

Significance of Hypnosis in the Treatment of TMD

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Abstract

The aim of this retrospective cross-sectional study was to identify the effectiveness of hypnosis therapy in the treatment of patients suffering from temporomandibular disorders (TMDs). From a pool of 3,000 TMD patients seen from January 2012 to January 2016, 34 TMD patients (29 females and 5 males) that fit the inclusion criteria were ultimately included in this study. Eligible patients were required to possess a designated TMD diagnosis, to be at least 16 years of age and to attend all three follow-up appointments after receiving hypnosis therapy from a trained medical practitioner. For all of the subjects, four data points were collected and mathematically evaluated for significance: subjective pain at initial visit, subjective pain at final visit, quantitative pain at initial exam, quantitative pain at final follow-up exam. The collected data was statistically analyzed via paired t-tests to determine if the overall pain reduction, seen in this group of 34 subjects treated with hypnosis therapy, was significant based on age, sex, and initial pain scores. Following statistical analysis, the data suggests that hypnosis therapy significantly reduces the quantitative pain score of TMD patients who are male, who are between the ages of 20 and 40 and who initially present with moderate to severe quantitative pain scores. These findings confirm that, in some situations, hypnosis is an effective treatment modality for TMD patients. However, more research is required on this topic to formulate more accurate, valid and robust conclusions.

Keywords: Orofacial Pain; Dental Methods; Pain Threshold/Physiology; Range of Motion; Articular/Physiology; Relaxation Therapy

Introduction

Temporomandibular disorders (TMDs) are a group of multifactorial, musculoskeletal disorders which involve the dysfunction of the temporomandibular joint, the masticatory musculature, or both, with symptoms highly related to psychological factors [1,2]. Patients with TMD typically present with pain in the masticatory muscles, earaches, headaches, facial pain that radiates to the neck and shoulders, pain in the jaw and surrounding tissues, limitations in jaw movements, and/or joint noises [2,3]. It is estimated that the prevalence of TMDs is 5 - 13% in the general population [4]. The etiology and underlying mechanisms of pain associated with TMD are not fully understood. Occlusal factors, parafunctional clenching and grinding, and psychosocial factors are all contributory towards the development of TMD, however, arguably the most agreed upon cause for TMD is parafunctional clenching and grinding [5-8]. This is usually the result of psychological distress, specifically anxiety and depression, as patients who suffer from TMDs tend to respond to psychological stressors with more intense facial muscle activity [2].

Since the definitive etiology of TMD is relatively inconclusive, no one treatment modality represents a sure solution. As such, a multidisciplinary treatment approach is recommended and utilized by health care practitioners. Traditional TMD treatments include supportive patient education, physical therapy, pharmacological treatment, occlusal therapy, and/or use of an intraoral splint [2,3,9-11]. Pharmacological treatment typically involves the use of medications such as non-steroidal anti-inflammatory drugs (NSAIDs), narcotic

analgesics, muscle relaxants, and/or low dose tricyclic antidepressants [3,11]. Occlusal appliance therapy is the most well-studied treatment method for TMD, with an estimated efficacy rate between 70% and 90% [9]. Although these traditional TMD treatments are helpful for a majority of patients, it has been estimated that about 23% of TMD patients do not respond to these treatment modalities at all [2].

As a result, alternative treatments are often considered: habit reversal, massed negative practice, cognitive-behavioral therapy, stress management and relaxation techniques, electromyographic (EMG) biofeedback, and hypnosis [2,3,9,10,12]. These alternative treatment modalities are considered biobehavioral therapies. *Biobehavioral* is a term derived from behavioral science theories and methods used to change a patient's pain perception. The aim of biobehavioral therapies is to decrease or eliminate the affective and psychological components of the experience of pain. Therefore, biobehavioral therapies are uniquely equipped to treat TMD patients, as this group of patients has higher levels of anxiety and depression compared to the general population [12,13].

Hypnosis is defined as "a procedure during which a health professional or researcher suggests that a patient or healthy individual experiences changes in sensations, perceptions, thoughts, or behavior" [11]. In addition, it is characterized as a feeling of deep concentration and altered consciousness, during which an individual is relaxed and open to suggestions which may be utilized to alter how a person experiences, perceives and behaves within his environment [13]. Hypnosis therapy is comprised of two main stages: induction and suggestions. Induction refers to the process of inviting the hypnosis participant to focus his/her attention, followed by suggestions, which seek to alter the participant's experience. Hypnosis treatment may be aimed at reducing pain, so suggestions could include changing the sensation of pain to another feeling, such as numbness; diverting focus away from pain; increasing an individual's ability to ignore pain; reducing the pain itself; and/or increasing feelings of comfort [14]. Hypnosis has several advantages when compared to other biobehavioral therapies. Unlike EMG biofeedback, hypnosis does not require complex equipment. Hypnosis also has several benefits over habit reversal techniques, which require extensive monitoring, coaching, and practice, and have been demonstrated to be ineffective as a treatment modality for TMD patients who grind or clench while sleeping [12]. Conversely, hypnosis may be uniquely effective at addressing the pain symptoms of TMD resulting from nocturnal parafunctional habits, such as grinding or clenching, which occur at an unconscious level. This is because hypnotic suggestions condition the body to automatically respond to certain cues or signals, whether a person is asleep or awake.

Furthermore, the literature indicates that hypnosis is an effective treatment modality for various chronic pain conditions, including fibromyalgia, multiple sclerosis, irritable bowel syndrome (IBS), headaches, sickle cell disease, spinal cord injuries, disability-related pain, and cancer-related pain [2,3,9-15]. Therefore, it follows that hypnosis could be an effective treatment method for the chronic pain associated with TMDs. Nonetheless, despite the advantages hypnosis has over other biobehavioral treatment modalities and the clear positive effect it has on the pain of other chronic pain conditions, there is a relative lack of research regarding hypnosis as a treatment modality for TMD patients. This is especially true in the contemporary scientific literature published, which possesses numerous limitations. Of these, the most common are small population sizes, an overrepresentation of female participants, non-ideal study designs, and limited follow-up periods following the conclusion of hypnotic therapy.

An open trial performed with 23 TMD patients by Simon and Lewis [2] concluded that TMD patients who received hypnotic therapy, while continuing their ineffective traditional therapies, reported significant decreases in pain frequency, pain duration and pain intensity, and a concomitant increase in daily functioning. The study also deduced that the patients' TMD symptoms did not spontaneously improve and that treatment gains from hypnosis were maintained for 6 months after the conclusion of the hypnosis treatment by comparing the experimental group to a group of TMD patients placed on a waitlist. However, this study lacked a formal control group to compare to the experimental group, randomization of the participants, and blinding of the participants or experimenters. This study also had a dropout rate of 17.8%, which was artificially lowered by the fact that the researchers included participants for analysis as long as they attended three of the six planned hypnotic sessions. Hypnotizability of the experimental population was also not measured, which is potentially

significant given the direct correlation it has with the probability that hypnotic therapy will be successful [13].

A comparative study of 40 female TMD patients performed by Winocur, *et al.* [9] looked at three treatment groups: hypnorelaxation (n = 15), occlusal appliances (n = 15) and a minimal treatment group, which only received education regarding TMD (n = 10). The researchers were able to conclude that hypnorelaxation and occlusal appliances were more effective than minimal treatment at alleviating muscular sensitivity to palpation. Moreover, hypnorelaxation, but not occlusal appliances, was significantly more effective than the minimal treatment group with regards to alleviating patients' subjective reports of pain. This study is limited by a small population size, which included only female participants. Its study design also lacks randomization of the experimental and control groups, as well as blinding of the participants researchers. In addition, the longest follow-up interval post-treatment was 2 months, which does not allow for conclusions to be drawn regarding the long-term efficacy of hypnosis therapy post treatment.

It is evident that current literature supports the notion that hypnosis could be effective at treating TMD patients. However, the extent of effect and the mechanism of action are unknown due to the current lack of research surrounding the topic.

Aim of the Study

This study aims to explore the efficacy of hypnosis as a treatment modality for TMD patients, with the change in pain severity as reported by the patient being the primary outcome evaluated.

Materials and Methods

This research was conducted utilizing a retrospective cross-sectional study design in which data was collected from a pool of up to 3,000 patients treated for TMDs from January 2012 to January 2016. Only patients diagnosed with TMDs at the initial and/or follow-up examinations, with the following diagnoses, were included in the study: disc displacement with or without reduction, retrodiscitis, ankylosis, open or closed TMJ fracture, synovitis and capsulitis, primary or secondary osteoarthritis (degenerative joint disease), TMJ adhesions, dislocation, temporal tendonitis, local myalgia, bruxism, myofascial pain, and centrally-mediated myalgia. Patients being at least 16 years old and attending all three follow-up appointments with an oral medicine provider after hypnoanalysis was performed were the other inclusion criteria. Trauma patients presenting to the clinic with TMDs within 3 months of their traumatic event were excluded from this study.

The clinic's records were reviewed for all patients between January 2012 and January 2016, and from the initial pool of 3,000 patients, a sample size of 34 patients with an age range between 28 and 80 (mean age ± s.d.: 51.4 ± 14.3 years) was obtained. The subjects consisted of 29 female patients (mean age ± s.d.: 52.3 ± 14.5 years) and 5 male patients (mean age ± s.d.: 46 ± 13.2 years). Prior to hypnosis therapy, the patients' subjective pain was scored, by the patients themselves, utilizing a numerical rating pain scale with values from 0 to 2 (Table 1).

	Subjective Feelings of Pain at Initial and Final Visit	Quantitative Assessment of Pain at Initial and Final Exam
n = 0	None	None
n = 1	Some	Mild
n = 2	Significant	Moderate
n = 3	N/A	Severe

Table 1: Pain scales used to assess the subjective feelings of patients at their initial and last visits and quantitatively at their initial and final exams.

Additionally, quantitative pain at this initial exam was determined by an oral health care provider through the bilateral palpation of the patients' temporomandibular joints (TMJs) as well as the following muscles: masseters, sternocleidomastoids, trapezius, occipitalis, and frontalis. The patients' reaction to the clinician's palpation determined their quantitative pain score, which was graded on a numerical rating pain scale with values from 0 to 3 (Table 1). This quantitative pain scale was standardized for all the oral health care providers who evaluated the subjects of this study. On this scale, "None" ($n = 0$) indicates that the patient did not react to the practitioner's palpation. "Mild" pain ($n = 1$) was defined as noticeable facial distress elicited by the patient as a result of the oral health care provider's palpation examination. If the patient responded to the palpation examination with facial distress and bodily movement, this was denoted as "Moderate" pain ($n = 2$). Finally, "Severe" pain ($n = 3$) was characterized as signs of facial distress, patient movement, and verbal shouting and/or other means of preventing the clinician from completing the palpation examination.

The patients all received hypnoanalysis from the same physician, a health care provider who specialized in hypnosis therapy. Following hypnoanalysis, patients were required to attend three follow-up appointments each spaced four to six weeks from the previous appointment. Patients were excluded from this study if they failed to attend all three of their scheduled follow-up appointments. Follow-up appointments were performed by an oral medicine provider and consisted of two main components. The patients' subjective feeling of pain and their quantitative pain score were determined and recorded using the same numerical rating pain scales and methodology as those used at their initial appointment.

For every subject, four data points regarding pain severity were collected and mathematically evaluated for significance: subjective pain at initial visit, subjective pain at final visit, quantitative pain at initial exam, quantitative pain at final follow-up exam. The collected data was statistically analyzed via paired t-tests to determine if the overall pain reduction, seen in this group of 34 subjects treated with hypnosis therapy, was significant based on age, sex, and initial pain scores. For the purposes of statistical analysis, the subjects were divided into three age groups: 20 to 40 years old, 40 to 60 years old, and over 60 years old.

The collected data was statistically analyzed via paired t-tests to determine if the overall pain reduction, seen in this group of 34 subjects treated with hypnosis therapy, was significant based on age, sex, and initial pain scores. A p-value of 0.05 (confidence interval 95%) was used to denote statistical significance, indicated by an asterisk in the figures.

Informed patient consent was obtained.

Results

The average subjective feelings of pain for all 34 subjects decreased from 1 ± 0.6 to 0.9 ± 0.6 from the initial visit to the final follow-up examination, a 10% decrease in pain score. When a paired t-test was used to evaluate the relationship between the 34 patients' subjective feeling of pain at the initial visit compared to that at the final follow-up examination, a p-value of 0.0831 was obtained, indicating that the decrease in the patients' subjective feelings of pain was not significant. In addition, the mean quantitative pain of all 34 patients decreased from 1.7 ± 0.7 to 1.3 ± 0.7 from the initial examination to the final examination. This represents a 24% decrease in quantitative pain score from the beginning to the end of the study. A paired t-test comparing the 34 subjects' quantitative pain score at the initial examination compared to the final follow-up examination yielded a p-value of 0.0630. Thus, the patients' decrease in quantitative pain score from the beginning to the end of the study was found to be non-significant.

	All Subjects (n = 34)	Female Subjects (n = 29)	Male Subjects (n = 5)
Age (years)	51.4 ± 14.3	52.3 ± 14.5	46 ± 13.2
Initial Visit (Subjective)	1 ± 0.6	1.0 ± 0.5	0.8 ± 0.8
Last Visit (Subjective)	0.9 ± 0.6	0.9 ± 0.6	0.8 ± 0.8
Initial Exam (Quantitative)	1.7 ± 0.7	1.7 ± 0.7	1.6 ± 0.5
Final Exam (Quantitative)	1.3 ± 0.7	1.4 ± 0.6	0.6 ± 0.5

Table 2: Baseline characteristics for subjects treated with clinical hypnosis (n = 34). All values written as mean ± s.d.

	20 - 40 years old	40 - 60 years old	60+ years old
Subjective Feeling at Initial Visit vs. Last Visit	p = 0.341	p = 0.339	p = 0.343
Quantitative assessment at Initial vs. Final Exam	p = 0.046*	p = 0.638	p = 0.434

Table 3: P-value for paired t-test for subjective feeling at initial visit vs. last visit and quantitative assessment at initial exam vs. last exam based on age of subjects. Statistical significance was found in the quantitative assessment at initial vs. final exam for subjects age 20- 40 years old.

	Females	Males
Subjective feeling at initial visit vs. last visit	p = 0.083	No Change
Quantitative assessment at initial vs. final exam	p = 0.244	p = 0.034*

Table 4: P-value for paired t-test for subjective feeling at initial visit vs. last visit and quantitative assessment at initial exam vs. last exam. Statistical significance was found in the quantitative assessment at initial vs. final exam for males with a p-value of 0.034.

Quantitative Assessment at Initial vs. Final Exam	All Subjects
Patients that began at None (0)	No change
Patients that began at Mild (1)	p = 0.166
Patients that began as Moderate (2)	p = 8.42E-06*
Patients that began as Severe (3)	p = 0.038*

Table 5: P-value for paired t-test for quantitative assessment at initial exam vs. last exam. Statistical significance was found in subjects that began with Moderate (2) and Severe (3) pain with a p-value of 8.42E-06 and 0.028, respectively.

Discussion

TMD is a highly complex, multifactorial disorder that affects 5 - 13% of the general population, a disproportionate amount of who suffer from anxiety and/or depression, which negatively affects nocturnal parafunctional habits. Many traditional treatment modalities have been experimented with over the years without much success, such as supportive patient education, physical therapy, pharmacological

treatment, occlusal therapy, and use of an intraoral splint. Lesser known alternative treatments, such as habit reversal, massed negative practice, cognitive-behavioral therapy, stress management and relaxation techniques, and electromyographic (EMG) biofeedback have also been explored without much value. Of all the alternative treatments, hypnosis has the highest potential for efficacy due to its focus on reducing pain, changing the sensation of pain to another feeling, diverting focus away from pain, increasing an individual's ability to ignore pain, and/or increasing feelings of comfort [9]. Additionally, hypnosis may be uniquely effective at addressing the pain symptoms of TMD resulting from nocturnal parafunctional habits, such as grinding or clenching, which occur at an unconscious level [3]. Hypnosis as a treatment modality for TMD is a relatively novel field of research that is still being explored.

The data was analyzed based off age, sex and initial pain scores. According to our research, statistical significance was found for quantitative level of pain at initial examination versus the final follow-up examination for participants ages 20 - 40 years old, male quantitative level of pain at the initial visit versus the final follow-up, and for quantitative level of pain at initial visit versus the final follow-up for patients who initially presented with moderate or severe pain. The data suggests that hypnosis therapy significantly reduces the quantitative pain score of participants who are male, who are between the ages of 20 and 40, and who initially present with moderate to severe quantitative pain scores.

Conversely, there were no statistically significant results for participants over 40 years when comparing pain scores within the designated age groups, for female quantitative level of pain at the initial visit versus the final follow-up, or for female subjective feelings of pain between the initial visit and last visit. Additionally, there was no change in the male subjective feeling of pain between the initial visit and last visit, and therefore a p-value could not be generated. Similarly, no difference was found between the initial and final examination quantitative pain scores of patients initially presenting with a quantitative pain level of None, and thus a p-value could not be generated.

Conclusion

While more significant results were hoped for across all of the age, sex, and pain score groupings, this study demonstrated that quantitative pain scores, for TMD patients presenting with moderate to severe pain at the initial examination, can be significantly reduced following hypnosis therapy. Clinically, this finding could indicate that hypnotherapy is most beneficial in the treatment of TMD patients who initially present with substantial pain that is not relieved by other treatment modalities. However, given several weaknesses in this study's design, further research is required to formulate more robust conclusions regarding the effects of hypnosis therapy in the treatment of pain in TMD patients. First, the inclusion criteria set forth at the beginning of the study was relatively stringent. This greatly restricted the number of participants that could have been included in this study. As a result of the small population size of 34 patients, the validity of all conclusions constructed on the basis of this study's data is greatly reduced. Future experiment recommendations include having less stringent inclusion criteria to increase the number of participants and creating a study design more adept at discerning any variations in the effectiveness of hypnotic therapy between male and female TMD patients. Nonetheless, hypnosis therapy represents a promising treatment modality for reducing pain in TMD patients. However, more research needs to be conducted to accurately determine the effectiveness of hypnosis as a treatment modality for TMD patients.

Funding

None.

Conflicts of Interest

None.

Author Contributions

Yasser Khaled: Performed literature review of hypnosis-TMD research for the last 20 years, contributed to data interpretation, critically revised, edited and approved all the manuscript.

Damien Nelson: Performed literature review of pertinent hypnosis-TMD research from the year 2000 to the present date, performed statistical analyses on the collected data, contributed to data interpretation, drafted and critically revised the manuscript especially pertaining to the Abstract, Introduction, and Materials and Methods sections.

Marjorey Razdolsky: Performed literature review of pertinent hypnosis- TMD research, drafted and critically revised the manuscript especially pertaining to the Introduction and Discussion sections, completed editing required to comply with the Journal of Dental Research's format requirements.

Annamarie Ciancio: Performed statistical analyses on the collected data, contributed to data interpretation, and drafted and critically revised the manuscript especially pertaining to the Results and Discussion sections.

Ethical Approval

All authors gave their final approval and agreed to be accountable for all aspects of the work.

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