ACTA ODONTOLOGICA SCANDINAVICA
2018, VOL. 76, NO. 7, 482–487
https://doi.org/10.1080/00016357.2018.1439529

Taylor & Francis
Taylor & Francis Group

Check for updates

ORIGINAL ARTICLE

A method for preventive intervention regarding temporomandibular pain and dysfunction

Saghafi Ellie and Mejersjö Christina

Clinic of Orofacial Pain, Sahlgrenska Academy and Public Dental Health, Gothenburg, Sweden

ABSTRACT
Objective: Adolescent girls frequently suffer from temporomandibular disorder (TMD) symptoms and associated headache. A program aimed at informing about risk behavior for TMD symptoms, how to influence harmful habits and about general relaxation was tested.
Material and methods: Eighty girls at two high schools, 16 years of age, with or without symptoms, were invited to the health information on two occasions and 60 girls participated. Firstly, a questionnaire regarding symptoms and oral parafunctional habits was administrated. Structured information was given about the normal anatomy and function of muscles and joints, about the occlusion, oral habits and symptoms of orofacial pain/dysfunction and headache. General relaxation was instructed and trained. At a three-month follow-up, the same questionnaire regarding symptoms as at baseline was completed.
Result: The information provided was perceived as useful and instructive. At the follow-up, 77% reported that they used what they had learned. Headache once a week or more decreased from 49% at baseline to 35% and headache 'never/rarely' changed from 11% to 25% ($p = .002$). Reported joint sounds had decreased by the follow-up ($p = .053$), as had the use of chewing gum ($p = .002$). A majority of the girls suggested that the information should be scheduled during school hours.
Conclusion: Health information about the jaw system can influence risk factors for TMD symptoms and the frequency of symptoms among adolescent girls.

ARTICLE HISTORY
Received 23 November 2017
Accepted 4 February 2018

KEYWORDS
Temporomandibular disorders; prevention; adolescents; health promotion; methodology

Introduction

Temporomandibular disorders (TMD) comprise musculoskeletal conditions associated with pain and/or dysfunction of the temporomandibular joints (TMJ), the jaw muscles, related structures and associated headaches [1]. The etiology of the symptoms is multifactorial and complex and influenced by psychosocial factors such as personality, behavior and environment. Psychosomatic symptoms [2,3], occlusal factors [4,5], oral parafunctions [4,6,7], socio-demographic affiliation [8] and lifestyle factors [9] are known risk factors influencing the development of TMD symptoms.

The prevalence of reported TMD symptoms has been found to be 4–19% in adolescents [10–12] with an increasing frequency with age [11,12]. Girls are affected more often than boys [11–13] and report more somatic symptoms than boys [11]. Adolescents, especially girls, frequently suffer from TMD symptoms and headache associated with TMD [11,13,14] resulting in increased school absence and analgesics consumption and impaired quality of life [11,14]. Clinical symptoms are few in children, but increases after puberty [5,15] and the prevalence of clinical dysfunction is higher in girls than boys [5,13,15].

Painful conditions could be caused by an overuse of the masticatory muscles, a faulty movement pattern or fear of moving the mandible, leading to muscle weakness and stiffness and in itself, an increase in pain [16]. A fear of moving the mandible due to pain may result in prolonged inactivity. A parafunctional habit may develop and increase prolonged and unconscious activity, with repetitive, low-intensity microtrauma that may cause muscle damage [16,17] and these parafunctional habits have been found to be associated with TMD symptoms and headache [18].

Various treatment methods have been described to increase the patient's awareness of habits and muscle tension at rest and in motion. Passive muscle stretching of a shortened painful muscle can reduce symptoms [17]. Anxiety or mental strain, as well as a painful condition elsewhere in the body, may increase tension of the jaw muscles, leading to additional pain, while general relaxation can reduce such muscle tension. Regular physical activity is beneficial, both for mental and general health and is an another important tool for relaxation and rehabilitation.

Progressive relaxation focuses on the difference between tense and relaxed muscles and has been shown to be effective also in an abbreviated form [19]. By activating and relaxing a muscle group, the degree of tension is gradually reduced. Progressive muscle relaxation reduced anxiety [20] and migraine frequency [21]. Also training body awareness has been shown to reduce tension headache [22].

CONTACT Mejersjö Christina christina.mejersjo@vgregion.se Specialisttandvården Bettfysiologi, Universitetsklinikerna FTV Västra Götaland, P.O. Box 7163, SE-402 33 Gothenburg, Sweden

© 2018 Acta Odontologica Scandinavica Society

Autogenic training is a form of auto-suggestion that aims at relaxing the body through patterns [23] and has been found to reduce tension headache. The patients use repeated short phrases such as ‘my right arm is heavy’ or ‘I am perfectly calm’. The entire body is included in the relaxation training and the focus is not only on the patients TMD symptoms.

Treating patients in a group is considered advantageous [24]. The group dynamics enables participants to not only take personal responsibility, but also give them the opportunity to discuss their own experiences and get valuable feedback from other group members as well. For a more lasting impact, the information should be combined with some form of active training, such as mobility training, stretching, relaxation and body awareness training [25]. Brief cognitive-behavioral therapy of patients with TMD pain has resulted in significant and lasting improvement in patients with myofascial pain [26].

The increasing knowledge about risk factors for TMD symptoms motivates preventive measures. Prophylactic interventions are rare and the effect of preventive information regarding TMD symptoms is not known. Prevention is generally a top priority in dentistry and ought to be studied also for TMD symptoms.

A program for preventive health information has been developed on the basis of current knowledge about risk factors and information/counseling commonly given to patients with TMD symptoms, with the aim to inform about risk behavior and risk factors for TMD symptoms and on how to influence or change harmful habits and about relaxation in general as well.

The aims of the study was to evaluate the program for health information regarding TMD symptoms among adolescent girls and to study the possible effects of the health information on symptoms of TMD.

Materials and methods

Two high schools in Gothenburg, Sweden, with pupils recruited from different socio-economical areas, were chosen for the study. With the approval of the headmasters and school nurses, girls from five first-year classes in three different programs, altogether 80 pupils, were invited to participate in the study. Sixty girls, mean age 16 years (15–17), accepted to participate and were included. Their respective school programs were science (14 students), economics (15) and the arts (31). Both students with and without symptoms were included.

The authors made a personal visit to the classes one week in advance and informed about the purpose and performance of the study, that participation was voluntary and that the meetings were going to be held directly after the end of the school day. Written information about the study was given to the girls. Their parents also received written information and were given the opportunity to consent to their daughters participation in the study. The study was approved by the Gothenburg ethical committee (Reg.no. 400-14).

Questionnaire regarding reported symptoms

Before the health information session, all participants completed a standardized questionnaire regarding symptoms of the jaws, face and head during the preceding three months, as well as oral parafunction and general health:

1. Symptoms of TMD and frequency (never/rarely, 1–2 times/month, 1–2 times/week, 3–4 times/week or daily); tiredness of the jaws, joint sound, headache, pain of the face or jaws, difficulties when opening wideor locking of the jaw.
2. Whether the reported symptoms had necessitated consumption of analgesic (yes/no) or sick leave from school (days/month).
3. Evaluation of the symptoms according to the Numerical Rating Scale (NRS): 0–10 (0 = no pain to 10 = worst pain imaginable).
4. Reported oral parafunctions and frequency (never/rarely, 1–2 times/month, 1–2 times/week, 3–4 times/week or daily); bruxing during sleep, clenching or bruxing when awake, pressing the tongue to the front teeth or palate, biting the lips, biting the nails or use of chewing gum.
5. Any oral piercings and their location.
6. General health on a five-point scale (0 = very good to 4 = very bad).

The intervention

Structured information was given about the normal temporomandibular system and the bite, about risk factors for TMD symptoms and ways to handle and change risk factors like oral habits and stress factors. There was also, brief information about general relaxation, mindfulness [27] and basic body awareness [28]. The information followed a strict manuscript that was constituted by two dentists working together, to groups of 8–10 girls on two occasions, each lasting 40 min, with one week between sessions. Relaxation instruction and training were given on both occasions and took 8.5 min. For those who wanted, the relaxation instructions were sent to their mobile phones. The health information is presented in Table 1 and the girls were prompted to practice what they had been taught.

At the end of the second meeting, the students submitted their opinions anonymously about the information and training, as well as suggestions on how to improve the information, by answering five questions:

a. The length of the information? (too long, enough or too short).
b. The content of the information? (grading 1–5, from not interesting to very interesting).
c. The understanding of the information? (grading 1–5, from no understanding at all to complete understanding).
d. Estimation of the benefit of the information on NRS (0 = no value to 10 = greatest possible value).

Table 1. Schematic content and length of the preventive health information and training given at two meetings of 40 min each.

First meeting	Minutes	Second meeting	Minutes
Introduction: Background and purpose of the program	10	Discussing last meeting, questions	5
Normal function and activity: Of the jaws, muscles, joints and bite and their interaction	10		
Risk behaviors and risk factors: Muscle tension and different parafunctions	5	About habits, general tension and comorbidity	5
Prevent symptoms and change habits: Jaw training and relaxation	5	Importance of physical activity and how to change habits	10
General relaxation methods: instruction and practical training	10	Discussing the home training and repeated training	10
		Questions and discussion on questionnaire answering	5

e. Do you practice what you have been taught to influence your symptoms (yes (several times/week, 1–2 times/week, 1–2 times a month or periodically) or no?)

Three-month follow-up

Three months after the information sessions, one of the authors visited the classes and the girls responded again to the same questionnaire as at baseline. Fifty-eight girls (96%) participated in the follow-up and two girls were absent due to illness on the follow-up day.

Data processing

The questionnaires and the comments to the information provided, were compiled and processed using the SPSS software(SPSS Inc., Chicago, IL). For comparison of reported symptoms and parafunctional behavior from the start to follow-up, as well as differences between schools and programs, the Students t-test, the Chi^2, McNemar's tests and the Wilcoxon signed rank test were used.

The health information program (Table 1)

Information about the normal anatomy and function of the jaw system; knowledge on how the lower jaw relates to the skull, possible jaw movements, chewing and the resting position of the mandible, that the right and left sides of the jaw are connected and that both sides are active when the jaw is moved. The TMJ can be felt in front of the ear with the fingertips when opening or closing the mouth.

Information about the muscles of the masticatory system; knowledge on different activities requiring muscle work and tension like chewing, swallowing, speaking or singing. Information about interaction between the muscles, about prolonged work/activity potentially leading to overloading, about the normal habitual position with the muscles at rest and the front teeth apart (the distance depending of the head position) and about the tension of the biting muscles interacting with the tension of the neck muscles was demonstrated. Instructions were given about exploration of the moving capacity of the mandible in all directions and about training on how to break muscle tension by stretching,

Information about the occlusion; knowledge on the bite change and the teeth movement due to pressure e.g. from braces, tongue pressure or from biting, that the teeth normally occlude differently when biting in different positions and that tooth contact always requires muscle work/tension was provided.

Information about oral habits; that what is usually done feels normal and right, even if it is unhealthy and that extended clenching may become an unconscious habit causing jaw problems. Pressing the tongue onto the palate, biting the nails or lips and prolonged gum chewing are other examples of habits that may cause symptoms. However, habits can be changed.

Information about general muscle tension; knowledge on circumstances that may increase general tension, such as concentrating hard, strong psychological pressure (maybe from oneself), worries or having a lot to think about and pain somewhere in the body. Mental tension may give rise to muscle tension, but we all differ in sensitivity and while one person may shrug at something, the next person may experience great discomfort.

Information about the effects of physical activity; Information was also provided as how the tension could be reduced by physical activity or general relaxation like mindfulness, yoga, suggestive relaxation, chi gong and regular physical training .

One method of general relaxation was instructed and practiced with the participants sitting or lying down (a combination of progressive relaxation with increased awareness of tension in the body and suggestive relaxation with the focus on breathing and the weight and load of the body, and the calm feeling of the body).

Results

There was a difference between the schools regarding participation in the program; 80 and 54%, respectively, of those invited, with the smaller number for the school with more students from lower socio-economic circumstances.

Opinions about the content of the program

The length of the information was found appropriate by 97% of the girls, 94% found the information highly interesting and 7% very interesting (the highest score). Ninety-two per cent of the girls reported complete understanding while 8% reported good understanding.

Reported benefit of the program

Ninety per cent reported the benefit to be of grade 5 or above (grades 0–10) and 10% of grade 3–4. At the follow-up, 70% of the girls stated that the program had given them some tools to influence their jaw and head symptoms and 77% reported that they used what they had learned to some degree. Information and training in groups were preferred by 97%.

To improve the intervention, a majority suggested that the information should be scheduled during school hours. The instructions into general relaxation and basic body awareness were the most appreciated parts.

Reported symptoms in the study group

Headache was reported at baseline with a frequency of 3–4 times/week or daily by 7% of the girls and 1–2 times/week by 42%, while at the follow-up the numbers were 5 and 30%, respectively. The girls reporting 'never or rarely" having a headache was 11% at baseline and 26% at follow-up ($p = .002$). Other symptoms reported to occur once a week or more often were tiredness of the jaws (16%), joint sounds (30%), facial pain (5%), difficulty opening wide (7%) and locking sensation (8%). There were changes in the frequency between the two occasions in both directions, with symptoms occurring both more frequently and more rarely. A significant overall decrease of the symptom frequency was noticed for headache ($p = .002$) and joint sounds ($p = .053$).

The mean intensity of the symptoms according to the NRS was 3.25 (SD =2.44) before the intervention, with 28% scoring 5 or higher, while at the follow-up, the mean intensity was significantly lower, at 2.43 (SD =1.98), with 16% scoring 5 or higher ($p = .025$). Sick leave due to symptoms of the head and jaws during the previous three months was reported by 32% at baseline, compared with 17% at follow-up ($p = .053$). The reported analgesic consumption due to jaw and head symptoms was 73% at baseline versus 36% at follow-up ($p < .001$).

Reported parafunctions

Use of chewing gum 1–2 times a week or more was reported by 79% at baseline, while at follow-up was reported by only 55%. Eight per cent reported a 'never or rarely' chewing gum at baseline, while at follow-up this was reported by 22% ($p = .002$). For other parafunctional habits, a decrease of the frequency was noticed for most habits; however, with no statistically significant changes.

Four girls (6%) had oral piercings and the ornaments were all located in the tongue. Three of those girls reported TMD symptoms of minor degree, according to the NRS.

Discussion

The program for health information was well perceived and the study shows that such information, given in groups, may reduce TMD symptoms in the short term in 16-year-old girls, an age with a high incidence of TMD symptoms [11,12]. To test the program, only girls were chosen, as girls are more often diagnosed with TMD symptoms than boys and also have significantly more severe symptoms than boys [5,11–15]. The two schools included in the study were deliberately chosen due to their differences regarding demographic areas, to allow for the inclusion of participants with different psychosocial study environments and school programs with different contents and expectations.

The number of dropouts, non-participants, was relatively small (20%), but there were more drop outs at the school with poorer socio-economic circumstances, which may have influenced the results somewhat. It could also be an indicator of a different degree of interest in health information and may reflect the possibility of changing risk behavior in different populations. There was a slight difference between how the health information was received with somewhat less appreciation among the science students, perhaps because of the 'soft' nature of information and training.

The amount and degree of TMD symptoms among the girls in the study were comparable to those in previous reports [13,29] and the group studied was regarded as representative of their age and gender. A standardized questionnaire was used to gain information about experienced symptoms of TMD and parafunctions. Self-reporting has been suggested as the criterion standard regarding subjective experiences and questionnaires have shown good reliability, both regarding the NRS and other numerically answered questions [30]. A strong correlation between self-reporting of bruxism and clinically based diagnoses has been found [31]; however, difficulty to remember experienced pain has to be considered [32].

Headache has been strongly associated with TMD and headache seems to precede other TMD symptoms [33]. Headache once a week or more often was frequently reported in this study, but the frequency decreased to follow-up and the group with headache 'never/rarely' increased. This could be an effect of the health information and relaxation training, as expected based on other studies [22–24]; however, the frequency of headache fluctuates and is also associated with many other factors than jaw tension, which may have influenced the frequency.

The negative impact of TMD symptoms on quality of life is known [11] and this was obvious also in this study. The significant reduction in analgesic consumption and sick leave from school by the three-month follow-up could be an effect of the health information program and the overall severity of the TMD symptoms according to the NRS scale, was significantly lower at follow-up when compared with at the baseline. This might indicate a decrease in the intensity of symptoms after the health information, but could also be due, in part, to the fluctuation of TMD symptoms [34].

Reported oral parafunctions decreased to follow-up, but statistically significantly only regarding the use of chewing gum, which is probably an effect of the health information. Increased awareness of oral habits and symptoms, is another factor influencing the reported frequency, which probably increased reported parafunctions and symptoms of which the girls were previously unaware. The health information

provided was appreciated and many students suggested that the information should be scheduled as a part of the general health promotion activities.

The weakness of the study is that the intervention program was tested in a small group of adolescents and with no controls. To our knowledge there has not been any such preventive intervention tested before and the aim was to study the perception to such health information among adolescents. The results are promising and many of the girls suggested that the information should be scheduled during the school-day. However; the method must be tested during a longer period of time and compared with a control group to be able to determine whether preventive health information could influence the incidence and degree of pain and dysfunction of the jaws and head.

Conclusion

The structured health information, given in groups, about the jaw system, the function and TMD symptoms was well received by 16-year-old high school girls. The results of the study indicate that preventive health information can influence risk factors and the frequency of TMD symptoms.

Disclosure statement

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

Funding

The study was supported by The Local Research and Development Board for Gothenburg and Södra Bohuslän.

References

[1] Okeson JP. Signs and symptoms of temporomandibular disorders. In: Okeson JP, editor. Management of temporomandibular disorders and occlusion, 7th ed. St. Louis, MO: Mosby, Elsevier Inc.; 2013. p.129–169.

[2] Suvinen TI, Nyström M, Evalahti M, et al. An 8-year follow-up study of temporomandibular disorders and psychosomatic symptoms from adolescence to young adulthood. J Orofac Pain. 2004;18:126–130.

[3] Fillingim RB, Ohrbach R, Greenspan JD, et al. Psychological factors associated with development of TMD: the OPPERA prospective cohort study. J Pain. 2013;14(Suppl12):T75–90.

[4] Marklund S, Wänman A. Risk factors associated with incidence and persistence of signs and symptoms of temporomandibular disorders. Acta Odontol Scand. 2010;68:289–299.

[5] Magnusson T, Carlsson GE, Egermark I. Changes in clinical sign of craniomandibular disorders from the age of 15 to 25 years. J Orofac Pain. 1994;8:207–215.

[6] Glaros AG, Tabacchi KN, Glass EG. Effect of parafunctional clenching on TMD pain. J Orofac Pain. 1998;12:145–152.

[7] Egermark I, Carlsson GE, Magnusson T. A 20-year longitudinal study of subjective symptoms of temporomandibular disorders from childhood to adulthood. Acta Odontol Scand. 2001; 59:40–48.

[8] Slade GD, Bair E, Greenspan JD, et al. Signs and symptoms of first-onset TMD and sociodemographic predictors of its development: the OPPERA prospective cohort study. J Pain. 2013; 14(Suppl12):T20–32.

[9] Östansjö V, Moen K, Storesund T, et al. Prevalence of painful temporomandibular disorders and correlation to lifestyle factors among adolescents in Norway. Pain Res Manag. 2017; 2017:2164825.

[10] Drangsholt M. Temporomandibular disorder pain. In: Crombie IK, Croft PR, Linton SJ, LeResche L, Von Korff M, editors. Epidemiology of Pain. Seattle: IASP Press; 1999. p. 203–233.

[11] Nilsson IM. Reliability, validity, incidence and impact of temporomandibular pain disorders in adolescents. Swed Dent J. 2007; 183:16–46.

[12] Lövgren A, Häggmn-Henrikson B, Vischer CM, et al. Temporomandibular pain and jaw dysfunction at different ages covering the lifespan-a population based study. Eur J Pain. 2016;20:532–540.

[13] Mejersjö C, Ovesson D, Mossberg B. Oral parafunctions, piercing and signs and symptoms of temporomandibular disorders in high school students. Acta Odont Scand. 2016;74:279–284.

[14] Emshoff R, Bertram F, Schnabl D, et al. Association between chronic tension-type headache coexistent with chronic temporomandibular disorder pain and limitations in physical and emotional functioning: a case-control study. J Oral Facial Pain Headache. 2017;31:55–60.

[15] Da Silva CG, Pachêco-Pereira C, Porporatti AL, et al. Prevalence of clinical signs of intra-articular temporomandibular disorders in children and adolescents: a systematic review and meta-analysis. J Am Dent Assoc. 2016;147:10–18.

[16] Sluka KA. General principles of physical therapy practice in pain management. In: Sluka KA, editor. Mechanisms and management of pain for the physical therapist. Seattle: IASP Press; 2009. p. 133–142.

[17] Brown SP. Exercise physiology. In: Brown SP, editor. Introduction to exercise science. Philadelphia: Lippincott Williams & Wilkins; 2001. p. 132–191.

[18] Motta LJ, Guedes CC, De Santis TO, et al. Association between parafunctional habits and signs and symptoms of temporomandibular dysfunction among adolescents. Oral Health Prev Dent. 2013;11:3–7.

[19] Carlson CR, Hoyle RH. Efficacy of abbreviated progressive muscle relaxation training: a quantitative review of behavioral medicine research. J Consult Clinical Psychol.1993;61:1059–1067.

[20] Wild K, Scholtz M. Strategies against burnout and anxiety in medical education, implementation and evaluation of a new course on relaxation techniques for medical students. PLoS One. 2014;9:e114967.

[21] Meyer B, Keller A, Wöhlbier HG, et al. Progressive muscle relaxation reduces migraine frequency and normalizes amplitudes of contingent negative variation (CNV). J Headache Pain. 2016;17:37.

[22] Sertel M, Simsek TT, Yümin ET. The effect of body awareness therapy on pain, fatigue, and health-related quality of life in female patients with tension type headache and migraine. West Indian Med J. 2016. doi:10.7727/wimj.2015.304

[23] Stetter F, Kupper S. Autogenic training: a meta-analysis of clinical outcome studies. Appl Psychophysiol Biofeedback. 2002;27:45–98.

[24] Bogart RK, McDaniel RJ, Dunn WJ, et al. Efficacy of group cognitive behavior therapy for the treatment of masticatory myofascial pain. Mil Med. 2007;172:169–174.

[25] Hassed C. Mind-body therapies-use in chronic pain management. Aust Fam Physician. 2013;42:112–117.

[26] Turner JA, Mancl L, Aaron LA. Short- and long-term efficacy of brief cognitive-behavioral therapy for patients with chronic temporomandibular disorder pain: a randomized, controlled trail. Pain. 2006;121:181–194.

[27] Greeson JM. Mindfulness research update: 2008. Complement Health Pract Rev. 2009;14:10–18.

[28] Gard G. Body awareness therapy for patients with fibromyalgia and chronic pain. Disabil Rehabil. 2005;27:725–728.

[29] Magnusson T, Egermark I, Carlsson GE. A prospective investigation over two decades on signs and symptoms of

temporomandibular disorders and associated variables. A final summery. Acta Odontol Scand. 2005;63:99–109.

[30] Wahlund K, List T, Dworkin SF. Temporomandibular disorders in children and adolescents: reliability of a questionnaire, clinical examination, and diagnosis. J Orofac Pain. 1998;2:42–51.

[31] Paesabi DA, Lobbezoo F, Gelos C. Correlation between self-reported and clinically based diagnoses of bruxism in temporomandibular disorders patients. J Oral Rehabil. 2013;40:803–809.

[32] Feine JS, Lavigne GJ, Dao TT. Memories of chronic pain and perceptions of relief. Pain 1998;77:137–141.

[33] Nilsson IM, List T, Drangsholt M. Headache and co-morbid pains associated with TMD pain in adolescents. J Dent Res. 2013;92:802–807.

[34] Köhler AA, Hugoson A, Magnusson T. Clinical signs indicative of temporomandibular disorders in adults: time trends and associated factors. Swed Dent J. 2013;37:1–11.