

# **The effectiveness of cognitive-behavioral therapy on tension type headache, migraine and temporomandibular disorders. An Evidence-Based Review.**

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## **Summary**

The aim of this study is to summarize and then critically evaluate, the available data, regarding the use and effectiveness of cognitive and behavioral therapy (CBT) techniques to migraine, tension-type headache (TTH) and temporomandibular disorders (TMD). The common characteristics of these three disorders are the intensity of pain and associated behavioral and psychological dysfunction, pain interference and recurrence.

The search of relative articles has been conducted through the following databases: Medline and Cochrane. 17 articles have been included, where six refer to migraine, six to TMD and five to TTH.

With regard to both migraine and headache tension type, the use of electromyographic (EMG) biofeedback resulted in the most positive results, followed by the relaxation techniques, the guided imagery and stress management techniques. On the other

hand, regarding the management of TMD, most positive results have been presented by cognitive restructuring, stress management and muscular relaxation techniques.

After meticulous article reading, it is apparent that every single technique can produce some reduction on pain intensity compared to no therapy regarding the pain management. However, a combination of several CBT techniques can lead to even better results regarding pain management.

**Key words:** Migraine, Tension Type Headache, Temporomandibular Disorders, Cognitive-Behavioral Therapy.

## **Introduction**

Headaches are particularly spread to the contemporary society being the most frequent and common health problem for most people. According to the Headache Classification Committee of the International Headache Society – HIS (1988), from the numerous types of primary and

secondary “Cephalalgias”, the most common are the Tension-Type Headache (TTH) and Migraine.

According to HIS, the pain concerning the TTH is typically bilateral, pressing or tightening in quality and of mild to moderate intensity, and it does not worsen with routine physical activity. Furthermore, photophobia or echophobia might be observed yet in the absence of nausea symptoms (Millea & Brodie, 2002). On the other hand, migraine is a repetitive cephalalgia revealing episodes with duration from 4 to 72 hours, with an average of 6 to 8 hours, which may stop automatically.

Migraine can be divided into two major sub-types: Migraine without aura, which is a clinical syndrome characterised by headache with specific features and associated symptoms and Migraine with aura, which is primarily characterised by the focal neurological symptoms that usually precede or sometimes accompany the headache. Although TTH and migraine are common disorders, their pathophysiology is not yet clear.

Anxiety, of course, is the most common explanatory causative factor

(Day, 1990), which brings about headaches, activates the sympathetic nervous system and consequently, increases the heart rate, blood pressure and muscular tone, as well as causing vessel contraction etc.

So, the prevalent viewpoint incriminates the arousal of sympathetic nervous system, which causes increased muscular tension of pericranial muscles to TTH and vessel contraction, which, again, is caused by stress to migraine (Olesen & Jensen, 1991, Jensen & Rasmussen, 1996, Christidis, Pasalidou et al., 2006).

Indeed, Temporomandibular Disorders (TMD) consist of a series of clinical conditions and symptoms, such as pain on jaw, head or neck, sensitivity and pain to temporomandibular and masticular muscles, restricted jaw functions and limited ability for correct jawbone’s movement and finally, strange sounds, which are produced inside the temporomandibular joint when the mouth is opening up (Dworkin et al., 1994, Jerjes et al., 2007).

The traditional method of coping with migraine, TTH and TMD is the medication usage, such as simple analgesics and nonsteroidal anti-

inflammatory drugs (NSAIDS) for acute therapy and the tricyclic antidepressant amitriptyline as preventive therapy (Silberstein & Lipton, 2001, Penzien., et al., 2004, Mitsikostas, 1997).

However, when these specific medications are taken in excess, this might result in iatrogenic effects, such as the aggravation of symptoms and increase of pain intensity (Andrasik, 2003). In the last decades there has been a shift to non pharmacological treatments, which are focused on finding and checking the cause that generates the symptoms, rather than their temporary distinction. Cognitive-Behavioral Therapy (CBT) is the common standard of psychosocial intervention for pain (Morley et al., 1999). The following Table (Table 1) presents the main differentiation points of medical interventions against CBT techniques.

**Table 1.**Differences between cognitive behavioral and medical interventions

- They place less emphasis on physical procedures
- They place more emphasis on patient involvement and personal responsibility
- They expand the scope of treatment so as to include emotional, cognitive, behavioral and social factors
- They search for ways in order to enable patients to cope with pain and associated symptoms more effectively.

On the other hand, of course, there is a viewpoint that the combined therapy of CBT with antidepressant medication may result in more positive outcomes in pain management compared to monotherapy (Holroyd et al., 2001). In particular Holroyd has conducted a randomized controlled trial on 203 adults, who were separated into three groups. The first group was receiving a tricyclic antidepressant therapy, the second a placebo treatment and the last one participated in a combined programme for stress management while additionally receiving a tricyclic antidepressant therapy. The results showed that the combined treatment was more probable to produce

clinically significant reductions in scores, regarding the pain's intensity and frequency on cephalalgias.

A few years after the CBT's appearance, Bill Fordyce (1976) argues in his book "Behavioral methods for Chronic Pain and Disease" that the successive pain management may come when new behaviors will be established and when the supportive surroundings will be different.

The central idea of his book is that the therapy's focus should be the "Pain Behavior", which refers to noticeable pain signs. Indeed, it is additionally underlined that the biomedical findings don't obliterate the possibility that, psychological or social factors may contribute to the disability level, which is associated with pain.

Besides, the definition of pain, given by IASP (International Association for the study of Pain) includes both cognitive and emotional variables, which are being evaluated and managed by CBT.

In particular, IASP defines "pain" as an unpleasant experience that accompanies both sensory and emotional modalities; may or may not be accompanied by identifiable tissue damage; and is influenced by multiple

factors, including cognitive, affective and environmental (Merskey, 1986, Merskey & Bogduk, 1994).

The above pain definition is consistent with the Bio-Psycho-Social Model of pain, which underlines the important interactions between biological, psychological and social variables concerning illness and pain, as well as with the Gate Control Theory (Melzack R. & Wall P.D., 1965), which points out the important roles of cognitions for pain, the attention to pain, the evaluation of its meaning, the fears for pain and coping strategies.

TTH, Migraine and TMD, such as any painful situation, have to be treated as multidimensional phenomena. Consequently, the clinician, who deals with pain management, should perceive this problem on a behavioral, emotional, social, cognitive and physiological basis.

Most specific aim of this article is to be answered the below questions:

- 1) Is CBT (concluding biofeedback) an effective treatment on HTT, Migraine and TMD contrary to no therapy? and
- 2) Which specific cognitive and behavioral techniques can be more adequate and effective in pain

management to patients suffering from TTH, Migraine and TMD?

## **Results**

According to Larsson & Carlsson (1996), relaxation techniques decreased significantly the headache intensity to children 10-15 years old suffering from TTH, contrary to the control group, which did not receive any relaxation. By applying relaxation techniques it has been observed that 69% of the students with TTH resulted in an improvement as far as the pain levels were concerned.

On the contrary, only 8% of students in the control group, who simply recorded headaches activity, resulted in some reduction in pain levels. The most promising outcome from this study is that the results from relaxation techniques were maintained even after 6 months, with a percentage improvement of 73% while those, who did not receive any therapy, had a percentage improvement of 27%.

Similarly to the above results, Devineni & Blanchard (2005) showed that progressive muscle relaxation combined with restricted biofeedback, autogenic training and stress management programme brought about significant reduction concerning the

pain management to patients with TTH, which was maintained after a 2 months follow-up evaluation in 47% of the participants.

The novel to this study was that the behavioral interventions were given through internet, something that proves that there are many other ways of coping with psychophysiological disorders apart from the traditional clinical treatment.

Arena and his coworkers separated 26 individuals with HTT into three groups with a view to comparing the effectiveness of: 1) Frontal Electromyographic (EMG) biofeedback, 2) Trapezius EMG biofeedback, which refers on combined EMG biofeedback on neck and shoulder (Arena et al., 1995) and 3) Progressive muscle relaxation. The study showed that the group with trapezius EMG biofeedback presented more significant clinical improvement concerning the pain intensity levels compared to the group with frontal EMG biofeedback and the group with relaxation techniques, which, furthermore, did not differentiate between themselves.

Lake et al (1979) produced one of the first studies, which examined the

effectiveness of biofeedback procedures and Rational-Emotive Therapy (RET) in patients suffering from migraine. In particular they compared the effectiveness of alternative biofeedback methods, such as EMG frontalis biofeedback and thermal biofeedback as well as the combination of thermal biofeedback and RET in 24 subjects who were separated in four groups.

Lake et al (1979) pointed out to the patients in the control group that they would receive the best therapy and that they are capable of changing the migraine intensity. The central point was that, the three groups who received biofeedback were more effective in pain reduction than the control group.

The results indicated that EMG biofeedback was more effective than thermal biofeedback. On the contrary, the combination of thermal biofeedback and RET did not seem to be more effective compared to the control group and the EMG biofeedback group.

RET, possibly, did not produce the expected results, on account of limited number of sessions, which was not

sufficient (three total sessions from 40 minutes each).

Another pain management method apart from relaxation techniques and various types of biofeedback is the instructed guided imagery. Mannix et al (1999) suggests that the intervention group, who once daily listened to a guided imagery audiocassette tape reported their headaches to be improved compared to control subjects, who received only medication therapy.

Several years before, Brown (1984) mentioned the effectiveness of guided imagery to groups, who suffered from migraine and he pointed out the positive outcome for the management and reduction of both experimental and clinical pain. Specifically, thirty-nine participants were randomly assigned into three groups (thirteen individuals per group) and remained under research for sixteen weeks. In the first intervention group, he applied the guided imagery method by including pleasant scenes, muscle relaxation techniques and diaphragmatic breathing. In the second intervention group he applied guided imagery techniques illustrating images with more elaborative details, without any

reference to the subjects' own behavior towards them.

The instructions to the above groups were to utilize these techniques when they already suffered from headache, when they felt that headache would appear or when they found themselves making catastrophic thoughts. Furthermore, it was noted in the third group (control group) that any subconscious stressful thoughts could be "unlearned" by a simple presentation of relaxation scenes in slides.

Ilacqua et al (1993) compared the effectiveness of guided imagery, thermal biofeedback and their combination to the migraine management of 40 subjects. In the control group the subjects were simply connected to the biofeedback machine and were instructed to relax. The results indicated that, no therapy seemed more effective than the others, concerning the reduction of migraine's frequency. However, the guided imagery was more effective in improving the subject's self reported ability to cope with pain. In other words, guided imagery training enabled subjects to have a more active role in dealing with their pain. The

reasons for this will be analyzed extensively in discussion part.

Christidis & Malisiova (2003) conducted a study, which showed that the reduction of increased muscular tension to normal levels, caused improvement of cephalalgic symptoms. This improvement implies reductions to both headache frequency and pain intensity on TTH.

Indeed, the neurophysiologic knowledge on behalf of the patients on stress and its contribution to psycho physiological disorders as well as the knowledge concerning the TTH reasoning and its symptoms and finally the impact of relaxation techniques and biofeedback, conducted positively to pain management contrary to the control group, which did not receive any intervention.

Consequently, the combination of three parameters of psycho physiologic management (the neurophysiologic tutoring, the use of EMG biofeedback and training patients in relaxation exercises and stress management techniques) contributed in the integrated control of the symptoms' somatization and manifestation (Christidis & Malisiova, 2003).

McGrath et al. (1992) suggested the idea of a self-administered CBT program to 24 subjects focusing on cognitive and behavioral strategies, stress management programs and relaxation techniques with limited therapists' involvement. So, one treatment group learned the techniques of relaxation and coping strategies by using audio cassette tapes at home while the other treatment group was taught the same relaxation techniques and coping strategies by a therapist in a clinic. The control group received information concerning headache triggers such as certain food types, overexposure to sun and exercise which may lead to migraines.

The equal sex distribution in the three groups, the unimportant age differences between the groups and the same contact frequency with the therapist both at the self-administered program and at control group, demonstrated that the self-administered program and the clinic treatment were equally effective and superior to the control treatment.

However, the self-administered program was three times more efficient and produced more reduction in migraine than the clinic treatment. Eventually, the stress management

programs were more effective concerning both the reduction in migraine intensity and the maintenance of the positive outcome after one-year follow-up evaluation.

According to recently research data from Gatchel et al. (2006), the training concerning the connection of mind and body, with emphasis on psychophysiological stress aspects, as well as the training of relaxation techniques, the use of attention diversion strategies, the planning of pleasant activities, cognitive restructuring and positive self-statements contribute to pain reduction on daily activities of patients with TMD.

Turner et al (2001) investigated whether the pain perceptions, catastrophic cognitions and coping strategies are associated with depression, limitations of jawbones' activities, pain and the disorder during mouth opening.

The above study revealed that the most important thing for patients with TMD is the changing of beliefs, which are associated with pain (mostly the belief regarding disability and catastrophic cognition) rather than changing the coping strategies (such as positive self-

statements and attention diversion strategies). The interventions, which solely aimed in pathology's determining and correction, were unsuccessful.

Consequently, the coping strategies by themselves don't exert significant role in the reduction of depressive symptoms and pain severity. On the contrary, the beliefs regarding pain experience play a significant role as well as the catastrophic cognitions on the above symptoms (Turner et al., 2001).

Nevertheless, concerning recently research data from the same author (Turner, 2006), the only coping strategy, which was noticed having an impact on reduction pain levels, was the relaxation. The benefits from CBT, undoubtedly, did not concern only the training on TMD and expectations, because the two groups had the same level of knowledge about TMD and the same expectations.

So, we can conclude, in certainty, that the subjects who received CBT and specifically, relaxation techniques, presented important improvement on pain, depression and on jaw functions, even on the next year follow-up evaluation.

Consequently, the interventions which are planned in order to change the thoughts and behaviors toward pain are capable of improving the disease's outcome for patients with TMD. Yet, the cognitions, which are associated with pain, play an important role on mood and general activities but not on specific jaw activities, which are associated with food and mastication. Thus, the only factor, which seemed not to be influenced by psychological variables, but on the contrary, by the jaws' anatomy and their physiology, is the disorder on opening up jawbones (Turner et al., 2001).

A few years later, again, Turner (2006) mentioned both the significance of reading articles concerning the psychological pain aspects, the questioning of negative thoughts for pain, relaxation techniques and other behavioral techniques for pain management as well as the significance of the relapse prevention, the completion of questionnaires, which concern the pain intensity, the jawbones' functions, depression pain beliefs (such as the pain belief as threat, harm or challenge), coping strategies and catastrophic cognitions. Turner (2006) suggested that changes on perceptions-beliefs toward pain

exert important role on pain intensity and on referred sense disability.

The reframing of beliefs for disability, harm and catastrophizing as well as the control perception toward pain, associated positively with pain intensity and frequency. Turner pointed out on a recent research (2007) that changes on self control ability toward pain were the factors, which led on pain reduction.

On below Table (Table 2) are depicted all these, which Turner revealed with her studies (2001, 2005, 2006, 2007).

**Table 2.** Factors which contributed to pain reduction (Turner, 2001, 2005, 2006, 2007)

- Reframing beliefs for disability, loss and harm
- Reframing catastrophic cognitions
- The perception of stimulus pain as challenge
- The perception of control beliefs on pain
- The perception of self-efficacy

Finally, another research from Dworkin, Turner et al. (1994) randomly assigned 185 patients into two groups (95 subjects in the intervention group and 90 subjects on

group therapy), who participated in group CBT therapy, also following the usual clinical dental therapy, presented long-standing reduction on pain levels than the patients, who received only, the usual dental therapy.

## Discussion

Undoubtedly, chronic pain has severe consequences both on society and on suffering individuals. Moreover, all health professionals have a moral duty to examine every aspect, which on an individual basis might lead to pain relief and disability reduction.

The effectiveness of cognitive and behavioral techniques concerning pain management and accompanying symptoms, such as depression, sadness, discomfort, was confirmed.

The extremely interesting finding noted by the thorough analysis of the above mentioned studies was that there are alternative forms of administration of cognitive and behavioral techniques apart from the typical administration by an educated and testified psychotherapist, such as the behavioral interventions, given through internet (Devineni, & Blanchard, 2005) and the self-administered program with relaxation and stress management techniques (McGrath et al., 1992).

Concerning the type of biofeedback, which presents the most positive results, it seemed that EMG biofeedback and thermal biofeedback were the most effective therapies on migraine management (Lake et al., 1979, Scarff et al., 2002). On the contrary, on HTT pain management, apart from frontal EMG biofeedback, the trapezius EMG biofeedback produced important results (Christidis & Malisiova, 2003). The findings, concerning the application of biofeedback, reinforce older findings of many research groups.

Yet, the therapeutic benefits of this method cannot attribute solely on this method but on the combination with other techniques, such as stress management programs, cognitive restructuring (identification of maladaptive appraisals and expectations and then, replacement maladaptive appraisals and expectations) guided imagery and progressive muscle relaxation techniques (Devineni & Blanchard, 2005, Scarff et al., 2002, Ilacqua, 1993, Gatchel et al., 2006).

The majority of the studies revealed the therapeutic benefits of the guided imagery method (Brown, 1984, Scarff et al., 2002, McGrath et al., 1992,

Mannix et al., 1999). On the other hand, many studies showed that guided imagery was not superior to other techniques (Ilacqua, 1993). However, the instructed guided imagery seemed more effective on improving the ability for pain management and on acquiring the perception of control toward pain.

The imagery of facts that are contradictory to the pain experience, functions totally therapeutically (Ilacqua et al., 1993). “Why are these techniques effective on pain management?” the answer, possibly, is because they interrupt the catastrophic cognitions and thoughts.

On the other hand, progressive muscle relaxation training is an effective way for migraine treatment and HTT management (Fichtel & Larsson, 2001, Scarff et al., 2002, McGrath et al., 1992, Larsson & Carlsson, 1996, Devineni & Blanchard, 2005, Christidis & Malisiova, 2003).

Finally, concerning TMD, it appears that cognitive restructuring and specifically the change of beliefs concerning the pain experience is more important than the coping strategies, such as the positive self-statements and attention diversion strategies (Turner J.A., 2001).

Every CBT technique, individually, seemed that may cause important reaction on pain levels than no therapy. However, from studies analysis seemed that the combination of techniques leads on more substantial and permanent results.

Nevertheless, it is important to be recognized that there is abundant space for further research with a view to applying whichever findings in therapeutic practice.

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