

# JAW'S EXERCISE INTERVENTION ON OSCILLATION TRACTION WITH THE OSCILLATION TRACTION TO REDUCE DISABILITY AND IMPROVE MOBILITY IN THE TEMPOROMANDIBULAR JOINT

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## ABSTRACT

**Objective:** To find out about difference addition of jaw's exercises intervention on traction oscillate just as good with traction oscillate in decrease disability and improve mobility in the case of TMJ internal derangement. **Methods:** this research is experimental, the sample was selected based on purposive sampling technique. The control group given oscillate traction, treatment groups given jaw's exercise and oscillate traction. Treatment group on measuring instrument before TDI  $34,1667 \pm 12,61$  and after  $17,083 \pm 6,96$  and on measuring Caliper before  $2,52 \pm 0,36$  and after  $3,36 \pm 0,42$ . whereas in the control group using a measuring instrument TDI  $34,13 \pm 7,63$  and after  $14,1667 \pm 4,91$  on caliper before  $3,43 \pm 0,75$  and after  $4,15 \pm 0,46$ . **Result:** Normality test with the Shapiro wilk test data obtained normal while its homogeneity test with Levene's test in homogeneous data. The results of hypothesis I and II with paired sample t-test, test hypothesis I retrieved the value  $p_{disability} = 0,017$  and  $p_{mobility} = 0,006$ , test the hypothesis II =  $P_{value} 0,000$  ( $P < 0,001$ ) test hypothesis III with independent sample t-test demonstrated the value of  $p$  ( $disability$ ) =  $0,138$ ,  $p$  ( $mobility$ ) =  $0,157$ . **Conclusion:** The addition of jaw's exercises intervention on oscillate traction just as good with oscillate traction in decrease disability and improve mobility in the case of temporomandibular joint disc internal derangement.

**Keywords:** Temporomandibular Joint, Jaw's Exercise, Traction Oscillate.

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## BACKGROUND

In the current era of modernization, humans are inseparable from various activities such as: chewing food on one side and the use of communication technology, for example, the use of telephones or mobile phones. Where the average telephone or mobile phone user has a habit of holding the telephone or cell phone using the jaw and shoulders which will make the disruption of the organ structure, especially in the jaw disturbed.

### A. TEMPOROMANDIBULAR JOINT DISTURBANCES OF INTERNAL DERANGEMENT

Internal derangements (IDs) in the temporomandibular joint, seen from an anatomical point of view, are deviations in a position or form of intra-articular tissue (IJAR, 2016). Clinically, internal derangements are expressed when normal motion functions are disrupted, such as flexibility from mandibular movements. Typically there are two types of internal derangement disorders, which are found in nearly 40% of the adult population, TMJ hypermobility and anterior or reduced disc displacement (ADDR), with those ending in temporomandibular joint disorders (Huddleston Slater et al., 2007).

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Anterior disc displacement with reduction in the case of TMJ with ADDR (Anterior disc displacement with reduction) in the closed mouth position, the articular disc is located anteriorly. During depression, the movement of the disc serves to reduce the gliding movement back to the superior condylus. In the elevation movement, the disc moves back anteriorly (IJAR 2016). So in this study the intervention used is jaw's exercise with oscillation traction compared to oscillation traction alone to reduce disability and increase mobility in the case of TMJ.

#### **B. EPIDEMIOLOGY OF TEMPOROMANDIBULAR JOINT PATIENTS**

Temporomandibular joint disorder is a disorder that is considered to affect individuals in the 20-40 years age group with an average age of 33.9 years. People with TMJ disorders tend to be more mature, who have unhealthy patterns. Where there is a peak for disc displacement at the age of 30 years, and for degenerative inflammatory joint disorders at the age of 50 years (Guo C, Shi Z, Revington P (2009)).

#### **C. PATHOPHYSIOLOGY OF TEMPOROMANDIBULAR DISCUS INTERNAL DERANGEMENT JOINTS**

Chewing muscle hyperactivity which can be a cause of myofascial pain. The diagnostic terms used to describe this condition are myospasm, and reflex splinting. Tooth attrition that shows tooth decay as a result of bruxism is not related to clicking on the TMJ or pain in the chewing muscles. The results of an experimental study of myofascial pain show consistency in the hypothesis that pain is caused by changes in central nervous system processes, but this finding can also be interpreted as a consequence of disability.

#### **D. MECHANISM OF DISABILITIES IN DISCUSS AND MASTIC MUSCLE IN TEMPOROMANDIBULAR JOINT**

The mechanism of disability in the disc is When the articular disc is cracked due to protusion due to a shift that is not in accordance with normal biomechanical patterns that can cause locking, abnormal patterns can cause persistent pressure resulting in pain and disability in the TMJ. Because of the bad habit of chewing on one side, imbalance arises between the right and left jaws, so that when chewing occurs irritation of the condylus and flaking on the surface of the temporomandibular joint. In articular discs there can be increased shifting activity so that the discs overuse causing disc flexibility to decrease, if this continues it can cause disc rupture or inflammation that causes disability.

Disability arising from provocation in the disc is difficult to evaporate, opening the mouth wide due to decreased ROM due to contractures in the muscles and capsular pattern formation which makes the Depression-Elevation movement patterns become abnormal.

Mandibular movements consist of elevation and depression movements, where the movements are assisted by several mastic muscles that help in carrying out mandibular elevations consisting of M.Metereter, M.Temporalis, M.Pterygoideus Medial while those who assist in performing mandibular depression consist from M. Pterygoideus Lateral, M. Digastricus, M. Geniohyoid, M. Mylohyoid.

If during the mandibular elevation and depression movements the mastika muscles do not work agonistically and the antagonist will make the mandibular movements become abnormal where at work the mastika muscles are not synergistic, it will make the imbalance muscle where there will be heavy compensation on one of the stronger muscles which over time or repeatedly will result in myofascial on mastika muscles.

#### **E. MEASUREMENT OF DISABILITIES AND MOBILITASTEMPOROMANDIBULAR JOINT DISCUS INTERNAL DERANGEMENT TDI (Temporomandibular Disability Index and Shove Term)**

##### **a. Temporomandibular Disability Index (TDI)**

TDI (Steigerwald / maher 1997) is a measuring tool which contains several questions or questionnaires compiled and designed to provide information on how far the level of disability that occurs in the temporomandibular joint in the case of internal disc derangement in carrying out some daily activities such as chewing, exercising, and others. With the validity of measuring instruments 0.735 Where instruct the patient to answer by crossing one of the options assessed according to the circumstances felt by the patient at that time. Then then calculate the value obtained then record it to find out the progress of the intervention.

##### **b. Calipers**

The calipers is an objective measurement used to measure the distance of the mouth opening / depression in which seen how much the jaw opening is done by the patient, this measuring instrument has a level of accuracy of 0.1 mm. The function of the calipers is to measure the outer diameter, inner diameter, and depth measured. The calipers have two scale quantities, namely the basic scale (main scale) and helper scale (nonius scale). The main scale of the calipers is located on a fixed part (upper jaw), showing the main numerical measurement value, having a small scale of 1 mm or 0.1 cm. Meanwhile, the calipers nonius scale is located on the movable part (sliding jaw) indicating a more precise measurement value, having the smallest scale of 0.1 mm or 0.01

cm. This measurement is carried out before the intervention to obtain measurement data before treatment and after the intervention to get measurement data after treatment. Where the validity of the measuring instrument is 0.82 (Ramon Fuentes, et.al, 2015).

#### **F. TESTS FOR KNOWING TEMPOROMANDIBULAR DISCUSS JOINT DISTURBANCES INTERNAL DERANGEMENT**

1. Pain test during active motion (jaw depression-elevation)
2. Test the pain when active movements with help
3. Pain tests during movement and palpation
4. Test pain when the movement of protraction
5. Test to find out the sound when the temporomandibular joint is moving
6. Limitation test on lateral gliding of the condylar
7. Test pain during joint play

#### **G. INTERVENTION OF OSILATION TRACTION IN TEMPOROMANDIBULAR JOINT DISORDERS DISCUSS INTERNAL DERANGEMENT**

According to Maitland, oscillation traction is a form of passive motion in joints with small or large amplitudes that are applied to all existing ROMs and can be done when the joint surface is in a state of distraction and compression. Mobilization is done passively by physiotherapists in MLPP. Before translational mobilization is carried out, grade I traction is performed. Traction is carried out to avoid irritation and oscillations are carried out to stretch the ligament capsule and manipulate muscle spasms.

#### **H. INTERVENTION OF JAW'S EXERCISE IN TEMPOROMANDIBULAR DISCUSS JOINT DISTURBANCES INTERNAL DERANGEMENT**

This exercise is done to help relax the mastika muscles that experience spasm or tightness, and can increase the mobility of the temporomandibular joint. Jaw's exercise can be done at any time where the symptoms are still considered acute to the chronic stage or absent. But it is stopped if there is pain that is very, very unbearable, if such pain arises, it is expected that the patient rests first so as not to suffer excessive tissue injury.

#### **I. THE PROVISION OF JAW'S EXERCISE MECHANISM ON THE REDUCTION OF DISABILITIES AND INCREASING MOBILITIES**

Jaw's exercise is an exercise performed by a patient but is still guided by a physiotherapist. Where this movement aims to train the muscles passively and actively, because the movement originates from within and is assisted by the therapist, it is hoped that the muscles being trained will relax so that it causes the effect of reducing or decreasing pain due to damage to the body and prevent movement limitations and maintain muscle elasticity.

#### **METHOD**

This research is experimental. This study was divided into 2 groups: the treatment group was patients who were given jaw's exercise intervention plus oscillation traction and the control group were patients who were given oscillation traction interventions. The study was conducted by looking at differences in disability scores and increased mobility in the two sample groups to get empirical evidence from the two forms of intervention provided.

Measuring instruments that will be used in this research are temporomandibular disability index (TDI) and calipers, where subjective and objective measurement results are able to achieve high validity values. TDI which is a measurement of the percentage of temporomandibular joint disability due to internal disc derangement and calipers to measure temporomandibular joint mobility, especially in depression-elevation and protraction movements. This study used 12 samples divided into 2 treatment and control groups, each group consisted of 6 people. The study was conducted for 3 weeks with an intensity of 3 x 1 week.

#### **RESULTS**

1. Measurement of Temporomandibular Joint Disability and Mobility Value with Temporomandibular Disability Index and Calibration Period in the Treatment Group

Measurement of functional ability and mobility using Temporomandibular Disability Index and Calibration in the Treatment group

2. evaluations were carried out as in table 1.1 below:

In table 1.1 the Treatment group with a sample of 6 people obtained the value of the TDI results before the intervention was  $34.1667 \pm 12.61$  while the value of the TDI results after the intervention was  $17.083 \pm 6.96$ . This shows that there was a decrease in the value of TDI after 6 interventions.

Table 1.1: Distribution of Average and Standard Deviation from Measurement of Disability Values with the Temporomandibular Disability Index in the Treatment Group.

Sampel	Nilai TDI		
	Sebelum	Sesudah	Selisih
1	22,5	10	12,5
2	55	30	25
3	37,5	17,5	20
4	20	12,5	8,5
5	32,5	15	17,5
6	37,5	17,5	20
	34,1667±12,61	17,083±6,96	17,25±5,9

In table 1.2 the Treatment group with a sample of 6 people obtained the value of the results of TMJ mobility before the intervention was  $2.52 \pm 0.36$  while the value of the results of the TMJ Mobility after the intervention was  $3.36 \pm 0.42$ . This shows that there is an increase in the value of TMJ mobility after 6 interventions.

Table 1.2: Distribution of Average and Standard Deviation from Measurement of Mobility Value with Calibration in the Treatment Group

Sampel	Nilai Mobilitas		
	Sebelum	Sesudah	Selisih
1	3,12	4,00	0,88
2	2,75	3,29	0,54
3	2,31	3,00	0,69
4	2,35	3,53	1,18
5	2,10	2,82	0,72
6	2,52	3,5	0,98
	2,52±0,36	3,36±0,42	0,83±0,23

### Normality test

After the Shapiro Wilk Test was conducted, it was concluded that the sample was normally distributed.

Table 1.5 Normality Test

	Nilai TDI			
	Sebelum	Shapiro Wilk Test nilai p	Sesudah	Shapiro Wilk Test nilai p
Kel. Perlakuan	34,1667±12,61	0,554	17,083±6,96	0,204
Kel.Kontrol	34,14±7,63	0,879	14,1667±4,91	0,557

  

	Nilai Mobilitas			
	Sebelum	Shapiro Wilk Test nilai p	Sesudah	Shapiro Wilk Test nilai p
Kel. Perlakuan	2,52±0,36	0,156	3,36±0,42	0,075
Kel.Kontrol	3,36±7,63	0,879	4,15±0,46	0,272

### Homogeneity Test

After doing homogeneity test (Levene 'test), it can be concluded that the data variant is homogeneous. where  $P > \alpha$  (0.05), it can be concluded that the variance in the two groups is the same or homogeneous, which means that at the beginning of the study there were no significant disability differences between the control group and the treatment group.

Table 1.6: Levene's Test Homogeneity Test Results

Kel.Perlakuan- Kel.Kontrol	Sebelum	Sesudah	Levene's Test nilai p
Disabilitas	34,1667±12,61	34,14±7,63	0,286
Mobilitas	2,52±0,36	3,43±0,75	0,086

From the two test results above (normality test and homogeneity test) then determined:

- a. Testing hypotheses I and II used parametric tests, namely paired sample t-test.
- b. Hypothesis III testing uses parametric test that is independent sample t-test.

**HYPOTHESIS TEST I**

With the provisions of the results of testing the hypothesis Ho is rejected if the p value <math>\alpha</math> value (0.05) and Ho is accepted if the p value >  $\alpha$  value (0.05). The hypothesis established is:

Ho: Oscillation traction intervention cannot reduce disability and increase mobility in the case of Temporomandibular Joint disc internal derangement

Ha: oscillation traction intervention can reduce disability and increase mobility in the case of Temporomandibular Joint disc internal derangement

Tabel 1.7 hipotesis I

Nilai	Rerata dan Simpang Baku		Paired Sampel t-test nilai P
	Sebelum	Sesudah	
Disabilitas	34,13±7,63	14,1667±4,91	0,017
Mobilitas	3,43±0,75	4,15±0,46	0,006

From table 1.7 above it can be explained that the average disability and mobility values of TMJ before being given an intervention are  $34.13 \pm 7.63$  and  $3.43 \pm 0.75$  while after the intervention the average disability and mobility values change to  $14, 1667 \pm 4.91$  and  $4.15 \pm 0.46$ . Based on the results of Paired-sample t-test is  $p = 0.017$  and  $p = 0.006$  where ( $p < 0.05$ ), this means that Ho is rejected. It can be concluded that oscillation traction intervention can reduce disability and increase mobility in the case of Temporomandibular Joint disc internal derangement.

**HYPOTHESIS TEST II**

With the provisions of the results of testing the hypothesis Ho is rejected if the p value <math>\alpha</math> value (0.05) and Ho is accepted if the p value >  $\alpha$  value (0.05). The hypothesis established is:

Ho: Adding jaw's exercise intervention to oscillation traction cannot reduce disability and increase mobility in the case of Temporomandibular Joint disc internal derangement

Ha: Adding jaw's exercise intervention to oscillation traction can reduce disability and increase mobility in the case of Temporomandibular Joint disc internal derangement

Tabel 1.8 hipotesis II

Nilai	Rerata dan Simpangan Baku		Paired Sample T-Test p value
	Sebelum	Sesudah	
Disabilitas	34,1667±12,61	17,083±6,96	0,000
Mobilitas	2,52±0,36	3,36±0,42	0,000

Based on table 1.8 it can be seen that the value of TDI and mobility of the treatment group before intervention is  $34.1667 \pm 12.61$  and  $2.52 \pm 0.36$  while the value of TDI and mobility after intervention are  $17.083 \pm 6.96$  and  $3.36 \pm 0.42$ . The results of Paired Sample T Test obtained p value = 0,000 where ( $p < 0.01$ ) ie Ho was rejected. It can be concluded that the addition of jaw's exercise intervention to oscillation traction can reduce disability and increase mobility in the case of Temporomandibular Joint disc internal derangement.

**HYPOTHESIS TEST III**

With the provisions of the results of testing the hypothesis Ho is rejected if the p value <math>\alpha</math> value (0.05) and Ho is accepted if the p value >  $\alpha$  value (0.05). The hypothesis established is:

Ho: No Difference The addition of Jaw's exercise intervention to oscillation traction in reducing disability and increasing mobility in the case of temporomandibular joint disc internal derangement

Ha: There are differences in the addition of Jaw's exercise intervention to oscillation traction in decreasing disability and increasing mobility in the case of temporomandibular joint disc internal derangement.

Tabel 1.9 hipotesis III

Disabilitas	Mean±SD	T-Test Independent Nilai P
Sesudah Perlakuan-	17,083±6,96	0,138
Kontrol	14,1667±4,91	

  

Mobilitas	Mean±SD	T-test Independent Nilai P
Sesudah Perlakuan-	3,36±0,42	0,157
Kontrol	4,15±0,46	

Based on table 1.9 it can be seen in the results after the intervention the TDI value and the mobility of the treatment group are  $17.083 \pm 6.96$ ,  $3.36 \pm 0.42$ . In the control group with TDI values and mobility of  $14.1667 \pm 4.91$ ,  $4.15 \pm 0.46$  and the results of the Independent T-Test obtained p value (disability) of the treatment-control group = 0.138, p (mobility) of the treatment group -control group = 0.157 where  $p > 0.05$  which means  $H_0$  is accepted.

It can be concluded that the addition of Jaw's exercise intervention to oscillation traction is as good as oscillation traction alone in decreasing disability and increasing mobility in the case of Temporomandibular Joint Discus Internal Derangement.

## DISCUSSION

Temporomandibular joint disc internal derangement joint disruption in which the overall temporomandibular joint system is usually disrupted due to overuse of the unilateral disc, the loss of teeth, in those who have bruxism habits, have asymmetrical jaws, have crossbite or overbite teeth. Where in the event of disruption, the disc will experience a decrease in elasticity and change in shape. This disorder begins with pain when chewing, pain in the mastika muscles, changes in the pattern of depression form C or S, the occurrence of limitations when opening and closing (depression-elevation), accompanied by dizziness, and sometimes can be accompanied by buzzing in the ear.

Based on the sample description in the population of the Edison Orange Notary Office in the case of Temporomandibular joint discus internal derangement, this complains of discomfort in the jaw that sometimes can cause discomfort during activities but they are ignored for years and this is also accompanied by ignorance they are concerning disorders that disturb them or they experience. The population complaining and experiencing this disorder is more common in women, which is in accordance with research conducted at the University of São Paulo, Faculty of Odontology, Brazil (2015) where the incidence of TMJ cases in internal derangement discs occurs more in women as much as 4: 1.

In the population in the Edison Orange Notary Office of patients who complain of the jaw of 25-34 years, patients under 25 years of age rarely experience this disorder but may not be included in Temporomandibular joint discus internal derangement discs. In the state of missing teeth / dates on the molars is one of the factors that can cause disruption in the Temporomandibular joint discus internal derangement (International Journal Approach Research 2016).

Through research conducted by Von Piekartz et al. , 2011 in the Netherlands Based on previous studies conducted by several experts, the use of oscillation traction therapy manual intervention can reduce the level of chronic levels of disability and disability and can provide significant results in increasing mandibular mobility.

Based on the results of references and literature as well as research that has previously been done Von Piekartz et al. , 2011 states that the use of manual therapy, especially in joint mobilization and oscillation traction is considered to be very effective for reducing disruptive pain in the TMJ, where the mechanism that occurs when traction is carried out is the release of abnormal cross links that are formed and release the adhesions formed by the presence of fibrous in joint section temporomandibular, and can accelerate joint movement during depression and jaw elevation.

Based on research conducted by Haketa et al, 2010 in Japan states that the use of oscillation traction coupled with jaw's exercise is proven to reduce disability and pain and increase mandibular mobility during depression-elevation and protraction. The use of oscillation traction interventions with low amplitude or the presence of slide motion in the joint, will cause the movement of synovial fluid that carries nutrients in the avascular part in the articular cartilage and also in intra articular fibro cartilage (Mobilization, Traction and Soft Tissues Techniques, 2017). Joint play technique helps the exchange of nutrients and prevents the effects of static degeneration when the joint is inflamed and unable to move within the range of motion of the joint concerned (Joint Play Movement of Temporomandibular Joint Clinical Consideration, 2016).

Jaw's exercise is an exercise performed by a patient but is still guided by a physiotherapist. Where this movement aims to train the muscles passively and actively, because the movement originates from within and is assisted by the therapist, it is hoped that the muscles being trained will relax so that it causes the effect of reducing or decreasing pain due to tissue damage, as well as preventing the occurrence of movement limitations and maintaining elasticity.

## CONCLUSION

Based on the results of research and discussion, the conclusions that can be drawn are as follows:

1. Oscillation traction interventions can reduce disability and increase mobility in the case of Temporomandibular Joint disc internal derangement.
2. Adding jaw's exercise intervention to oscillation traction can reduce disability and increase mobility in the case of Temporomandibular Joint disc internal derangement.
3. The addition of Jaw's exercise intervention to oscillation traction is as good as oscillation traction alone in decreasing disability and increasing mobility in the case of Temporomandibular Joint Disc Internal Derangement.

## Reference

- American Association of Oral and Maxillofacial Surgeons (AAOMS), Parameters of Care, Fifth Edition.2012. AAOMS ParCare 2012. J Oral Maxillofac Surg 70:e1-11, 2012, Suppl 3
- American Association of Oral and Maxillofacial Surgeons (AAOMS). Criteria For Orthognathic Surgery.2015. Available at <http://www.aaoms.org/images/uploads/pdfs/ortho> Accessed November. 9, 2015
- A.M. Matuska et al. *Biomechanical and biochemical outcomes of porcine temporomandibular joint disc deformation.*Archives of Oral Biology 64 (2016) 72 –79
- Anthony C Atkinson and Atanu Biswas.*Randomised Response Adaptive Designs in ClinicalTrials.* CRC Press, Boca Raton, 2014.
- Ardizzone, I., Celemin, A., Aneiros, F., del Rio, J., Sanchez, T., & Moreno, I. (2010). *Electromyographic study of activity of the masseter and anterior temporalis muscles in patients with temporomandibular joint (TMJ) dysfunction: comparison with the clinical dysfunction index.* Med Oral Patol Oral Cir Bucal,15 (1), 14-19.
- Francisco Neto, Norman Thie and Ambra Michelotti Susan Armijo-Olivo, Laurent Pitance, Vandana Singh. (2015) *Exercise for Temporomandibular Disorders: Effectiveness of Manual Therapy and Therapeutic , System*
- Gallo, L. M., Gossi, D. B., Colombo, V., & Palla, S. (2008). *Relationship between kinematic center and TMJ anatomy and function.* J Dent Res, 87 (8), 726-730
- Gerdle B, Ghafouri B, Ernberg M, Larsson B. Chronic musculoskeletal pain:review of mechanisms and biochemical biomarkers as assessed by themicrodialysis technique. J Pain Res. 2014;7:313
- Glauca Marques Dias et al. *Measurement of Spee curve in individuals with temporomandibular disorders: a cross-sectional study.* Department of Dentistry, Federal University of Juiz de Fora – Juiz de Fora – MG – Brazil. 2016
- Slade GD. *Epidemiology of tempo-romandibular joint disorders and related painful conditions.* Mol Pain. 2014;10(Suppl 1):O16.