

Review Article

Paediatric Headache: A New Perspective on Treatment

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Germany**Received:** August 19, 2015; **Accepted:** October 10,
2015; **Published:** October 15, 2015**Abstract**

Headache is a widespread pain problem in children and adolescents in a large number of countries. Data on its prevalence and its association with other pain problems and somatic and psychological symptoms is presented. The paper focuses on treatments for headache outside the standard medical canon, which are grounded in the biopsychosocial model of pain. The main interventions evaluated in this field are relaxation training, biofeedback and cognitive behavioural therapy. A currently expanding area of research on Internet-based self-management programs is described. There is evidence of high improvement rates due to psychological treatments and their sustainability. The status of evidence is reviewed and perspectives in this field are discussed.

Introduction**The epidemiology of headache and its psychosocial associations**

The epidemiology of paediatric pain and headache is described in numerous articles of international origin [1-4]. Thus, the conclusion can be drawn that recurrent headache is – except for children below 10 – the most prevalent pain in both girls and boys up to early adulthood. Also, most studies show that girls are more frequently affected by headache than are boys from about the age of 11 years on. It has often been assumed that the first menarche is associated with this phenomenon, but evidence is scarce [5]. Probably, a large number of psychosocial and biological factors interact regarding this difference between sexes.

Though data on prevalence may vary significantly between studies depending mainly on methodological reasons, one can rely on the fact that tension type headache is the most prevalent headache [6]. In a German sample of more than 5000 9–14 year old youths diagnosed according to the ICHD II (2004; computerized evaluation), Heinrich et al. found a percentage of 17.6 being affected by tension type headache and 8.9% by migraine. The percentage of non-classified children was 35.4%, which describes the variability of headache syndromes in youth. Migraine is by far the type of primary headache, which is most debilitating and annoying.

Though headache and also migraine and tension type headache are often viewed as specific pathophysiological entities, separating them from other pains, evidence has accumulated that considers a large number of children and adolescents to be affected by multiple pains [1,7,8]. Thus, about 38% of the sample reported recurrent pain in more than three sites. Accordingly, there is evidence of a general vulnerability to pain problems beside some possible differences in the specific pathophysiology.

There is a long history of research on the association of headache with the psychological features of an individual [9], and evidence has accumulated in favour of this assumption [10,11]. In general, a higher level of so-called internalizing symptoms (anxiety and depressive symptoms) has been found in headache-affected youth [12], and a higher level of externalizing symptoms (aggressiveness, hyperactivity, attention disorder symptoms) has also been found [13]. Only a few

studies examined the differences between types of headache and their linkage to psychological traits [14,15]. In a recent German study, it was shown that there is a consistent and rather distinct association between headache and psychological symptoms of negative affectivity [13]. This association exists in both types of headache but is clearly stronger in migraine than in tension type headache. Significant associations were also found with the traits somatosensory amplification (a tendency to attend to and emphasize physical sensations) and anxiety sensitivity (indicating a disposition to feel threatened by physical symptoms of arousal and anxiety) characterizing the bonds between emotion and pain. This evidence does not of course signify that each girl or boy being affected by headache has a severe psychopathological problem but that he or she has a stronger disposition to negative affectivity as well as a stronger disposition to perceptual and emotional sensitivity to pain in comparison to children without headache or other pains. This evidence fits well with the theory brought forward by Kato et al. [16], which they named the “common path model”. Their empirical findings suggest that two paths lead to the development of pain, explicitly including headache disorders: one characterized by sensory dysfunctions like hypersensitivity of the central stimuli processing system and a second path characterized by dysfunctional affective processing. In our study, cognitive-emotional trait variables explained about 24% of the variance in migraine incidence, compared to much lower rates related to socio-environmental factors (12%) and dysfunctional behaviours (7.4%). The strongest and most congruent risk factors in the socio-environmental domain were school and familial stress. In conclusion, the cognitive-emotional traits and especially internalizing symptoms were more strongly linked to headache, especially migraine, than were all other psychosocial or behavioural features.

There is also clinical research, which substantiates a relationship between headache and psychological disorders (anxiety, depression; [9,17]) though this is not to be interpreted as psychopathology in all or nearly all children with headache. These findings give reason for a careful psychological assessment of children who are in need of pain treatment. Using PedMIDAS [18], it was found that 4% in a population sample of children with headache showed moderate to high disability (activity interference), suggesting an indication for treatment.

Based on the above consideration, psychological assessment (once secondary headache is excluded) should include emotional and functional disability (e.g. the psychometric assessment of depressive symptoms, and disability by PedMIDAS, the Pediatric Pain Disability Index (P-PDI; [19]) or the Bath Adolescent Pain Questionnaire (BAPQ; [20]).

In recent years, parameters of cognitive emotional processing of pain, especially catastrophizing pain, have become a main topic of interest regarding their influence on pain coping and pain experience in adults and children [21]. A catastrophizing way of evaluating pain (i.e. magnifying its sensory and emotional impact, feeling helpless and ruminating about the negative consequences of pain) has shown to be a trait variable, which coincides with a higher intensity of pain and a higher level of disability [22]. If there are definite signs of the cognitive-emotional impact of pain in a child or vice versa, psychological treatment should be considered.

Paediatric headache treatment

The introduced biopsychosocial perspective inspired the development of psychological treatments in children and adolescents and is also related to parents' reluctance to consent to pharmacological treatment of their children.

The German Migraine and Headache Society explicitly recommend psychological interventions for recurrent headaches that are described in this section. Three different treatment methods have been subjected to rigorous empirical testing: relaxation training (RT), biofeedback and cognitive-behavioural therapy (CBT).

A new treatment approach in adult psychotherapy of pain, namely acceptance and commitment therapy (ACT), also promises favourable results in the treatment of paediatric headache, as the first study by Wicksell et al. [23] demonstrated. ACT, as an extension of traditional CBT, focuses on improving the functionality and quality of life by increasing the patient's ability to act effectively in concordance with personal values in the presence of pain and distress.

Hypothetical mechanisms of action and the objectives of each type of treatment will be described briefly before examining the state of evidence.

Relaxation training

Progressive relaxation training as one of the first psychological interventions examining paediatric headache concentrates on tensing and subsequently relaxing the muscles of the extremities, the head, shoulder and back, in a step-by-step manner. After prolonged training, a generalized relaxation response can be immediately self-induced and realized in nearly every situation. The objectives for the use of relaxation are the improvement of body awareness, a reduction of the general level of arousal, the ability to relax specific tense muscles, which may trigger or reinforce pain, and the prevention as well as the alleviation of the general stress response contributing to headache. Furthermore, RT is assumed to establish the cognition of "self-efficacy" – a belief in one's control or influence over mental and bodily functions. Self-efficacy is one of the most important mechanisms of change in psychotherapy.

Biofeedback treatment

Biofeedback treatment is based on the technical assessment

of physiological functions (e.g. the tension level of the frontalis muscle). Biological signals are transformed into perceptible signals, such as acoustic or visual stimuli, and immediately fed back to the patient. Thus, the patients are able to "hear" or "see" the actual "body state". They are instructed to modify the physiological function in a direction that is assumed to prevent or alleviate pain (e.g. to relax the frontalis muscle in headache). The immediate feedback is expected to start a learning process. Self-control trials are always included in the training procedure to make the patient independent of the feedback in the long run. If feedback is based on muscle tension or peripheral skin temperature (usually measured at a finger), the objective is to induce a state of "relaxation". Thermal biofeedback is conducted with the directive to increase temperature at the periphery and is often applied with concomitant relaxation self-instructions. Skin conductance measures (low conductance signalling relaxation) and EEG parameters (e.g. α -feedback) are rarely used in biofeedback treatment of headache. Vasomotor feedback (assessment of the blood volume of the arteria temporalis indicating dilatation or constriction of the vessel) is targeted at the reduction of migraine episodes. The rationale behind this procedure is that the control of central vasomotor responses, which are monitored by feedback, can lead to a prevention of episodes of migraine. The main physiological function considered for self-control in TTH is, of course, muscle tension (face, neck and shoulders), which also has been used in migraine.

Cognitive-behavioural therapy

Cognitive-behavioural therapy (CBT) is a multimodal intervention that typically comprises RT; improvement of self-monitoring of headache and potential triggers (by keeping a diary); restructuring of dysfunctional cognitions and attitudes (e.g. decreasing catastrophizing); improvement of coping with pain, in particular by the strengthening of self-efficacy beliefs thus diverting attention from pain, and the enhancement of self-confidence as well as problem solving (stress management). Furthermore, the maintenance of activities in spite of pain (except in episodes of migraine) is advanced, especially if avoidance is a central feature of pain behaviour. Some treatment programs also involve parents, who are educated to improve their coping with their children's pain and to not reinforce pain behaviour. RT and CBT are often administered in a group setting.

Some studies on CBT transformed into self-management programs and presented by electronic media (typically internet) have been conducted in recent years [24].

State of the evidence: psychological treatment of headache

In 2006, Trautmann et al. [25] published a meta-analysis on psychological treatments of recurrent headache that was based only on 23 RCTs. Intragroup effect size differed between the treatment and waiting list conditions, clearly favouring the treatment groups. The inter-group effect sizes – indicating efficacy of the active treatment – were low (<0.50) regarding headache variables (intensity, duration and frequency) and medication but high (>0.80) regarding the number of responders (decrease of headache $\geq 50\%$). A responder rate of 70% was found in the treatment conditions, and only 30% improved in the control groups. This meta-analysis indicated an improvement of outcomes at follow-up (pre-follow-up effect size: 1.0). Differences

between treatments of different headache types could not be analysed due to the small number of studies.

The most recent meta-analysis on paediatric pain [26] included 25 RCTs. A total of 20 studies focused on headache treatment, and the rest dealt with other pain problems. The general conclusions of the authors were based on findings from all of the included studies. The most impressive result revealed that treated children have a six-fold higher chance (odds ratio [OR] = 5.9) of clinical improvement ($\geq 50\%$ headache reduction) directly after therapy than non treated children have and that the OR at follow-up is even higher (OR=9.88). The “number needed-to-treat” (NNT=2.64) signifies that less than three children have to be treated to achieve one “success”, which is a very good outcome. However, Palermo et al. [26] only found six studies assessing disability and emotional functioning associated with headache. The analysis revealed no significant effect of treatment on these outcome variables, which was quite unexpected.

Four studies so far have been conducted on self-management programs based on electronic media targeted mainly at headache.

Overall results are positive. One study showed a significant reduction of intensity, frequency and duration of headache at post-treatment, compared to a waiting list control group [27]. Hicks et al. [28] found a reduction of abdominal pain and headache with a responder rate of more than 70% compared to 15% in the control group and a three month maintenance of the improvement. In the study of Palermo et al. [29] an improvement of pain intensity and a reduction of disability was reached and maintained at a three-month follow-up. A responder rate of 63%–55% was found in a three armed study design with CBT, relaxation training and pain education at three months follow-up without any significant differences between the conditions, whereas a significantly greater improvement was observed at post treatment, favouring CBT [30].

The low number of n and the high dropout rate in some studies still limit the evaluation of significance of these results regarding the general efficacy and cost effectiveness of this type of intervention.

Conclusions and Perspectives

An abundance of studies supported an association of paediatric pain, including headache, with psychological traits, especially negative affectivity indicated by internalizing and also externalizing symptoms. Although a slightly higher prevalence of mental disorders in children with recurrent pain has been found severe psychopathology is rare. Headache is also associated with psychosocial stressors like a negative family climate or school stress. The cognitive emotional processing of pain, such as catastrophizing, influences pain experience and also disability. Also, traits, such as anxiety sensitivity or somatosensory amplification, moderate a child's competence to cope with pain. Thus, in a clinical context with children seeking help for their pain, psychological assessment should be implemented and psychological treatment should be considered if a child is emotionally or functionally debilitated by pain and there is a distinct interference with social activities in terms of school, family or peers.

Psychological treatments have shown their efficacy in reducing headache both in the short and long run. Although there are no studies with a follow-up of several years, it may be assumed that early

psychological treatment can be seen as a preventive action. These types of treatment may also strengthen self-efficacy beliefs regarding health that an individual can profit from in further life.

However, some limitations have to be noted. The mechanisms of treatment are not yet uncovered as no real differences are revealed among different treatments. The specific indication of treatments, such as BFB, RT or CBT, is not known. A large disadvantage is that these treatments are not available for the majority of children but are limited to specific treatment centres. Also, in public opinion, medical discipline is valued much more than a psychological approach to somatic pain disorder. This seems to be especially the case in adolescents. Only very few youths aged 15–19 years and older have enrolled in treatment studies so far. Whether self-management treatments presented by the Internet are a way out of this dilemma is not yet proven.

The author invests some hope in the further development of Internet based self-management programs, which have to be made much more attractive technically and must increasingly refine their motivational power. In consequence, more effort should be invested to improve these treatment alternatives and to expand this research area.

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