



Effectiveness Of Manipulation Along with Proprioceptive Technique on Pain and Functional Limitations in Relationship With Cervical Spine Among Temporomandibular Joint Dysfunction-A Simple Experimental Study

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ABSTRACT

Background: Temporomandibular disorders (TMDs) affect the temporomandibular joints (TMJs), masticatory muscles, and related tissues, causing regional facial or jaw pain and functional difficulties with activities such as eating, yawning, and speaking. Common symptoms include pain in the TMJs or masticatory muscles, which can be triggered during clinical examination, and audible sounds from the

TMJs. Physiotherapy, involving manipulation and proprioceptive techniques, has been shown to effectively reduce pain and enhance jaw mobility.

Aim: This research aims to evaluate the combined effectiveness of manipulation and proprioceptive techniques in treating TMDs and to investigate their relationship with the cervical spine.

Objectives: The primary goal is to assess the impact of integrating manipulation and proprioceptive techniques on TMD treatment outcomes and their association with the cervical spine in affected patients.

Subjects and Methods: The experimental study included males and females aged 35-50 with TMD. Participants underwent a combined treatment of manipulation and proprioceptive techniques over 8 months. Pain and jaw function were evaluated using the Visual Analog Scale (VAS) and Jaw Functional Limitation Scale (JFLS) before and after 4 weeks of treatment.

Results: Significant improvements were observed in TMD patients. The mean VAS score decreased from 5 before treatment to 2.53 afterward. The t-value exceeded the critical t-value at a 0.05 significance level. Similarly, the JFLS mean score increased from 6.67 pre-treatment to 8.33 post-treatment, with the t-value also surpassing the critical value at a 0.05 significance level.

Conclusion: The study concludes that combining manipulation and proprioceptive techniques significantly reduces pain and improves jaw function in TMD subjects.

Clinical Implications: Utilizing manipulation and proprioceptive techniques is effective in reducing pain and enhancing jaw function for individuals with TMD subjects.

Keywords: Temporomandibular joint disorder, Manipulation technique, Proprioceptive technique, Jaw functional limitation scale.

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1. Introduction

Temporomandibular joint disorder (TMD) is a prevalent condition that impairs normal jaw function. TMD is a multifactorial disease process influenced by muscle hyperfunction or parafunction, trauma, hormonal factors, and articular changes.¹ The temporomandibular morphofunctional complex frequently experiences pathology that results in discomfort, disability,

and diminished quality of daily life. Although TMD may start locally, mandibular dysfunction can extend to the entire orofacial region.¹

The connection between the orofacial area and the cervical spine involves both the masticatory system and posture. Cervical posture disorders can cause functional changes in the orofacial region during activities like mouth opening, chewing, and swallowing. Understanding the relationship between TMJs and the cervical spine can enhance the effectiveness of pain and dysfunction treatment by dentists and physical therapists.²

The prevalence of temporomandibular joint and muscle disorder (TMJD) ranges from 5% to 12%. TMJ disorders are notably more common in women than men, with those using supplemental estrogen or oral contraceptives being more likely to seek treatment.³

TMJ dysfunction is classified into intracapsular and extracapsular disorders. Intracapsular disorders include capsulitis, synovitis, retrodiscitis, ankylosis, arthritic changes, and dislocations. Extracapsular disorders encompass myofascial pain syndrome, myositis, tendinitis, and tissue hyperplasia or hypoplasia. Differentiating the cause of TMJ dysfunction is challenging, as symptoms of intracapsular and extracapsular issues can overlap with conditions like cervical whiplash and closed head injuries. Symptoms such as headache, neck pain, shoulder pain, tinnitus, and dizziness are common. Myofascial patients often have multiple trigger points in the lateral pterygoid, medial pterygoid, and masseter muscles. Identifying the cause of temporomandibular dysfunction is crucial for accurate diagnosis and effective treatment. Inflammatory responses in the TMJ from various sources can lead to a cascade involving mediators like bradykinin, histamine, tumor necrosis factor, and serotonin found in the synovial fluid.

The upper ends of the mandible, or condyles, move along the joint socket during jaw movements. A soft tissue disc separates the condyles from the joint socket, acting as a shock absorber. Damage to this joint can cause temporomandibular joint syndrome, characterized by reduced mandibular range of motion, muscle and joint pain, joint crepitus, and functional limitations in jaw opening.

Treatment options include ultrasound, iontophoresis, electrotherapy, low-level laser therapy, and splints. Manual therapy, a well-established aspect of physical therapy, involves specialized techniques for managing neuro-musculoskeletal conditions based on clinical reasoning. The International Federation of Orthopedic Manipulative Physical Therapists (IFOMPT) defines orthopedic manual physical therapy as a specialized physiotherapy field using specific manual techniques and therapeutic exercises.²

Manual therapy has been employed to treat TMD with mouth-opening limitations, though the effectiveness of manipulation varies among researchers, and its necessity is debated. Cervical

spine manipulation techniques aim to improve range of motion through flexion and extension exercises.

Charles Sherrington originally defined proprioception as the perception of joint and body movement and position in space. Proprioceptive techniques for the TMJ include isometric coordination exercises with the mouth in various positions, exercises to correct joint and muscle asymmetries, and mouth-opening exercises with the trunk inverted.³

Visual Analog Scales (VAS) are psychometric tools used to measure the severity of disease-related symptoms in patients, allowing for rapid classification of symptom severity and disease control. A typical VAS is a horizontal line, 100 mm in length, with endpoints indicating the extremes of the measured parameter. Variations include horizontal scales oriented differently or vertical VAS.

The Jaw Functional Limitation Scale (JFLS-20) is a specific instrument for assessing the functional status of the masticatory system. It includes three constructs ideal for research and patient evaluation in cases with varying jaw function limitations.

2. Methodology

2.1` Study Design: This experimental study utilized a pre-test, and post-test design with two intervention groups to evaluate the effectiveness of combining manipulation with proprioceptive techniques on pain and functional limitations associated with cervical spine and temporomandibular joint (TMJ) dysfunctions.

2.2 Subjects: The study included patients experiencing TMJ pain who visited the Department of Physiotherapy at PPG College of Physiotherapy in Coimbatore, Tamil Nadu. A total of 15 patients were selected based on the following inclusion criteria: (i) ages 35 to 55 years, (ii) joint crepitus and tenderness, (iii) symptom duration of 3 to 6 weeks, and (iv) 'Mild' to 'Moderate' pain intensity on the Visual Analogue Scale.

2.3 Methods: The study aimed to assess the impact of manipulation combined with proprioceptive techniques on pain and functional limitations related to cervical spine issues in TMJ dysfunction. Fifteen subjects meeting the criteria were selected through purposive sampling and received the interventions over 6 months. Pre- and post-test assessments were conducted using the Visual Analogue Scale and Jaw Functional Limitation Scale. The computed 't' values were 17.62 and 10.19 respectively, both exceeding the table value of $p < 0.05$. The findings indicate that the interventions effectively reduced pain and improved jaw function.⁴ Description of Experimental Interventions: Manual therapy, a key area of physical therapy, has evolved significantly, with contributions from the International Federation of Orthopaedic Manipulative Physical Therapists (IFOMPT). This specialized field focuses on neuro-musculoskeletal conditions through specific manual techniques and therapeutic exercises. Manual therapy has been used to treat

temporomandibular disorders (TMD), particularly to address mouth-opening limitations. 4 The efficacy of manipulation varies among studies, and its necessity is debated. Techniques for cervical spine manipulation include flexion and extension to enhance range of motion. 5

Proprioception, as defined by Charles Sherrington, involves the perception of joint and body movement, body position, and limb flexions and extensions. Proprioceptive techniques for the TMJ include isometric coordination exercises with the mouth in various positions (closed, halfopen, open), manual control exercises to correct joint and muscle asymmetries at the craniomandibular level, and exercises to facilitate mouth opening with the trunk inverted. 6

3. Demographical Data

3.1 Group Analysis

3.1.1 Data Analysis for Pain By Visual Analogue Scale:

The table shows the difference between the pre-test and post-test values of the experimental group reduction of pain in temporomandibular joint dysfunction subjects. 7

Table No 1: Data Analysis for Pain By Visual Analogue Scale

VAS	MEAN	SD	T-VALUE	P-VALUE
PRETEST	5	0.44	17.62	<0.05
POST-TEST	2.53	0.24		

TABLE NO: 3.3.1 ANALYSIS OF PRE-TEST AND POST-TEST VALUES OF PAIN

The pre-test mean value and standard deviation values of VAS were 5 and 0.44. The post-test mean value and standard deviation values of VAS were 2.53 and 0.24. The obtained t value is greater than the table t value at the significance level of 0.05. 1 Hence the statistical report states that there was significant reduction of pain after the treatment in the experimental group. 8

3.2 Group Analysis:

Data Analysis for Jaw Functional Limitation Scale

The table shows the difference between the pre-test and post-test values of the experimental group functional limitation of jaw in temporomandibular joint dysfunction subjects. 9

Table No 3: Analysis Of Pre-Test and Post-Test Values Of Jaw Functional Limitation Scale

JAW FUNCTIONAL LIMITATION SCALE	MEAN	SD	T- VALUE	P-VALUE
PRE-TEST	6.67	0.81	10.19	<0.05
POST-TEST	8.33	0.31		

The pre-test mean value and standard deviation values of JFLs were 6.67 and 0.81. The posttest mean value and standard deviation values of JFLs were 8.33 and 0.31.¹⁰ The obtained t value is greater than the table t value at the significant level of 0.05. Hence the statistical report states that there was a significant reduction of jaw functional limitation after treatment in the experimental group.¹¹

4. Discussion

Temporomandibular joint (TMJ) disorders (TMD) can occur at any age and have widespread effects, particularly impacting cervical function. Women are more frequently affected by TMDs, with over 65% of subjects in this study being women.¹² The duration of orofacial pain can influence pain intensity assessments on the Visual Analogue Scale (VAS), with shorter durations potentially leading to overestimation and longer durations possibly resulting in underestimation of pain. TMJ pain often correlates with cervical spine joint pain, which can affect the perception of clinical signs and treatment responses.¹³

Anthony Tosin et al. (2021) conducted a study to assess the prevalence, sociodemographic characteristics, and clinical presentation of TMD in otorhinolaryngological practice. The study, based in a hospital setting, involved patients diagnosed with TMD. Data were collected using pretested interviewer-assisted questionnaires. The prevalence of TMD in this study was found to be 1.3%.¹⁴ The study sample included 17 male patients, with a male-to-female ratio of 1:0.28. Joint disorders comprised 75.4% of all disorders, while both mastication muscle and joint disorders accounted for 21.5%. Most patients (47.7%) presented between 1 and 13 weeks after onset. Unilateral TMD was present in 98.5% of cases.^{15,16}

Joanna et al. (2021) investigated the prevalence of single and multiple diagnoses and potential sided dominance of TMD in patients with myofascial pain with referral. The study included 50 individuals (37 females and 13 males) aged 18 to 25 years, with an average age of 23-36. Joint vibration analysis was performed, classifying 67% of examined TMJs as group I according to Mark Piper's classification. Class IIIA was present in 17% of joints, and 8% were classified as class IVA.^{17,16} There were no statistically significant gender differences in TMD prevalence ($p=0.838639$). The study found a high prevalence of overlapping muscle and intraarticular disorders, with 28% of subjects having both myofascial pain with referral and bilateral TMD. Sixty-two percent had no intraarticular disorders.¹⁸⁻²³ The study did not confirm the hypothesis of sided dominance in TMD occurrence, though such differences could not be entirely ruled out due to the small sample size. Physiotherapy aimed to alleviate symptoms through general and local treatments based on the disorder type and stage.²⁴⁻²⁵

This study emphasized the effectiveness of physiotherapy treatments for TMD and cervical issues. The TMJs and cervical spine are interconnected through neuroanatomical and neurophysiological pathways, with disease in one area affecting symptoms in the other. Manual therapy and proprioceptive techniques applied to both regions over 8 months showed significant symptom reduction at both TMJ and cervical levels.²⁶ Pre- and post-test values were measured using the Jaw Functional Limitation Scale and VAS. The study supports the effectiveness of these techniques in reducing pain and improving jaw function in TMD cases. The statistical analysis aligns with the alternate hypothesis, confirming the efficacy of manipulation and proprioceptive techniques in managing TMD symptoms.²⁷

5. Conclusion

The study results indicate that manipulation and proprioceptive techniques have beneficial effects, significantly reducing pain and improving jaw function in subjects with temporomandibular joint dysfunction. The findings confirm that these techniques are effective in alleviating pain and enhancing jaw function in TMD patients. Consequently, the study supports the alternate hypothesis and rejects the null hypothesis.

Limitations:

- The sample size was small.
- The study was confined to a specific age group.
- The intervention duration was brief.
- The long-term effects of the intervention were not evaluated.
- The study focused solely on pain and jaw functional limitations, excluding other symptoms.

6. Conflict of interest

No potential conflict of interest was reported by the authors.

7. Acknowledgement

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