to attend 3 sessions per week, that will last between 30 minutes to 1 hour depending on their group. 4 assessment sessions will happen: before, midway and after the treatment with a follow up at 6 months. Patients have the liberty to leave the study at any point.

VII. Risks

The risks involved in this study are minimal and the well-being of the patients will be monitored during the face to face sessions with the physiotherapist.

VIII. Benefits

If you participate in this research, you may feel benefits in terms of pain relief, better function related to the temporomandibular joint and the related tissues, an improvement in the quality of life and the posture.

IX. Confidentiality

The information collected in this study are confidentials and will not be shared outside of the research purpose. Any information about you will have a number on it instead of your name. Only the researchers will know what your number is. It will not be shared.

X. Sharing the results

The results of this study will be published in order that other interested people may learn from our research. confidential information will not be shared.

XI. Right to refuse or withdraw

You do not have to participate in this research if you do not wish to, you are allowed to withdraw at any time. Refusing to participate will not affect the care you are receiving at the center in any way.
It is your choice and it will be respected.

XII. Who to contact

If you have any questions you may ask them now or later, even after the study has started. If you wish to ask them later you may contact one of our investigators or research coordinator.

Annex 2 - Graded Chronic Pain Scale Version 2.0

Graded Chronic Pain Scale Version 2.0

1. On how many days in the **last 6 months** have you had facial pain? _____ Days

2. How would you rate your facial pain **RIGHT NOW?** Use a scale from 0 to 10, where 0 is "no pain" and 10 is "pain as bad as could be".

No pain										Pain as bad as could be
0	1	2	3	4	5	6	7	8	9	10

3. In the LAST 30 DAYS, how would you rate your **WORST** facial pain? Use the same scale, where 0 is "no pain" and 10 is "pain as bad as could be".

No pain										Pain as bad as could be
0	1	2	3	4	5	6	7	8	9	10

4. In the LAST 30 DAYS, **ON AVERAGE**, how would you rate your facial pain? Use the same scale, where 0 is "no pain" and 10 is "pain as bad as could be". [That is, *your usual pain* at times you were in pain.]

No pain										Pain as bad as could be
0	1	2	3	4	5	6	7	8	9	10

5. In the LAST 30 DAYS, how many days did your facial pain keep you from doing your **USUAL ACTIVITIES** like work, school, or housework? (every day = 30 days)

_____ Days

6. In the LAST 30 DAYS, how much has facial pain interfered with your **DAILY ACTIVITIES**? Use a 0-10 scale, where 0 is "no interference: and 10 is "unable to carry on any activities".

No interference										Unable to carry on any activities
0	1	2	3	4	5	6	7	8	9	10

7. In the LAST 30 DAYS, how much has facial pain interfered with your **RECREATIONAL, SOCIAL AND FAMILY ACTIVITIES**? Use the same scale, where 0 is "no interference: and 10 is "unable to carry on any activities".

No interference										Unable to carry on any activities
0	1	2	3	4	5	6	7	8	9	10

8. In the LAST 30 DAYS, how much has facial pain interfered with your **ABILITY TO WORK**, including housework? Use the same scale, where 0 is "no interference: and 10 is "unable to carry on any activities".

No interference										Unable to carry on any activities
0	1	2	3	4	5	6	7	8	9	10

Annex 3 - Jaw Functional Limitation Scale — 20

Jaw Functional Limitation Scale – 20

For each of the items below, please indicate the level of limitation **during the last month**. If the activity has been completely avoided because it is too difficult, then circle '10'. If you avoid an activity for reasons other than pain or difficulty, leave the item blank.

		No limitation										Severe limitation
1.	Chew tough food	0	1	2	3	4	5	6	7	8	9	10
2.	Chew hard bread	0	1	2	3	4	5	6	7	8	9	10
3.	Chew chicken (e.g., prepared in oven)	0	1	2	3	4	5	6	7	8	9	10
4.	Chew crackers	0	1	2	3	4	5	6	7	8	9	10
5.	Chew soft food (e.g., macaroni, canned or soft fruits, cooked vegetables, fish)	0	1	2	3	4	5	6	7	8	9	10
6.	Eat soft food requiring no chewing (e.g., mashed potatoes, apple sauce, pudding, pureed food)	0	1	2	3	4	5	6	7	8	9	10
7.	Open wide enough to bite from a whole apple	0	1	2	3	4	5	6	7	8	9	10
8.	Open wide enough to bite into a sandwich	0	1	2	3	4	5	6	7	8	9	10
9.	Open wide enough to talk	0	1	2	3	4	5	6	7	8	9	10
10.	Open wide enough to drink from a cup	0	1	2	3	4	5	6	7	8	9	10
11.	Swallow	0	1	2	3	4	5	6	7	8	9	10
12.	Yawn	0	1	2	3	4	5	6	7	8	9	10
13.	Talk	0	1	2	3	4	5	6	7	8	9	10
14.	Sing	0	1	2	3	4	5	6	7	8	9	10
15.	Putting on a happy face	0	1	2	3	4	5	6	7	8	9	10
16.	Putting on an angry face	0	1	2	3	4	5	6	7	8	9	10
17.	Frown	0	1	2	3	4	5	6	7	8	9	10
18.	Kiss	0	1	2	3	4	5	6	7	8	9	10
19.	Smile	0	1	2	3	4	5	6	7	8	9	10
20.	Laugh	0	1	2	3	4	5	6	7	8	9	10

Annex 4 - Short Form 12 Items Version 2 Health Survey

SF-12 v2

Patient Identification Information

Date (Outcomes.SF12Date) (dd-mmm-yyyy)

To print blank form

Click here

Questionnaire assessment performed: (Outcomes.SF12Performed)
- ☐ Not performed
- ☐ Performed/Completed

Questionnaire mode (Outcomes.SF12QuestionnaireMode)
- ☐ Telephone interview
- ☐ Postal questionnaire
- ☐ Web-based completion
- ☐ Personal interview

(Subject.SubjectID) **SF-12®:**
This survey asks for your views about your health. This information will help keep track of how you feel and how well you are able to do your usual activities.

For each of the following questions, please select the one that best describes your answer.

1. In general, would you say your health is: (Outcomes.SF12GenHlth)
- ☐ 1 - Excellent
- ☐ 2 - Very Good
- ☐ 3 - Good
- ☐ 4 - Fair
- ☐ 5 - Poor

(Subject.SubjectID)
2. The following questions are about activities you might do during a typical day. Does YOUR HEALTH NOW LIMIT YOU in these activities? If so, how much?

2a. MODERATE ACTIVITIES, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf: (Outcomes.SF12HlthLmtModAct)
- ☐ 1 - Yes, Limited A Lot
- ☐ 2 - Yes, Limited A Little
- ☐ 3 - No, Not Limited At All

2b. Climbing SEVERAL flights of stairs: (Outcomes.SF12HlthLmtClmbSvrlFlStair)
- ☐ 1 - Yes, Limited A Lot
- ☐ 2 - Yes, Limited A Little
- ☐ 3 - No, Not Limited At All

(Subject.SubjectID)
3. During the PAST 4 WEEKS how much of the time have you had any of the following problems with your work or other regular activities AS A RESULT OF YOUR PHYSICAL HEALTH?

3a. ACCOMPLISHED LESS than you would like: (Outcomes.SF12PhyHlthLessAccomp)
- ☐ 1 - All of the time
- ☐ 2 - Most of the time
- ☐ 3 - Some of the time
- ☐ 4 - A little of the time
- ☐ 5 - None of the time

3b. Were limited in the KIND of work or other activities: (Outcomes.SF12PhyHlthLmtWrkAct)
- ☐ 1 - All of the time
- ☐ 2 - Most of the time
- ☐ 3 - Some of the time
- ☐ 4 - A little of the time
- ☐ 5 - None of the time

(Subject.SubjectID)
4. During the PAST 4 WEEKS, how much time have you had any of the following problems with your work or daily activities AS A RESULT OF ANY EMOTIONAL PROBLEMS (such as feeling depressed or anxious)?

4a. ACCOMPLISHED LESS than you would like: (Outcomes.SF12EmotProbLessAccomp)

☐ 1 - All of the time
☐ 2 - Most of the time
☐ 3 - Some of the time
☐ 4 - A little of the time
☐ 5 - None of the time

4b. Didn't do work or other activities LESS CAREFULLY than usual:

(Outcomes.SF12EmotProbWkLessCare)
☐ 1 - All of the time
☐ 2 - Most of the time
☐ 3 - Some of the time
☐ 4 - A little of the time
☐ 5 - None of the time

5. During the PAST 4 WEEKS, how much did PAIN interfere with your normal work (including both work outside the home and housework)?

(Outcomes.SF12PainInterfWrk) ☐ 1 - Not At All
☐ 2 - A Little Bit
☐ 3 - Moderately
☐ 4 - Quite A Bit
☐ 5 - Extremely

(Subject.SubjectID)
6. These questions are about how you feel and how things have been DURING THE PAST 4 WEEKS. For each question, please give the one answer that comes closest to the way you have been feeling. How much of the time during the PAST 4 WEEKS –

6a. Have you felt calm and peaceful?

(Outcomes.SF12TimesFeelCalmPcful)
☐ 1 - All of the time
☐ 2 - Most of the time
☐ 3 - Some of the time
☐ 4 - A little of the time
☐ 5 - None of the time

6b. Did you have a lot of energy?

(Outcomes.SF12TimesFeelEnergetic) ☐ 1 - All of the time
☐ 2 - Most of the time
☐ 3 - Some of the time
☐ 4 - A little of the time
☐ 5 - None of the time

(Subject.SubjectID) 6c. Have you felt downhearted and low?

(Outcomes.SF12TimesFeelDown) ☐ 1 - All of the time
☐ 2 - Most of the time
☐ 3 - Some of the time
☐ 4 - A little of the time
☐ 5 - None of the time

(Subject.)
(Subject.SubjectID) 7. During the PAST 4 WEEKS, how much of the time has your PHYSICAL HEALTH OR EMOTIONAL PROBLEMS interfered with your social activities (like visiting with friends, relatives, etc.)?

(Outcomes.SF12PhyEmotInterfSoc) ☐ 1 - All of the time
☐ 2 - Most of the time
☐ 3 - Some of the time
☐ 4 - A little of the time
☐ 5 - None of the time

Physical Functioning	(Outcomes.SF12ScorePF) Score	(Outcomes.SF12ScorePFNBS) Norm-Based Score	
Role-Physical (RP)	(Outcomes.SF12ScoreRP)	(Outcomes.SF12ScoreRPNBS)	
Bodily Pain	(Outcomes.SF12ScoreBP)	(Outcomes.SF12ScoreBPNBS)	
General Health (GH)	(Outcomes.SF12ScoreGH)	(Outcomes.SF12ScoreGHNBS)	
Vitality	(Outcomes.SF12ScoreVT)	(Outcomes.SF12ScoreVTNBS)	
Social Functioning	(Outcomes.SF12ScoreSF)	(Outcomes.SF12ScoreSFNBS)	
Role-Emotional (RE)	(Outcomes.SF12ScoreRE)	(Outcomes.SF12ScoreRENBS)	
Mental Health (MH)	(Outcomes.SF12ScoreMH)	(Outcomes.SF12ScoreHMNBS)	
Physical Component Summary	(Outcomes.SF12ScorePCS)		
Mental Component Summary	(Outcomes.SF12ScoreMCS)		
SF-6D (Utility Index) Score	(Outcomes.SF12ScoreSF6D)		
SF-6D (Utility Index Release 2) Score	(Outcomes.SF12ScoreSF6DR2)		
Response Consistency Score	(Outcomes.SF12ScoreRCI)		
SF-12 Total Score:	(Outcomes.SF12TotalScore)		

Annex 5 - Fonseca amnestic index for identifying pain-related and/or intra-articular Temporomandibular Disorders

Questions	No	Sometimes	Yes
1- Is it hard for you to open your mouth?			
2- Is it hard for you to move your mandible from side to side?			
3- Do you get tired /muscular pain while chewing?			
4 - Do you have frequent headaches?			
5- Do you have pain on the nape or stiff neck?			
6- Do you have earaches or pain in craniomandibular joints?			
7- Have you noticed any TMJ clickingwhile chewing or when you open your mouth?			
8- Do you clench or grind your teeth ?			
9- Do your feel your teeth do not articulate well?			
10- Do you consider yourself a tense (nervous) person?			