Effectiveness of cognitive and behavioral strategies in tension-type headache in adults: an overview of systematic reviews

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Abstract

Tension-type headache is a prevalent condition known to produce a substantial impact on patient, with direct and indirect financial costs. It represents a concrete public health priority. Being a multi-factorial disorder, tension-type headache management benefits from a multidisciplinary and integrative approach, which also includes cognitive behavioral therapy.
We conducted a systematic review, which aim was to better understand cognitive and behavioral strategies contribution for tension-type headache in adults and which strategies/interventions are most recommended.
We found 26 systematic reviews that met our inclusion criteria. We also found an overview of systematic reviews with meta-analysis, exploring the efficacy of psychological treatments for headaches and interesting guidelines about the treatment of tension-type headache. A large number of cognitive-behavioral strategies have been used to treat episodic or chronic tension-type headache. *The European Federation of Neurological Societies* offers levels of recommendation for cognitive-behavioral treatments: level A for EMG biofeedback; level C for cognitive behavioral therapy and relaxation training.
There is substantial evidence in favor of cognitive-behavioral intervention for tension-type headache management in adults, but additional studies are still necessary to understand specific protocols.

Keywords: *Tension-type headache, Chronic headache, Cognitive-behavioral therapy, Cognitive Strategies/intervention, Behavioral strategies/intervention.*

Sommario

Efficacia delle strategie cognitive e comportamentali nella cefalea tensiva negli adulti: una panoramica di revisioni sistematiche

La cefalea tensiva è una patologia a elevata prevalenza con un considerevole impatto sul paziente, costi finanziari diretti e indiretti. Rappresenta una reale priorità nell'ambito della salute pubblica.

Essendo un disturbo multifattoriale, la gestione della cefalea tensiva beneficia di un approccio integrativo e multidisciplinare, che includa anche la terapia cognitivo-comportamentale.
Abbiamo realizzato una revisione sistematica, lo scopo era comprendere meglio il contributo delle strategie cognitivo-comportamentali per la cefalea tensiva dell'adulto e quali interventi siano maggiormente raccomandati. Abbiamo trovato 26 revisioni sistematiche che rispettassero i nostri criteri di inclusione. Inoltre, abbiamo trovato una panoramica di revisioni sistematiche con meta-analisi che ha indagato l'efficacia degli interventi psicologici nelle cefalee, e interessanti linee guida sul trattamento della cefalea tensiva. Un ampio numero di strategie cognitivo-comportamentali è stato applicato per trattare la cefalea tensiva episodica o cronica. La *European Federation of Neurological Societies* assegna i seguenti livelli di raccomandazione per i trattamenti cognitivo comportamentali: livello A per EMG biofeedback; livello C per terapia cognitivo comportamentale e training di rilassamento.
L'evidenza disponibile in favore degli interventi cognitivo-comportamentali per la gestione della cefalea tensiva nell'adulto è sostanziale, tuttavia sembrano necessari studi addizionali per comprendere gli specifici protocolli di intervento.

Parole chiave: *Cefalea tensiva, Cefalea cronica, Terapia cognitivo-comportamentale, Strategie/intervento cognitivo, Strategie/intervento comportamentale.*

INTRODUCTION

Headache disorder is a very common disease, it occurs in around 46% of the population (Harris, Loveman, Clegg, Easton, & Berry, 2015). 50% of adults suffered for this disease during one-year period. It becomes chronic when occurring more than 180 days per year and more than 14 days per month for more than three months (Lee, Lee, Cho, Kim, & Yoon, 2019).

The Headache Classification Subcommittee of the *International Headache Society* (ICHD-III) (2013) defines *Tension-Type Headache* (TTH) as a mild-to-moderate type of oppressive-constricting algia, frequently bilateral, of variable duration from a few minutes to several days, sometimes associated with photophobia or phonophobia, osmophobia. Pericranial tenderness may be present or not. It is generally not associated with gastrointestinal disorders, nor aggravated by routine physical activity. ICHD-III distinguishes an episodic form (ETTH) and a chronic form (CTTH), the second characterized by headache episodes in 15 or more days per months.

Tension-type headache is a prevalent condition in the general population (Stovner & Andree, 2010; Jensen & Stovner, 2008; Stovner, Zwart, Hagen, Terwindt, & Pascual, 2006; Stovner & Scher, 2005), it is known to produce a substantial impact on patient, in terms of ictal symptoms, mainly pain, and interictal elements such as anxiety, mood disorders, affective distress and avoidance behavior. Functional ability and productivity may be reduced, quality of life may be impaired.

As a consequence of its high prevalence, individual burden and direct and indirect financial costs, headache represents a concrete public-health priority (Steiner et al. 2014; Vos et al., 2012; Beghi et al., 2010; Lenaerts, 2006; Linde et al., 2012; Stovner et al., 2007; Holroyd et al., 2000). For example, Linde and colleagues (2012) estimated 303€ per person

per year and 3.561€ for medication overuse headache. Psychological costs are important and considerable: psychological comorbidity is common, with related stress consequences such as sleep problems, anxiety and depression (Goulart e al., 2014).

Headache-related disability can usually be reduced firstly identifying and then avoiding triggers. Then, pharmacological and non-pharmacologic treatments are administered. Among non-pharmacological, often studies describes protocols using for example relaxation training (RT), stress management techniques, biofeedback training (BFT) often electromyographic (EMG), acupuncture or physical therapies (Barbanti, Egeo, Aurilia, & Fofi, 2014; Bendtsen & Jensen, 2011; Mathew & Mathew, 2011; Bendtsen & Jensen, 2009; Fumal & Schoenen, 2008; Jensen & Rasmussen, 2004; Penzien, Rains, Lipchik, & Creer, 2004). Among these, RT, BFT, stress management, can be associated as tools of the behavioral cognitive therapy (CBT).

According to current indications, being a multi-factorial disorder, TTH management seems to reach benefits adopting a multidisciplinary and integrative approach. Andrasik and colleagues (2005) underline the limited classical perspective about head pain, when it is considered from a biomedical model point, where pain is viewed as a bottom-up signal. They propose a conception of pain as the result of complex interactions of biological, psychological and social aspects.

The precise and detailed mechanism is not well known yet. This point makes complex the research methodology; studies see different criteria and reviews generally show some weak points. Again, treatments composed by pharmacology and CBT tools sees many kinds of therapeutic protocols, making difficult to compare results among samples.

In this work we want to describe the current point about TTH treatments, offering a stimulus to some development about composed protocols which consider the multifactorial aspect.

MATERIALS AND METHODS

We conducted a systematic review and aimed to answer the following clinical questions: has the efficacy of CBT strategies been demonstrated for TTH in adults? Which strategies or interventions are most recommended? We searched (Figure 1): Medline, The Cochrane Library and PsycNET as databases, from 2000 to February 2019, and reference lists were checked. We conducted an advanced search using «tension-type headache», in all fields, as first search term; «cognitive-behavioral therapy», or «cognitive intervention» or «cognitive strategies», or «behavioral intervention», or «behavioral strategies» as MeSH Terms, in all fields. Then we conducted another search with «chronic headache» as first search term, and the same previous MeSH Terms and dates. Preliminary, we removed duplicates. Then we considered only English-language systematic reviews of randomized controlled trials or non-randomized controlled trials. Both systematic reviews with meta-analysis and without meta-analysis were selected. The reviews had to synthesize effects of at least one or more of the following psychological treatments: EMG biofeedback, RT, CBT, hypnosis, stress management strategies, psychological education in comparison with placebo, waiting list or no treatment, standard care, physiotherapy or other physical treatments, alternative and

complementary treatment (for example, acupuncture), and other psychological treatment (around cognitive-behavioral field). Articles were excluded if they were non-systematic reviews or clinical trials. We rejected articles specifically dealing with migraine and other primary headaches, TTH in children or adolescents, TTH research and clinical management not including cognitive-behavioral strategies. We found 26 systematic reviews that met our inclusion criteria: 12 about TTH specifically, 2 about chronic headache, 12 about primary headache in general. We also found an overview of systematic reviews with meta-analysis exploring the efficacy of psychological treatments for headaches (Huguet, McGrath, Stinson, Tougas, & Doucette, 2014) and two interesting guidelines on the treatment of TTH (Bendtsen et al., 2010; Sarchielli et al., 2012).

Primary outcome measure widely adopted was days of headache per month. It seems to be the best choice to define headache frequency, instead of counting the number of the attacks, due to problems distinguishing between separate attacks (Lee et al., 2019) and their duration.

Advancing the heterogeneity of the methodological choices, recurring secondary outcome measures were reduction in pain intensity, intake of acute medications, disability and quality of life levels (Lee et al., 2019; Raggi et al., 2018; Probyn et al. 2017; Harris et al., 2015; Huguet et al., 2014).

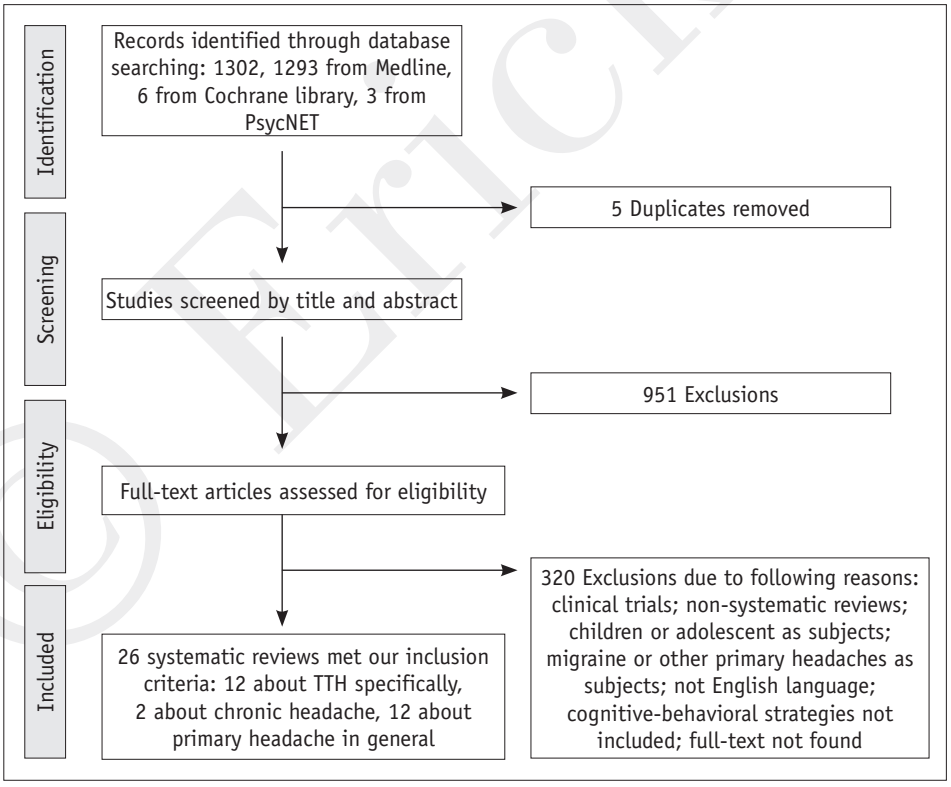

Figure 1 Selection studies process.

RESULTS

A large number of psycho-behavioral treatment strategies have been used to treat episodic or chronic TTH. Regarding number and quality of the studies, as Table 1 shows, the level of recommendation for psycho-behavioral treatments according to the European Federation of Neurological Societies (EFNS) is:

- level A for EMG biofeedback
- level C for CBT and RT.

Table 1 – Synthesis of EFNS levels of recommendation of non pharmacological treatments for tension type headache

Treatment	Level of recommendation
Psycho-behavioral treatments; EMG Biofeedback	A
Cognitive-behavioral therapy	C
Relaxation Training	C
Physical therapy	C
Acupuncture	C

These strategies are largely investigated in literature (Gu, Hou & Fang, 2018; Sun-Edelstein & Mauskop, 2012; Bendtsen & Jensen, 2011; Smitherman, Penzien, & Rains, 2007; Andrasik, 2007; Rains, Penzien, McCrory, & Gray, 2005; Nash, 2003). Demonstrated efficacy is preventive, not symptomatic. Sarchielli and colleagues (2012) offer an interesting classification just about symptomatic and preventive treatments. Specifically, their work shows criteria levels:

- level A: two or more clinically controlled, randomize, double- blind studies carried out according to good clinical practice (GCP) vs placebo or vs an active drug for which there is proven evidence of efficacy;
- level B: one clinically controlled study according to GCP or more than one controlled case–control study/ies or cohort study/ies;
- level C: favorable judgment of two-thirds of the Ad Hoc Committee, historical controls, non-randomized studies, case reports.

A second criterion is about the scientific strength of evidence:

- +++ efficacy compared with placebo or an active drug < 0.01;

• ++ $p < 0.05$ or the minimum clinically significant level (difference in the parameters < 15%;
• + no statistically significance;
• 0 no efficacious or important side effect.

Levels of recommendation:

• level I. The treatment is supported by significant data or +++ evidence, without severe adverse effects;
• level II. Statistically lower significance and ++ level, no severe adverse events;
• level III. Statistically but not clinically significant;
• level IV. Efficient treatment but severe adverse effect or without proven efficacy.

The Tables below (2a and 2b) we report from this work synthesize the main evidence of non-pharmacological treatment considered.

Table 2a – Synthesis of symptomatic non-pharmacological treatments for TTH (from Sarchielli et al., 2012)

Treatment	Level of evidence	Scientific strength of evidence	Clinical effectiveness	Adverse events	Level of recommend ation
Pain relieving maneuvres	-	-	0	-	IV

Table 2b – Synthesis of preventive non-pharmacological treatments for TTH (from Sarchielli et al., 2012)

Treatment	Level of evidence	Scientific strength of evidence	Clinical effectiveness	Adverse events	Level of recommend ation
Biofeedback	A	++	++	-	I
Cognitive-behavioral treatment	-	-	+	-	IV
Strategic short term psychothe-rapy	-	-	+	-	IV

Treatment	Level of evidence	Scientific strength of evidence	Clinical effectiveness	Adverse events	Level of recommend ation
Chiropratic, osteopathy	C	+	+	-	III
Physiotherapy	C	+	+	-	III
Acupuncture	A	++	+	Rare	II
Transcuta-neous elec-trical nerve stimulation (TENS)	-	-	?	-	IV
Physical activity	-	-	?	-	IV
Pranotherapy	-	-	?	-	IV
Orthodontic and gnatho-logical tech-niques	C	+	+	-	IV

Main evidences are about preventive effect given by non-pharmacological treatment. EMG biofeedback, one of the strongest, eases the recognition and control of muscle tension by imparting continuous feedback relative to muscle activity (Smitherman et al., 2007; Nash, 2003; Andrasik, 2007), using operant conditioning paradigm to learn the muscle condition recognition and the possibility to change the contraction amount. CBT can be applied here associating psycho-physiological condition with covert or overt environment events. This procedure can show which are the triggers for the specific subject. The role of the psychotherapist consists in stimulating triggers coping and re-association of the events linked with headache with a different response, directed toward the opposite trend of the one associated with the headache attack.

RT aids the patient to recognize and control increase of muscle tension during daily activities. RT makes use of a wide range of affective, cognitive and behavioral techniques, such as meditation and breathing exercises. There is no convincing evidence that RT is better than no treatment, waiting list or placebo (Gu et al., 2018; Huguet et al., 2014; Sun-Edelstein & Mauskop, 2012; Bendtsen et al. 2010; Verhagen, Damen, Berger, Passchier, & Koes, 2009). According to other authors (Baillie, Gabriele, & Penzien, 2014), the inclusion of aerobic exercise into behavioral headache treatments seems to be beneficial. Hypnotherapy has been reported operative in TTH, but there is no conclusive evidence for its effect (Huguet et al., 2014; Bendtsen et al., 2010).

A recent extensive and scrupulous meta-analysis including 53 studies established that BFB has a robust effect (Nestoriuc, Rief, & Martin, 2008). The combination of EMG biofeedback with RT produced an enhanced and long-lasting effect. The majority of the studies we included employed EMG biofeedback. It was not possible to draw dependable conclusions as to whether the effect differed between patients with episodic and chronic TTH (Nestoriuc et al., 2008).

About BFT, they have found no difference between these technique and CBT alone. And another evidence on the CBT side was that CBT plus antidepressant was not more significant than CBT plus placebo. These data suggest some contribution from CBT approach, but confirming some weak points found during the review selection process. On the same direction, a very recent systematic review with meta-analysis summarizes that psychological treatments for headache disorder significantly reduce the attacks frequency, and the suffering from headache (Lee et al., 2019). The authors comment some studies where psychological therapy (CBT or BFT with RT) showed comparable effect to pharmacotherapy (amytriptiline or propranolol). Furthermore, the combination of both was found to be more effective than one of them alone.

Among CBT strategies, considerable part is the patient education to identify thoughts and beliefs that might generate stress and then intensify headache. These thoughts are challenged, and alternative adaptive thoughts are elaborated. Andrasik and colleagues (2005) give an interesting contribution about the cognitive aspect, specifying functions as attention, coping strategies, beliefs, expectations, self-efficacy and pain remembering. CBT may be useful not only stimulating thoughts changing, for example avoiding catastrophe style, but also the underlying beliefs about pain. CBT may work on attention skill, developing the possibility to cope with pain observing it neutrally or directing the focus on other stimuli. Self-efficacy can influence pain and then headache episode: patient can be skilled to have methods for episode managing; this better ownership influence pain perception. CBT available evidences are not conclusive (Huguet et al., 2014; Sun-Edelstein & Mauskop, 2012; Bendtsen et al., 2010). We are here seeing that it can be useful in many steps of the treatment, from identifying triggers to cope with them. Mental stress is one of the most commonly reported condition working as trigger factor of TTH (Sun-Edelstein & Mauskop, 2012; Bendtsen & Jensen, 2011; Bendtsen et al., 2010). Also, CBT can facilitate behaviors, protecting from the headache attack and possible psychological comorbidity. Among them, sleep, anxiety (National Institute and Health Care Excellence, 2013) also between episodes or depression (World Health Organization, 2012).

A recent review found that behavioral approaches in general produce a significant improvement in some patient-reported outcomes that are generally considered, in headache research field, as relevant secondary endpoints: disability, quality of life level, depression, anxiety and self-efficacy scores, as well as intake of acute medications (Raggi et al., 2018).

Quite recently, some authors found that self-management interventions for TTH (including CBT, RT and mindfulness-based techniques) may be more effective than usual care (symptomatic drugs) in reducing pain intensity, mood and headache-related disability, but are ineffective toward headache frequency. They also suggest that delivery these strategies in group might increase efficacy (Probyn et al., 2017).

DISCUSSION

The evidences described confirm that psychological approach to headache is useful, particularly CBT pool of techniques (Lee et al., 2019; Gu et al., 2018; Raggi et al., 2018; Huguet et al., 2014; Sun-Edelstein & Mauskop, 2012; Bendtsen & Jensen, 2011; Bendtsen et al., 2010; Smitherman et al., 2007; Andrasik, 2007; Rains, Penzien, McCrory, & Gray, 2005; Nash, 2003).

Behavioral strategies seem to produce measurable effects on headache frequency when used as preventive treatment, in a way that psychological approach to headache is to be considered eligible as pharmacology. In detail, one of the most represented efficacy about techniques is EMG biofeedback (Huguet et al., 2014; Bendtsen et al., 2010; Sun-Edelstein & Mauskop, 2012; Bendtsen & Jensen, 2011; Nestoriuc et al., 2008; Smitherman et al., 2007; Andrasik, 2007; Rains et al., 2005; Nash, 2003). RT and CBT may have an effect in TTH but, at present, there is no definitive evidence about it (Gu et al., 2018; Huguet et al., 2014; Sarchielli et al., 2012; Sun-Edelstein & Mauskop, 2012; Bendtsen & Jensen, 2011; Bendtsen et al., 2010; Smitherman et al., 2007; Andrasik, 2007; Rains et al., 2005; Nash, 2003).

Other authors are more cautious in their conclusions about every cognitive-behavioral strategy investigated, including EMG biofeedback: methodological inappropriateness and lack of statistical power in the evidence base impedes to draw meaningful conclusions (Harris et al., 2015). The lack of standardized treatment protocols in psychological treatment represents a real challenge for demonstrating the effectiveness of these interventions (Lee et al., 2019). This concept is well represented by guidelines: the only non-pharmacological treatment recommended by National Institute and Health Care Excellence (NICE) (2013) guidelines for TTH is acupuncture. These guidelines mention that «In the absence of good evidence on the effectiveness of psychological therapies, it is difficult to judge whether their costs would be offset by their effectiveness at reducing headache frequency». NICE used strict criteria. They include studies comparing psychological treatment with active controls, and with sample size more than 25 subjects. It results on only five studies included.

Web-based cognitive behavioral interventions for chronic pain are characterized, compared with pharmacological treatments, by lower costs and inferior risk of adverse effects, but additional studies are still necessary to validate their concrete benefit in headache field (Macea, Gajos, Daglia Calil, & Fregni, 2010).

We agree with other author conclusions (Lee et al., 2019) thinking that psychological treatment need more methodological quality to produce stronger results. According to us, one of the weak points is the heterogeneity of the protocols, also into one approach as CBT. This is composed by many techniques and it should be to concretely define the treatment protocol used in one specific research. For example, BFT is sometimes compared to CBT, where it could be considered as a method part of a CBT treatment. Another point observed, most of the included studies had a treatment duration of 1–2 months, but a long-lasting treatment efficacy might be hypothesized. Again, the heterogeneity found on the panorama literature may be the consequence of an actual no complete understanding

of headache mechanism. Therefore, until scientific evidence will be provided, a precise assessment considering the bio-psycho-social model is recommended: the points involved specifically in the subject headache problem should be observed and measured; then the complex treatment protocol could be administered. Guided by this paradigm, the team of specialist useful for TTH patient is potentially composed by neurologist, physical therapist, psychologist and others (Huguet et al., 2014; Bendtsen et al., 2010; Sun-Edelstein & Mauskop, 2012; Bendtsen & Jensen, 2011; Gaul et al., 2011; Smitherman et al., 2007; Andrasik, 2007; Rains et al., 2005; Nash, 2003).

From data analyzed, we deduce that the efficacy of treatment can be increased through combination of behavioral therapies with prophylactic medication, taking advantage of a synergistic effect. Multidisciplinary headache treatment can decrease headache frequency and burden of disease, along with the risk for medication overuse headache (Raggi et al., 2018; Huguet et al., 2014; Bendtsen et al., 2010; Sun-Edelstein & Mauskop, 2012; Bendtsen & Jensen, 2011; Verhagen et al., 2009; Smitherman et al., 2007; Andrasik, 2007; Rains et al., 2005; Nash, 2003). Behavioral strategies, mostly exempt from adverse side effects, should be taken into account as a first-line option in some specific situations, for example women who are pregnant or nursing, patients with other chronic conditions requiring many pharmacological treatments, and pediatric patients (Lee et al., 2019; Raggi et al., 2018).

Finally, even if cognitive-behavioral intervention and related strategies have gained a considerable position in the management of patients with ETTH and CTTH (Gaul et al., 2011; Krishnan & Silver, 2009; Lake, 2001), as well as psychologists are considered significant members of multidisciplinary teams, future studies with rigorous method, standardized protocols, adequate statistical power, employment of standardized outcome measure with long-term follow-up and other strategies to reduce bias are needed (Lee et al., 2019; Harris et al., 2015). An adequate number of well-designed RCTs, using more standardized outcome measures, would promote the effective assessment of specific psychological treatment for specific type of headache, producing more specified and tailored recommendations.

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