Original Article

Does lifestyle modification (physical exercise and listening to music) improve symptoms in patients with a temporomandibular disorder? A randomized clinical trial

ABSTRACT

Introduction: The aim of the study was to compare pain relief in temporomandibular disorder (TMD) patients with or without lifestyle modification.

Materials and Methods: This randomized clinical trial was performed on patients with TMD, who did not regularly exercise or listen to music. The participants were allocated into two groups. In the treatment group, the participants were instructed to exercise five times or more per week (30 minutes per session) and listen to the music of their choice five times or more per week (15 minutes per session) for 12 weeks. In the control group, the participants had their usual lifestyle without any modifications. The participants were examined for clicking and crepitus in the joint and maximum mouth opening before and after the intervention. The pain severity was also documented based on a visual analog scale.

Results: Thirty five patients were studied in each group. Twelve weeks after the intervention, the mean pain severity was 2.70 ± 0.73 in the treatment group and 4.63 ± 0.77 in the control group. The results of data analysis demonstrated a significant difference between the two groups regarding the mean pain severity at 12 weeks after the intervention (P <.001).

Conclusions: Lifestyle modification through physical exercise and listening to music may reduce pain in TMD patients.

Keywords: Healthy lifestyle, pain, temporomandibular joint, temporomandibular joint disorders, temporomandibular joint dysfunction syndrome

INTRODUCTION

Temporomandibular disorders (TMDs) are a common cause of dysfunction and pain in the temporomandibular joint (TMJ) and masticatory muscles. The signs and symptoms of TMD include regional pain in the temporal and preauricular areas, limitations in mouth opening and jaw movements, and jaw popping.[1] A differential diagnosis should be made between joint-related and muscle-related disorders. Chronic pain is the main reason patients seek TMD treatment. Overall, TMD may be associated with depression or other psychological and general health problems, which affect an individual's quality of life.[2]

Various biological, psychological, and social factors may be responsible for the occurrence or severity of TMD.[3] Psychological factors (stress and depression) and sleep disorders lead to TMD pain among adolescents.[4] It has been proposed that lifestyle modification and stress relief may have positive effects on the improvement of TMD.[5] Evidence

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shows that mindfulness-based stress reduction (which is a program that decreases stress through physical and psychological activity) through physical activity and listening to music can effectively reduce the stress level of adults.[6,7]

The study aimed to determine if lifestyle modification could improve TMD pain in patients with TMD. It was hypothesized that mindfulness-based stress reduction through physical activity and listening to music could reduce pain severity in TMD patients. This study aimed to compare pain relief among TMD patients with or without lifestyle modification.

MATERIALS AND METHODS

In this randomized clinical trial (IRCT20210209050304N1), the study population consisted of patients who were referred to the Oral and Maxillofacial Surgery Department with signs and symptoms of TMD between September 1, 2018 and October 31, 2021. The study was approved by the medical ethics committee (IR.SBMU.DRC.REC.1399.070).

Patients who were eligible for the study had the signs and symptoms of TMD (pain and restrictions in maximum mouth opening [MMO] with clicking or crepitus), and they did not exercise regularly (<30 minutes per week) or listen to music (<10 minutes per week). The exclusion criteria were as follows: a history of TMJ surgery; condylar fractures; bruxism; TMJ pathologies; systemic diseases affecting TMJ (e.g., rheumatoid arthritis); being partially edentulous; failure to return for follow-up; and unwillingness to participate in the study.

An independent researcher created random allocation cards using computer-generated random numbers to select subjects for the treatment and control groups. The criteria for the diagnosis of TMD included noise when opening or closing the mouth (clicking and crepitus), preauricular pain (spontaneous or functional), and restrictions in MMO (calculating maximum interincisal opening). An oral and maxillofacial surgeon examined all patients in this study. All subjects received pharmacological agents for 10 days, including a muscle relaxant (methocarbamol, 500 mg q8h) and a nonsteroidal anti-inflammatory drug (naproxen, 250 mg q12h).

The patients were allocated into two groups. In the treatment group, the patients were instructed to exercise (routine physical exercises such as walking, running, hiking, gym, etc.) five times per week or more (30 minutes per session) and listen to the music of their choice five times per week or more (15 minutes per session) for 12 weeks. In the control group, the subjects had their usual lifestyle without any modification. The participants were examined for clicking, crepitus, and MMO before and after the intervention. The pain severity was also documented based on a visual analog scale as follows: 0, no pain; 1-3, mild pain; 4-6, moderate pain; and 7-10, severe pain.

Sample size calculation: The sample size was calculated based on the following formula:

$$N = (r + 1)(Z\alpha/2 + Z_1\text{-}\beta)^2 (\sigma 2/rd2)$$

The type I error (Zα) was estimated at 1.96 at a 95% confidence level, and the type II error (Z1-β) was 0.84. As per a previous study, an acceptable clinical difference was hypothesized to be 1.5 standard deviations.[8] As per our calculations, a sample size of 30 patients was calculated for each group at a confidence level of 95% and a study power of 90%.

Statistical analysis: Statistical analyses were performed in SPSS Version 22 for Windows (IBM, USA). *P* values less than. 05 were considered statistically significant. An independent *t*-test was used to compare the pain severity score and MMO between the treatment and control groups. Moreover, Fisher's exact test was used to compare the prevalence of clicking between the two groups.

RESULTS

In this study, a total of 35 individuals were examined in each group. In the treatment group, two patients did not attend the follow-ups and were removed from the study. The mean age of the participants was 29.90 ± 8.47 years in the treatment group and 27.05 ± 7.89 years in the control group. There was no significant difference in the mean age of the two groups ($P = 0.15$). The treatment group consisted of seven men and 26 women, and the control group included nine men and 26 women. The results did not indicate any significant difference in the frequency of males and females between the two groups ($P = 0.78$).

Before the onset of the intervention, variables, including MMO, pain severity, and clicking, were not significantly different between the treatment and control groups ($P > .05$) [Table 1]. Twelve weeks after the intervention [Table 2], the mean pain severity was 2.70 ± 0.73 in the treatment group and 4.63 ± 0.77 in the control group. The results of the data analysis showed a significant difference in the mean pain severity between the two groups at 12 weeks after the intervention ($P < .001$).

The mean MMO was 39.42 ± 1.06 mm in the treatment group and 37.80 ± 0.90 mm in the control group at 12 weeks after

Table 1: The comparison of variables between the treatment and control groups before the intervention

Variables at T0	Treatment group	Control group	*P*
MMO (mm)	35.90±26.02	35.94±1.86	0.95*
Pain severity	6.18±0.91	6.31±0.96	0.56*
Frequency of clicking	20 Yes, 13 No	24 Yes, 11 No	0.61**

T0=Baseline assessment, *Independent *t*-test, **Fisher's exact test

Table 2: The comparison of outcomes between the treatment and control groups after the intervention

Outcomes	Treatment group	Control group	*P*
MMO (mm)	39.42±1.06	37.80±0.90	<0.001
Pain severity	2.70±0.73	4.63±0.77	<0.001
Frequency of clicking	11 Yes, 22 No	14 Yes, 21 No	0.62

the intervention. The results suggested a significant difference in the mean MMO between the treatment and control groups at 12 weeks after the intervention ($P < .001$). The prevalence of clicking in the treatment and control groups was not significantly different at 12 weeks after the intervention ($P = 0.62$).

DISCUSSION

The quality of life is correlated with TMD.[2,8,9] In the present study, it was assumed that lifestyle modification might improve pain relief in TMD patients. This study focused on exercise and music for patients who did not regularly exercise or listen to music. The pain severity was evaluated after the intervention in TMD patients with or without lifestyle modification. The results showed a significant reduction in pain severity in the treatment group compared to the control group. The frequency of patients with clicking or crepitus was not significantly different in the treatment group.

It is believed that psychological, biological, sociodemographic, and lifestyle factors affect chronic pain in individuals.[10] Lifestyle modification significantly influences an individual's stress level and mental health.[11] In this regard, Robinson *et al*.[12] found a close correlation between chronic fatigue syndrome and TMD pain. Overall, stress and mental health influence sleep quality, which is an important factor in TMD pain.[13]

It is well known that sports and physical activity have a great impact on mental health and stress relief.[14,15] Geneen *et al*. reported that there was no strong evidence confirming the positive effects of physical activity and exercise on chronic pain. The main shortcomings of previous studies include the small sample size and being potentially underpowered. However, their favorable effects on the reduction of pain severity and improvement of physical function have been reported. Physical exercise commonly has small-to-moderate effects on health. Available evidence recommends physical activity and exercises as interventions that can improve pain severity, physical function, and consequently, quality of life, without any significant adverse effects.[16]

The analgesic effects of music on pain have been advocated in several studies.[17-19] However, the possible mechanisms of music-induced analgesia are not only specific to music; the descending pain modulatory system (DPMS) is also involved. DPMS is in the final step of pain perceptions that modulate pain through top-down pathways.[20] In this regard, Garza-Villarreal *et al*. reported that music is an adjuvant treatment for chronic pain, decreasing the patients' self-reported pain; the analgesic effect of music was higher with self-chosen music over researcher-chosen music.[21]

To the best of our knowledge, no research in the literature has investigated the effects of exercise and music on TMD pain. The present study indicated the effects of physical exercise and music on reducing pain severity. It can be hypothesized that the combination of exercise with music affects DPMS and triggers a top-down regulation mechanism via DPMS.[19] However, further studies with an extended follow-up period and bigger study groups are beneficial to confirm our study results.

CONCLUSION

Based on the present findings, lifestyle modification through physical exercise and listening to music may reduce symptoms in TMD patients. Periauricular pain and MMO were significantly improved in patients who have routine physical exercise and listen to music in addition to medications prescribed for TMD problems.

List of abbreviations

TMD = Temporomandibular disorders
TMJ = Temporomandibular joint
MBSR = mindfulness-based stress reduction
MMO = maximum mouth opening
VAS = visual analogue scale
DPMS = Descending pain modulatory system

Ethics approval and consent to participate

Ethical clearance was obtained from medical ethics committee with reference number IR.SBMU.DRC.REC.1399.070. dated 29/07/2021. This randomized clinical trial also registered with this code (IRCT20210209050304N1) in Cochrane Central Register of Controlled Trials.

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Conflicts of interest

There are no conflicts of interest.

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