AN INDIVIDUALLY TAILORED BEHAVIOURAL MEDICINE TREATMENT IN PHYSIOTHERAPY FOR TENSION-TYPE HEADACHE

A single-case study of three patients

HELENA LAGERLÖF
SAMMANFATTNING

Bakgrund och syfte: Huvudvärk av spänningstyp (HST) är vanligt förekommande. Det finns oklarheter avseende både dess patofysiologi och olika behandlingars effekt. Syftet med denna studie var att beskriva och utvärdera effekten av en individuellt anpassad beteendemedicinsk behandling i fysioterapi för patienter med HST.

Metod: En single-case studie med A1-A2-B-A3-design av tre patienter med HST genomfördes. Utfallsvariabler var huvudvärksfrekvens (antal dagar med huvudvärk), huvudvärksindex (medelintensitet), konsumtion av smärtlindrande medicin, tro på sin förmåga avseende kontroll av huvudvärken, samt upplevd påverkan av huvudvärken på funktion i vardagsaktiviteter och på glädje i aktiviteter med familj och vänner.

Resultat: Tro på sin förmåga avseende kontroll av huvudvärken ökade markant för 2 av 3 patienter. Huvudvärksfrekvens och huvudvärksindex minskade markant för en av patienterna. En av patienterna svarade först inte alls på behandlingen, men blev mycket bättre inför den sista uppföljningen avseende huvudvärksindex och funktion och glädje i aktiviteter.

Diskussion och konklusion: Ett beteendemedicinskt förhållningssätt i behandling som grundar sig på funktionell beteendeanalys kan vara ett sätt att som fysioterapeut hantera patienter med HST. HST är en vid diagnosgrupp och det verkar då logiskt att behandlingen bör anpassas individuellt för att få bästa effekt.

Nyckelord: Huvudvärk av spänningstyp, Primärvård, Self-efficacy, Fysioterapi, Beteendemedicin.
ABSTRACT

Background and aim: Tension-type headache (TTH) is common. There are uncertainties regarding both the pathophysiology and the effect of treatments. The aim of this study was to describe and evaluate the effect of an individually tailored behavioural medicine treatment in physiotherapy, based on a functional behavioural analysis.

Method: A single-case study with A1-A2-B-A3-design of three patients with TTH was performed. Outcome variables were headache frequency (days with headache), headache index (mean intensity), consumption of analgesics, headache management self-efficacy (HMSE), disability and feelings of loss of happiness in activities with family and friends.

Results: HMSE increased markedly for 2 of 3 patients. Headache frequency and headache index decreased for one of the patients. One of the tree patients did not first respond to treatment but was much better before the last follow-up regarding headache index, disability and loss of happiness.

Discussion and conclusion: A behavioural medicine treatment in physiotherapy based on a functional behavioural analysis can be a way for physiotherapists to handle patients with TTH. Since the diagnosis TTH is heterogenic it seems logical that the treatment should be individually tailored.

Keywords: Tension-type headache, Primary health care, Self efficacy, Physical therapy modalities, Behavioural medicine.
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>1.1 Epidemiology</td>
<td>1</td>
</tr>
<tr>
<td>1.2 Classification</td>
<td>1</td>
</tr>
<tr>
<td>1.3 Pathophysiology</td>
<td>2</td>
</tr>
<tr>
<td>1.4 Treatments for tension-type headache</td>
<td>3</td>
</tr>
<tr>
<td>1.5 Behavioural medicine in physiotherapy</td>
<td>3</td>
</tr>
<tr>
<td>1.6 The rationale of this study</td>
<td>4</td>
</tr>
<tr>
<td>2 AIM</td>
<td>5</td>
</tr>
<tr>
<td>3 METHOD</td>
<td>5</td>
</tr>
<tr>
<td>3.1 Design and content of the phases</td>
<td>5</td>
</tr>
<tr>
<td>3.2 Patients and setting</td>
<td>5</td>
</tr>
<tr>
<td>3.3 Behavioural medicine intervention in physiotherapy for TTH</td>
<td>6</td>
</tr>
<tr>
<td>3.4 Data collection</td>
<td>7</td>
</tr>
<tr>
<td>3.5 Data analyses</td>
<td>8</td>
</tr>
<tr>
<td>3.6 Ethical consideration</td>
<td>8</td>
</tr>
<tr>
<td>4 RESULTS</td>
<td>9</td>
</tr>
<tr>
<td>4.1 Patient 1</td>
<td>9</td>
</tr>
<tr>
<td>4.1.1 Functional behavioural analysis</td>
<td>9</td>
</tr>
<tr>
<td>4.1.2 Individually tailored treatment</td>
<td>10</td>
</tr>
<tr>
<td>4.1.3 Outcome</td>
<td>10</td>
</tr>
<tr>
<td>4.2 Patient 2</td>
<td>13</td>
</tr>
<tr>
<td>4.2.1 Functional behavioural analysis</td>
<td>13</td>
</tr>
<tr>
<td>4.2.2 Individually tailored treatment</td>
<td>14</td>
</tr>
<tr>
<td>4.2.3 Outcome</td>
<td>14</td>
</tr>
<tr>
<td>4.3 Patient 3</td>
<td>17</td>
</tr>
<tr>
<td>4.3.1 Functional behavioural analysis</td>
<td>17</td>
</tr>
<tr>
<td>4.3.2 Individually tailored treatment</td>
<td>18</td>
</tr>
</tbody>
</table>
4.3.3 Outcome ...........................................................................................................18

5 DISCUSSION ...........................................................................................................21
  5.1 Results ...............................................................................................................21
  5.2 Methodological considerations ........................................................................24

6 CONCLUSIONS ......................................................................................................26

7 REFERENCES .........................................................................................................26

SUPPLEMENT A: DIAGNOSTIC HEADACHE DIARY (IN SWEDISH)
SUPPLEMENT B: HEADACHE DIARY (IN SWEDISH)
SUPPLEMENT C: ACTIVITY DIARY (IN SWEDISH)
SUPPLEMENT D: HEADACHE MANAGEMENT SELF-EFFICACY SCALE (IN SWEDISH)
INTRODUCTION

1.1 Epidemiology

Headache disorders are common and one of the most frequent diagnoses is tension-type headache (TTH) (R. Jensen & Symon, 2006). The prevalence varies widely between different studies, mostly due to methodological differences since the classification of TTH has been modified (International Headache Society [IHS], 1988, 2004). In a recent study (Schwaiger et al., 2009) of Italian men and women aged 55-94 years the one-year-prevalence was 36% for all sorts of headaches, 16% for frequent TTH and 2% for chronic TTH. In earlier extensive studies (Lyngberg, Rasmussen, Jorgensen, & Jensen, 2005; Rasmussen, Jensen, Schroll, & Olesen, 1991) of Danish adults the prevalence of frequent TTH was 29% in 1989 and 37% in 2001 in the same population. Chronic TTH increased from 2 to 5% during the same period of time in the same population.

1.2 Classification

According to the second edition of International Classification of Headache Disorders (ICHD-2) (and also the beta version of ICHD-3 that was published after the onset of this study) TTH has to meet two of the following four criteria: Headache with a) a bilateral localization, b) by pressing or tightening quality, c) of mild to moderate intensity, d) which is not aggravated by routine physical activity such as walking and climbing stairs (IHS, 2004, 2013). It is required that the person has had at least 10 episodes for at least 30 minutes. There are three subcategories depending on the frequency. Episodic infrequent TTH is apparent for less than 12 days a year whereas episodic frequent TTH is apparent more often. Chronic TTH occurs at least 15 days per month. Episodic TTH should not be associated with nausea or vomiting, nor in combination with more than one of photophobia (light sensitivity) or phonophobia (sound sensitivity). In chronic TTH one of the symptoms of photophobia, phonophobia or mild nausea may occur.

Differential diagnoses to consider are migraine, secondary headache forms and new daily persistent headache (NDPH). If the headache meets the criteria for TTH, but was presented for the first time in close connection with an incident such as a whiplash injury, the headache should be categorized as secondary TTH. NDPH is a primary headache diagnosis that could be very much alike TTH, with the exception that it is daily from the onset. A person can meet the criteria of multiple forms of headache, and for example have both diagnoses TTH and migraine (IHS, 2004).
1.3 Pathophysiology

The term "tension-type headache" was first introduced in 1988 by IHS and then replaced several earlier terms such as "muscle contraction headache", "tension headache" and "stress headache". These former terms indicated a pathophysiological explanation for the headache that had not been possible to confirm in studies. Despite extensive research since 1988, the causal relationships between TTH and muscle tension is still vague and the term TTH is still being used (Silberstein et al., 2005).

Psychological stress is the most common trigger for TTH (P. R. Martin, Milech, & Nathan, 1993; Nash & Thebarge, 2006). Nash and Thebarge (2006) concluded that psychological stress and headache are interrelated in a multifaceted way, physiologically as well as psychosocially. The relationship is mutual, since stress might predispose, trigger and exacerbate headache but headache might as well aggravate stress. However, the earlier hypothesis that stress causes increased muscular tension which causes headache has not been confirmed in studies (Bendtsen & Fernandez-de-la-Penas, 2011). Numerous studies (R. Jensen, Rasmussen, Pedersen, & Olesen, 1993; Lipchik, Holroyd, Talbot, & Greer, 1997; Metsahonkala et al., 2006) have shown that people with TTH, both children and adults, have an increased tenderness to palpation in pericranial muscles, but in terms of muscle activity and electromyography (EMG), the results are conflicting (Wittrock, 1997). A theory that has been investigated in recent years is that TTH might be referred pain from trigger points in head and neck muscles (Bendtsen & Fernandez-de-la-Penas, 2011; Fernandez-de-Las-Penas, Alonso-Blanco, Cuadrado, & Pareja, 2006; Fernandez-de-Las-Penas, Cuadrado, & Pareja, 2007). Joint dysfunctions in neck and jaw have been proposed as possible factors leading to trigger points (Graff-Radford & Newman, 2002). Persons with TTH tend to have a more forward head posture and restricted neck range of motion in comparison with controls, but the causal relationships are still unclear (Fernandez-de-Las-Penas et al., 2007). Most researchers seem to agree that the cause of TTH is multifactorial with both peripheral and central mechanisms involved and that central sensitization is of importance particularly when TTH evolves from episodic to chronic (IHS, 1988).

A contributing factor to the difficulty in understanding the pathophysiology and establishing effective treatments might be that TTH is not a homogenous disorder (Fernandez-de-las-Penas et al., 2011; Sjaastad, 2011). Fernández-de-las-Peñas (2011) tried to identify prognostic factors in the history and physical examination among women that were likely to benefit from multimodal physiotherapy sessions including manual therapies to joints and muscles, indicating that TTH should be divided into sub-groups and the treatments should not be the same for all patients. Sjaastad (2011) described patients with remarkably different history, from psychological problems to low grade intoxication and concluded that all of them could have had the diagnosis TTH based on questionnaires frequently used in studies, but they would most likely not benefit from the same treatments.
1.4 Treatments for tension-type headache

Persons with TTH seeking public health care for their pain is a relatively small group compared to for example those with migraine. Many people treat their headaches with over the counter drugs for symptom relief (Rasmussen, Jensen, & Olesen, 1992). Antidepressants, like Amitriptyline, have been used for prophylactic treatment of frequent and chronic TTH. These drugs have demonstrated significant efficacy over placebo in several studies (Gobel et al., 1994; Lampl, Marecek, May, & Bendtsen, 2006), but the clinical relevance has been questioned since the improvement is often limited (Fumal & Schoenen, 2008), and a recent systematic review (Verhagen, Damen, Berger, Passchier, & Koes, 2010) showed no evidence or conflicting evidence for the effectiveness of prophylactic drugs on chronic TTH. (Gobel et al., 1994; Lampl et al., 2006).

Conservative treatments used and evaluated in controlled studies include acupuncture, physical exercise, relaxation, and cognitive/behavioural treatments. In a systematic literature review (Linde et al., 2009) it was concluded that acupuncture could be a valuable tool in the treatment of frequent and chronic TTH. Physical exercise, relaxation and acupuncture were compared in a randomized controlled study of chronic TTH sufferers´ well-being. There were some significant differences in favour of relaxation and physical exercise (Soderberg, Carlsson, Stener-Victorin, & Dahlof, 2011). A craniocervical training program combined with physiotherapy, mostly consisting of massage and postural correction, had better effect than physiotherapy alone for TTH in one study (van Ettekoven & Lucas, 2006). Relaxation has in a previous meta-analysis demonstrated efficacy (Bogaards & ter Kuile, 1994). However, in a recent literature review (Verhagen, Damen, Berger, Passchier, & Koes, 2009) the conclusion was drawn that there is no evidence that relaxation, biofeedback or cognitive/behavioural therapy is better than no treatment, waiting list or placebo. Apparently there is no consensus about the optimal treatment for TTH.

1.5 Behavioural medicine in physiotherapy

Behavioural medicine in physiotherapy is anchored in the biopsychosocial perspective (Elven, Hochwalder, Dean, & Soderlund, 2014), which has become widely accepted for explaining illness and pain. This perspective emphasizes a distinction between nociception and pain, with nociception being a biological event, whereas pain is a subjective perception that can only be understood if the interrelationships between biological changes, psychological status, and the sociocultural context are considered (Gatchel, Peng, Peters, Fuchs, & Turk, 2007). Behavioural medicine is a broad area applied by different professions in different disciplines (McKegney & Schwartz, 1986).

Behavioural medicine in physiotherapy considers medical, physical, cognitive, and social environmental factors in analysis and treatment of pain-related disability (Soderlund, 2011). The behavioural medicine treatment in physiotherapy is individually tailored and based on functional behavioural analysis (FBA) (Asenlof, Denison, & Lindberg, 2005a). The FBA has the purpose of exploring and defining the variables that have an impact on a person’s problem behaviours contributing to disability. With this analysis as a base the individual’s
skills that need improvement can be determined, whether these are physical skills, cognitive or social skills (Haynes & O’Brien, 1990). Behavioural medicine in physiotherapy rests on several theoretical models.

The FBA is highly based on the ideas of operant conditioning, described by Skinner (1988), explaining how a behaviour is controlled by the consequences that the individual experience from the behaviour. A behaviour that is followed by something that the person perceives as positive will probably be repeated, whereas behaviours followed by something negative are not as likely to be repeated. There are also behaviours that are learned through respondent conditioning. These behaviours are automatic reactions, usually physiological or emotional, elicited by a conditioned stimulus. The respondent conditioning occurs when a neutral stimulus becomes conditioned because it is associated with an unconditioned stimulus that would automatically elicit an unconditioned response (Linton, Melin, & Gotestam, 1984).

An important theory for behavioural medicine in physiotherapy is also the social cognitive theory (SCT), described by Bandura (1986). SCT describes an interdependence between the individual, the behaviour and the environment. Any of these three factors could be the target of change, in order to reach a specific goal. Self-efficacy is a central concept in SCT, referring to the strength of one’s belief in ability to complete tasks with a specific behaviour in order to achieve specific goals (Bandura, 1997). Self-management refers to how a person deals with the diversity of tasks related to their condition, such as taking medication or maintaining or creating new meaningful behaviours or life roles. Self-management is accordingly dependent on the person’s self-efficacy for these tasks (Lorig & Holman, 2003).

Another theory that has influenced behavioural medicine in physiotherapy is the transactional theory of stress and coping, described by Lazarus (1993). This theory describes how the response to a perceived threat, a stressor, is individual. The response, called coping, is dependent on an individual’s evaluation of the stressor and the perceived possibilities of handling with the stressor (Lazarus, 1993).

The biopsychosocial perspective requires evaluation of pain from a wider perspective. The individual’s response to pain and the individual’s perception of impact from pain on one’s life becomes central. Multidimensional pain inventory (MPI) is one example where the physical, social and psychological impact of pain on one’s everyday life is rated (Kerns, Turk, & Rudy, 1985).

1.6 The rationale of this study

There is a high prevalence of TTH in the adult population. Also, according to empirical experience it is common for a physiotherapist in primary health care to meet patients with TTH. Different treatments including over the counter drugs, antidepressants, physiotherapy and cognitive behavioural therapy have been tried without a consensus of optimal treatment. An individually tailored behavioural medicine treatment in physiotherapy, that target both physical and psychosocial impairments, would seem appropriate due to the complex nature and heterogeneity of TTH.
2 AIM

The aim of this study was with an experimental single-case design, to describe and evaluate the effect of an individually tailored behavioural medicine treatment in physiotherapy for patients with tension-type headache.

Research questions:

What effect does an individually tailored behavioural medicine treatment in physiotherapy have on a TTH patient’s

a) headache frequency (days with headache per week)?
b) headache index (mean of headache intensity scores on NRS 0-10 over a week)?
c) behaviour of consumption of analgesics?
d) disability?
e) feelings of loss of happiness?
f) self-efficacy for headache management?

3 METHOD

3.1 Design and content of the phases

A single-case A1-A2-B-A3 design with non-concurrent multiple baselines across subjects was used (Morgan & Morgan, 2009). During A1, the first baseline phase, the subjects were not exposed to any part of the intervention. Baseline data for headache parameters were collected for approximately one week during this phase. Phase A2, the second baseline phase, was started with discussing behavioural factors - feelings, thoughts and doings - of the patient’s everyday life that might have an effect on the headache. The patient then filled in an individually tailored diary with focus on behaviours possibly influencing the headache, as well as scores regarding the influence of daily life by the headache. Continued baseline data collection of headache parameters was also proceeded. Phase B started with the functional behavioural analysis. During this phase also the intervention steps were started: basic skills acquisition, applied skills acquisition and generalization of skills. During phase A3 the intervention was withdrawn except for two follow-up visits.

3.2 Patients and setting

Three patients were recruited (by the author) among ordinary patients seeking physiotherapist care in primary health care. The patients might have been seeking care directly or been referred from other physiotherapists or general practitioners. The criteria of
inclusion followed the criteria established in the guidelines for behavioural treatments of TTH (Penzien et al., 2005). Although, in contrast with these guidelines it was in this study permitted for the patient to have other forms of headache in addition to TTH without being able to discriminate them. Thus, adult persons 18-65 years old with frequent or chronic TTH according to ICHD-2 were included (IHS, 2004). The patients filled in a previously used Diagnostic headache diary (Russell et al., 1992) (Suppl A), translated to Swedish, during phase A1 and A2 and the final inclusion was made after these two baseline phases to ensure that the headache was actually classified as TTH. The first three patients that fulfilled all phases are reported. There were four other patients that were first included but were withdrawn because they did not show up on visits or did not fill in the requested forms.

3.3 Behavioural medicine intervention in physiotherapy for TTH

The intervention consisted of an application of the model for analysis and behavioural medicine treatment in physiotherapy described by Åsenlöf, Denison & Lindberg (2005b) (see bullet points below). A modification was made since the connection between headache and activities are not usually as apparent as for other musculoskeletal pain, and when tried it showed to be difficult to start by choosing target activities as the model suggests.

1. Identifying problematic situations and activities.
   The patient was asked to list activities or situations when the headache was problematic or in some other way connected to the headache. The patient then was asked to describe his/her thoughts and feelings that were usually associated with these activities or situations.

2. Self-monitoring with a diary.
   In this stage the patient would at the end of each day summarize and write down notes of activities during the day as well as feelings and thoughts during the day. This was done with a diary specifically made for this purpose.

3. Individual functional behavioural analysis (FBA) and goal setting.
   From the information from earlier stages a hypothesis was drawn, of causal relationships leading to and maintaining the patient’s behaviour that was supposed to affect the headache. Antecedents, responses and consequences were identified, the components that seemed possible to change were discussed, and goals were determined regarding target behaviours. The hypothesis was subject to recurrent re-evaluation during the forthcoming stages.
4. **Basic skills acquisition.**
The components identified in the former stages were targeted with preferably home exercises and occasional manual treatments to increase the physical, psychological and social capabilities to reach the goals. Examples of physical skills being targeted were joint mobility in neck and jaw, muscular endurance and mobility, posture and relaxation. Examples of cognitive skills that were targeted were adopting alternative coping strategies, learning to recognize and replace negative thoughts, and seeking social support. Home exercises were used for acquisition of physical, cognitive and social skills. The physiotherapist used different techniques to support the subject’s behavioural change, such as self-monitoring, pacing, shaping and fading. It was an essential part of the treatment to strengthen the patient’s self-efficacy in behavioural change through reinforcement of steps taken by the patient according to plan for behavioural change.

5. **Applied skills acquisition.**
During this stage the exercises were more complex and several basic skills were combined in one exercise. The exercises were also to be performed in daily situations and activities.

6. **Generalization.**
When the first goal was met regarding the first target behaviour, the procedure was repeated with other target behaviours listed at the first stage. The FBA was complemented and additional basic skills as well as applied skills were rehearsed.

7. **Maintenance and relapse prevention.**
This stage included two follow-up sessions to prevent relapse, at approximately 1 month and 3 months after the treatment. These sessions were to coach the patients in maintenance of the new behaviour and to prevent relapse.

### 3.4 Data collection

*Headache frequency, headache index* and *behaviour of consumption of analgesics* were measured with the Headache diary (Suppl B) through A1, A2, B and one week before each follow-up session in A3. In the Headache diary the patient was to score the headache intensity on an 11-point (0-10) numerical rating scale (NRS) and the consumption of analgesics four times a day. Headache frequency is a recommended outcome variable in studies of behavioural treatments for TTH (Penzien et al., 2005). Headache index is an outcome variable that take frequency, duration and intensity into account, and therefore sometimes can reflect the overall level of suffering better than headache frequency (Lake & Saper, 2002). There is no consensus about how to define headache index (Penzien et al.,
Headache index was in this study defined as means of intensity scores NRS (0-10) per week, i.e. the sum of all 28 scores for one week divided by 28.

Disability and feelings of loss of happiness were measured with the Activity diary (Suppl C) through A2, B and one week before each follow-up session in A3. The Activity diary consisted of a modified version of MPI-S, part 1, questions nr 8-10 (Bergstrom et al., 1998). The patient scored on NRS (0-10) at the end of every day how much impact the headache had had on the ability to participate in daily activities (disability), and the feelings of loss of happiness from headache in doing activities with family and friends. The purpose of measuring disability and loss of happiness, was to continuously evaluate pain from a wider perspective. Although the biopsychosocial perspective is well accepted for understanding pain, all three components are not always well-represented in the outcome measures (Froud et al., 2014). Disability and feelings of loss of happiness represent the psychosocial aspects of pain, and measure how much impact headache has on the individual’s everyday life.

Self-efficacy for headache management was measured with Headache Management Self-efficacy Scale (HMSE) (French et al., 2000) (Suppl D). It was filled in before A1, before B, immediately after B and at the two follow-up sessions of A3. HMSE is a scale with 25 items rated on a 7-point scale that ranges from 1 = strongly disagree to 7 = strongly agree. The statements provide information about the patient’s confidence in their ability to prevent headache episodes and manage headache-related pain and disability. It is a brief self-efficacy measure with a simplified item and scoring format constructed in order to make it easily used, and it has proved to have a high level of internal consistency as well as construct validity (French et al., 2000). This scale was translated to Swedish.

### 3.5 Data analyses

Self-rated scores of headache frequency, headache index, consumption of analgesics, disability, and loss of happiness are presented with graphs, each point representing scores for one week. Headache frequency are presented as number of days per week. Headache index, disability and loss of happiness are presented as means per week. Behaviour of consumption of analgesics are presented as number of units taken per week (one unit representing prescribed adult dose of over the counter analgesics). The graphs were analysed only visually (not by statistical methods) for observed level, trend and variability within and between phases. The visual inspection is a subjective mode of analysis and offers no formal criteria for evaluation (Morgan & Morgan, 2009).

Results of HMSE are presented with descriptive data.

### 3.6 Ethical consideration

Participation in the study was voluntary, and the conditions were clarified before the patient approved to be a part of the study. Patients seeking care for their headache had to wait for
the actual treatment to start for between two to four weeks. The patients were informed about the possibility to get treatment directly, if the patient choose to not participate in the study. But then the treatment could not be as tailored as if he or she had agreed to be a part of the study. Data was collected and presented with respect to confidentiality so that the patients would not risk to be identified by the reader.

4 RESULTS

The data for the FBA were collected through physiotherapy clinical history and physical examination and through Activity diary used from baseline phase A2 and trough out the study. The individually tailored treatment was based on the FBA. These steps are described shortly for each patient prior to results of headache frequency and headache index, behaviour of consumption of analgesics, disability, feelings of loss of happiness and HMSE score.

4.1 Patient 1

4.1.1 Functional behavioural analysis

The first patient (P1) was a 68-year old female, retired from work. She was living with her husband and had grown up children that had moved out long time ago. A few years ago she had problems with her right jaw when chewing. Ever since then she had felt that her jaw was tense. At some point she started to feel light headaches every now and then. The last year she had experienced headaches almost every day. The headache was usually present already when she woke up in the morning. It seemed to get somewhat worse during days when she was stressed. She perceived her jaw muscles as tense and tender. She had low intensity headaches most of the days (figure 1 and 2), with no perceived disability but affecting feelings of happiness in activities with family and friends (figure 4). Her self-efficacy for managing headache (HMSE) was low (table 1). She used analgesics but not that much that it would be primary problem behaviour (figure 3).

From the anamnestic information, headache diary, and the clinical investigation it was in the FBA hypothesized that the behaviour that would have most effect on her headaches was her continuous contracting of jaws. This behaviour probably increased headache intensity and use of analgesics, influenced negatively her self-efficacy for managing headache and perceived feeling of happiness in activities. Therefore, the behaviour of contracting the jaw muscles was analysed in order to understand the function of the behaviour. The behaviour seemed to be going on almost all the time, even during nights, and in that way it had become more or less automatic. The antecedents and consequences of this behaviour were therefore hard to identify. However, it could be concluded that the behaviour was intensified in
situations with psychological stress, as for example worry for family members being ill. Contracting her jaw was clearly a behavioural excess, and being relaxed was a behavioural deficit. She was motivated and seemed to be in a good position for changing her behaviour.

The long-term goal was set to no headache more than twice a week. It was concluded that the primary purpose of the treatment would be to find a way for her to increase the control of tension of the jaw during the daytime activities. It was hypothesized that the jaw muscles would continue to be relaxed during the nights if they were relaxed during the days.

### 4.1.2 Individually tailored treatment

The treatment consisted of eight visits with home exercises in between, including two follow-up visits.

Basic skills targeted were: to know and feel what is a neutral relaxed position of the jaw, to be able to control the muscular tension, and to do her exercises regularly. Applied skills targeted were to recognize when her jaw gets tens in activities and to do the exercises when necessary to decrease tension. Generalization of the skills was not needed.

The behaviour change was guided by the physiotherapist. The behaviour change techniques self-monitoring, feedback, shaping and fading were used and the physiotherapist aimed to strengthen the patient’s self-efficacy for behavioural change through reinforcement of every progress during all treatment stages.

### 4.1.3 Outcome

All outcomes were considered as proxy measures for increased control of the tension of jaw muscles.

The goal of no headache more than twice a week was met.

*Headache frequency* and *headache index* are presented in figure 1 and figure 2. During baseline she had headaches at 6 out of 7 days and during the two follow-up visits these figures were 1 and 2 out of 7 days respectively.

The behaviour of *consumption of analgesics* is presented in figure 3 and was reduced to zero at the follow-ups.

*Disability* and feelings of *loss of happiness*. She reported no disability in activities during any of the phases. Loss of happiness was reduced to zero after treatment and was stable through follow-up (figure 4).

*HMSE* score increased considerably from baseline to directly after treatment and was stable through follow-up (table 1).
Figure 1: Patient 1. Headache frequency in self-reported days with headache per week.

Figure 2: Patient 1. Headache index in means per week of self-reported intensity on NRS-scale 0-10 at 4 times a day.
Figure 3: Patient 1. Self-reported consumption of analgesics in units per week (1 unit = 500 mg paracetamol or 400 mg ibuprofen).

Figure 4: Patient 1. Self-rated disability and loss of happiness on NRS-scale 0-10 in means per week.
Table 1: Patient 1. HMSE (Headache Management Self-Efficacy) scale 0-176 point, higher point indicating higher self-efficacy (French et al., 2000).

<table>
<thead>
<tr>
<th>Week</th>
<th>HMSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (before A1)</td>
<td>131</td>
</tr>
<tr>
<td>3 (before B)</td>
<td>125</td>
</tr>
<tr>
<td>9 (after B)</td>
<td>170</td>
</tr>
<tr>
<td>14 (follow-up 1)</td>
<td>161</td>
</tr>
<tr>
<td>26 (follow-up 2)</td>
<td>169</td>
</tr>
</tbody>
</table>

4.2 Patient 2

4.2.1 Functional behavioural analysis

The second patient (P2) was a 28-year old woman, with office work, living with her boyfriend. She had experienced daily headaches for approximately six months. She had started on a new work eight months ago and after that the headache had got worse. She could not understand why since she felt that the new work was less stressful than the former one.

According to her diary she had headaches continuously varying in intensity between 2 and 6 on a NRS-scale (figure 5 and 6), and often worse in the afternoon than in the mornings. Her analgesics use behaviour showed that she seldom used them (figure 7). Analgesics seemed to not help. She reported both dysfunction (avoidance of activities due to headache) and feelings of loss of happiness, but loss of happiness was generally higher than dysfunction (figure 8). The physical examination showed that she had a minor cervical dysfunction of C2 with a slight tenderness on the right facet joint and, a slightly restricted range of motion in neck rotation to the right, and tender muscles on the right side of neck and shoulder. Thus, behaviour of slightly excessive contracting of shoulder and neck muscles seemed to be present. She was also slightly tender in the muscles of the jaw by having a contracting behaviour of jaw muscles. She had an occlusal splint that she used during the nights since long time ago. She had a very low HMSE-score indicating low self-efficacy for controlling her headache (table 2).

It could be concluded in the FBA that the headache intensity was rather stable with no scorings of less than 2. It was not possible to see a pattern from the diary that would explain the variation of headache in behavioural terms otherwise than the excessive contracting behaviour of jaw, neck and shoulder muscles, and feelings of being stressed. This made it difficult to choose behaviour to do a proper FBA. The patient and physiotherapist agreed to try to target all possible dysfunctions that could contribute to TTH i.e. tension of muscles of neck, shoulders, jaw as well as stressful feelings. During the treatment the diary would still be filled in and supposedly new hypothesis of behavioural causes to the maintenance of headache would come up.
4.2.2 Individually tailored treatment

The treatment consisted of nine visits with home exercise in between, including baseline visits. There were no follow-up visits, but the requested forms for follow-up (Activity diary) was sent by mail.

Basic skills that were targeted were increased endurance and circulation of muscles that supposedly might cause TTH, and to recognize muscle tension and when she felt psychologically stressed. Applied skills targeted were to recognize muscle tension and then decrease the tension in activities. Psychological stress after all did not seem to be a problem and was not further targeted.

The behavioural change was supported by the physiotherapist through techniques of self-monitoring, feedback, shaping, pacing and fading. To strengthen the patient’s self-efficacy for success in the behavioural change was central.

When treatment seemed to have no effect, manual manipulation of C2 was performed three times as a complement to the behavioural treatment. The neck range of motion increased but with momentary or no effect on the headache.

4.2.3 Outcome

There was no recognized change of the headache during the treatment. Thus, the patient and the physiotherapist agreed to stop the treatment after nine visits during three months. The patient was in contact with her doctor, which resulted in further investigation with no findings. At the last follow-up five months after treatment the headache was much better, with still no explanation why.

*Headache frequency and headache index* are presented in figure 5 and figure 6. The patient had headaches all days through all the phases. The intensity was rather stable through all phases until the last follow-up period when it was approximately half of the means through the other phases.

The behaviour of *consumption of analgesics* is presented in figure 7 and was negligible through all phases.

*Disability* and feelings of *loss of happiness* seemed to get progressively slightly higher through treatment and then lower at the last follow-up. See figure 8.

*HMSE* score increased from baseline to directly after treatment but was not stable through follow-up (table 2).
Figure 5: Patient 2. Headache frequency in self-reported days with headache per week.

Figure 6: Patient 2. Headache index in means per week of self-reported intensity on NRS-scale 0-10 at 4 times a day.
Figure 7: Patient 2. Self-reported consumption of analgesics in units per week (1 unit = 500 mg paracetamol or 400 mg ibuprofen).

Figure 8: Patient 2. Self-rated disability and loss of happiness on NRS-scale 0-10 in means per week.

Table 2: Patient 2. HMSE (Headache Management Self-Efficacy) scale 0-176 point, higher point indicating higher self-efficacy.

<table>
<thead>
<tr>
<th>Week</th>
<th>HMSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (before A1)</td>
<td>50</td>
</tr>
<tr>
<td>3 (before B)</td>
<td>59</td>
</tr>
<tr>
<td>16 (after B)</td>
<td>79</td>
</tr>
<tr>
<td>20 (follow-up 1)</td>
<td>59</td>
</tr>
<tr>
<td>34 (follow-up 2)</td>
<td>68</td>
</tr>
</tbody>
</table>
4.3 Patient 3

4.3.1 Functional behavioural analysis

The third patient (P3) was a 30-year old female with migraine and/or tension-type headache several days a week. She was working as a psychologist in the primary care, living with her boyfriend. She had experienced headaches since she was a little girl and migraine since she was fifteen years old. She had tried lots of medication and had at last found one medicine that had at least some effect - if taken early it could stop an oncoming migraine attack.

According to the baseline data she had headaches every other day with intensity varying from low to very high (figure 9 and 10) and sometimes she could not tell if it was migraine, TTH or something else. Both physical and psychological factors contributing to headache were found. She had marks around her tongue indicating that she had behaviour of pressing her tongue against the teeth. She used an occlusal splint during nights. She had negative thoughts about the headache and got stressed from having headache since she could not control it and she did not know if she would be able to work in the future. She did not exercise regularly although she thought she should. This made her feel unsatisfied with herself. She was taking her migraine medicine several times a week (figure 11), more often than she thought was healthy. One reason for this was that she often could not tell if it was migraine or other headache and she thought she could not risk getting a real migraine attack, especially not if she had to be at work. Her perception of disability and feelings of loss of happiness was highly varying depending on how much headache she had (figure 12). She had a low HMSE-score and thus had a low confidence for controlling her headaches (table 3).

There were several behaviours that were supposed to contribute to her headaches, which led to several intertwined FBAs. Contracting her muscles of shoulders, neck and jaw was a behavioural response primarily in situations when she felt psychological stress. This physical reaction is a natural unconditioned response in situations that are perceived as stressful. But in this case the reaction was also thought to be a conditioned response to situations that resembled earlier stressful situations, and thereby occurred more frequently. She felt the stress in situations when she was feeling not in control, often either not in control of headache or not in control of work-related tasks. Automatic negative thoughts were also common in these situations. The consequence she felt was tension and headache and even more stress of not being in control, which positively reinforced her automatic negative thoughts. Her feeling of anxiety for getting headache was also a behaviour in close connection with psychological stress. This behaviour had the antecedent of knowing that it would not be a good time for having headache, e. g. when she knew that she had important things to do that would be difficult to call off. Her low self-efficacy for controlling her headache was thought to be an important psychological factor for maintaining the behaviour of physical tension, automatic negative thoughts and feelings of anxiety.

Sometimes her headache or fear of headache made her take migraine medicine. This operant response had the short term positive reinforcing consequence of her feeling that she had done something to prevent the worst scenario of migraine headache. At the same time it
made her in the long run feel even less in control of her headache, and it made her worried that the medicine would not be healthy and that she would get even more headache from taking them.

Another behaviour targeted was her physical activity level. Her headaches made her tired and she felt not able to be physically active as much as she would like to. She had tried to go to classes at the gym. If she had headache when she started the consequence would often be worse headache afterwards, a positive punishment that made it difficult for her to plan the activities. In the long run her low physical activity might lead to more physical and psychological stress, and more headache.

In summary, the interrelationship of stress and headache was obvious, and her feeling of not being in control was important for maintaining her behaviours. The short-term goals were that she would feel that she had tools to brake behavioural chains earlier and for example start to do her exercises instead of getting tens when she felt worried. The long-term goal was set to a maximum of headache two days per week.

### 4.3.2 Individually tailored treatment

The treatment consisted of 14 visits with home exercises in between, including baseline and follow-up visits.

Basic physical skills that were targeted were to learn to activate the deep forward muscles of the neck and to increase the endurance and blood circulation of neck and shoulder muscles in order to be able to control muscle tension. Cognitive basic skills that were targeted were: to recognize negative thoughts, get conscious about reasons that she takes her medication and to use support from her boyfriend to keep up physical activity. Applied skills were better posture in everyday activities, to recognize and replace negative thoughts in activities, questioning medication intake, and to be physically active on a regular basis.

First focus was set on physical skills (i.e. muscular endurance and posture), then cognitive skills (i.e. negative thoughts), after that medication overuse, and lastly physical activity.

Through all of the treatment stages the physiotherapist used techniques to support the patient’s behavioural change, with self-monitoring, feedback, shaping, pacing and fading. To strengthen the patient’s self-efficacy of ability to influence the headache and to succeed in the behavioural change was important.

### 4.3.3 Outcome

All outcomes were considered as proxy measures for increased control over muscular tension, psychological stress and medication overuse.

She did not reach the goal of headache a maximum of 2 days a week.

Since the variability of the outcome in diaries through the baseline and treatment phases proved to be high, it was decided that the patient would fill in the diary continuously through
the follow-up period (A3) and not only at one week before the follow-up visits. Otherwise it was considered that the results might be skewed. Although, the diary for week 39 and 40 was unfortunately lost by the patient.

_Headache frequency_ and _headache index_ are presented in figure 9 and figure 10. The variability is high and it is difficult to draw conclusions, although the trend is that both mean frequency and index reduced slightly from baseline, through intervention, to follow-up.

The behaviour of _consumption of migraine medicine_ reduced considerably when this was targeted in treatment, and was stable on a lower level through follow-up, although the variability was high (figure 11).

The behaviour of _consumption of over the counter analgesics_ varied through the phases with no certain difference from baseline through treatment to follow-up (figure 11).

_Disability_ and feelings of _loss of happiness_. The variability is high and no trends can be observed (figure 12).

_HMSE_ increased considerably, from baseline to after treatment and through follow-up, indicating that her self-efficacy for managing headache did increase during the treatment (table 3).

Figure 9: Patient 3. Headache frequency in self-reported days with headache per week.
Figure 10: Patient 3. Headache index in means per week of self-reported intensity on NRS-scale 0-10 at 4 times a day.

Figure 11: Patient 3. Self-reported consumption of migraine medicine and analgesics in units per week (1 unit = 500 mg paracetamol or 400 mg ibuprofen).
5 DISCUSSION

5.1 Results

This study presents a possible way for management of patients with TTH in the physiotherapy field. To conduct an FBA can be a starting point for an individually tailored behavioural medicine treatment based on hypotheses related not only to the patient’s diagnosis but also to physical, psychological and social factors that are specific for that particular patient. All three patients in this study were categorized as having TTH according to the IHS classification, however, the FBAs led to different conclusions regarding the individualized behavioural medicine treatment.

For P1 the FBA was rather uncomplicated with one factor more important than others, her behaviour of contracting the jaw muscles. When this was focused on, all self-rated scores
changed to the better and were stable through follow-up. Disability in activities was zero from start and feelings of loss of happiness reduced to zero during treatment, meaning that the headache had no longer impact on her feeling of happiness in activities after treatment. One thing to consider is that P1’s headache perhaps should have been classified as secondary TTH, since it seemed to have a connection with her earlier jaw problems. However, it did not show up in close connection to an incident as stated in the classification (IHS, 2004).

For P2 the treatment seemed to have no effect, and the reason for this could only be speculated on. One possible explanation could be that even though the criteria for TTH according to the IHS classification were fulfilled, her headache should have been categorized otherwise. An alternative diagnosis would be NDPH (IHS, 2004, 2013). This headache can be very similar to chronic TTH with the exception that it is unremitting from the day of onset or within the first three days after onset. NDPH is a primary headache diagnosis that can mimic both TTH and migraine, and the pathogenesis is poorly understood (Rozen, 2014). There are two sub forms of NDPH, of which one is self-limiting within several months and the other one is refractory to treatment (IHS, 2004, 2013). Although P2 could not tell the exact day when the headache started, which is often the case with sufferers of NDPH (Rozen, 2014), it cannot be excluded that she had NDPH instead of TTH. In that case, this could explain why she did not respond to treatment, and why it was suddenly better.

For P3 the FBA was multifaceted. She had migraine as a diagnosis aside of TTH and the headaches had a major impact on her daily life. There seemed to be a slightly lowering trend for the variables headache frequency and headache index through the treatment phase. But the high variability through all phases makes it hard to draw conclusions. The consumption of migraine medicine decreased in close temporal connection to when this target behaviour was directed, with no demonstrable effect on headache frequency or headache index. The HMSE score increased significantly from baseline to after treatment, which indicates that she felt higher self-efficacy for controlling her headache after treatment. A higher self-efficacy for being able to prevent headaches has been shown to be related to lower levels of depression and anxiety, fewer somatic symptoms, and better adjustment to their headache-related problems (N. J. Martin, Holroyd, & Rokicki, 1993). Higher management self-efficacy has been associated with higher quality of life for patients with chronic conditions (Alok et al., 2014; Cramm, Strating, Roebroeck, & Nieboer, 2013). Although, the causal relationships are not clear, this suggests that even if the headache would not change at all from the treatment, the treatment could still be justified if it leads to higher headache management self-efficacy.

For P1 and P2 both disability and feelings of loss of happiness decreased along with headache frequency and index. Thus lower impact of pain is probably primarily an effect of less headache for P1 and P2. For P3 disability and loss of happiness did not seem to decrease during treatment whereas there seemed to be a slight decrease of headache frequency and headache index. This is interesting since the HMSE score increased considerably from baseline to after treatment. At the last follow-up this fact was discussed with the patient. Her spontaneous explanation was that she had been trying to neglect her headaches and how she felt, and tried to keep up with her work and activities until it was impossible. During treatment she felt that she started to listen to her body, and sometimes that made her go

22
home from work or cancel activities. She felt that this was a progress, although she scored the impact of pain higher these days.

It has been a question of discussion whether active coping strategies, that focus on controlling pain or function despite pain rather than avoidance, is always advantageous for headache sufferers. A common advice to headache sufferers has been to avoid triggers (P. R. Martin, 2010). Passive coping strategies, which involve avoidance behaviour and surrendering control over pain, have been associated with chronic pain in several studies (Carroll, Ferrari, Cassidy, & Cote, 2014; Vlaeyen & Linton, 2000). But for migraine sufferers it has been questioned if avoidance behaviour is as disadvantageous as it is for musculoskeletal pain in general, since exposure to triggers might elicit migraine attacks that could have been avoided (Wieser, Walliser, Womastek, & Kress, 2012). P. R. Martin (2010) proposes that clinicians should start to think in terms of “coping with triggers” instead of avoiding triggers. He summarises evidence from several studies, including both persons with TTH and migraine, showing that avoidance of triggers results in sensitization, and that repeated prolonged exposure to triggers results in desensitization and less headache. His reasoning is in line with other researchers (McLean, Coutts, & Becker, 2012) that have proposed pacing as being most important both for migraine and tension-type headache sufferers. The primary goal of pacing for headache patients is to avoid triggering of headaches through self-regulation of physical exertion and psychological stress. Different approaches to balance activity and rest are required, depending on the situation and how many possible triggers that are present (McLean et al., 2012). This further underlines the importance of individually tailoring the treatment to the patient.

To the authors’ knowledge, no earlier study has evaluated a behavioural medicine treatment in physiotherapy for TTH with the intention to target physical, psychological and social factors. Different kinds of physiotherapy treatments as well as behavioural treatments have been evaluated though, but the evidence for these treatments cannot be summarized easily since there are both unclear and conflicting results. One way of interpreting the rather modest evidence of the effectiveness of these treatments for TTH is that the heterogeneity of the patients with TTH might be too vast for the use of a more standardized treatment. It might be that even though the patients can be categorized as having TTH, the factors and behaviours that cause and contribute to maintain the headache are different between the patients. In light of this reasoning, it is not that strange that group design studies that evaluate the effect of one standardized treatment will not reach significant difference between groups. If some of the patients have mostly physical impairments whereas others have psychosocial impairments, they would most probably not benefit from the same treatment. A refined classification with subcategories according to these possible causes, that could guide the choice of treatment more, would be most helpful both for practitioners and researchers. It seems logical that when diagnoses are wide and the classification is under constant revision (IHS, 2013), it is even more important to individually tailor the treatment.

To apply individually tailored behavioural medicine treatment is like inventing a new treatment for every patient, which is not exceptional or foreign to clinically working physiotherapists, but in scientific literature it is still rather unusual. Methodologically strict RCTs have been the golden standard for years, due to the growth of evidence based medicine
in the medicine field where that design has been most suitable for many research questions. When it comes to psychosocial and other complex interventions, i.e. treatments that has several interacting components, the rigid RCT has been questioned (Morgan & Morgan, 2009; Ruggeri, Lasalvia, & Bonetto, 2013). Ruggeri et al (2013) propose a new era with pragmatic RCTs for evaluating psychosocial interventions. In short, their view is that it is inherent in the psychosocial treatment that it needs to be individually tailored, which leads to challenges regarding study design that would not be encountered in e.g. pharmacological studies. If this difference is not considered and dealt with, the outcome of the complex treatments might be undervalued in trials and the goal of finding the best treatment for each patient cannot be reached (Ruggeri et al., 2013). This reasoning is also highly valid for a behavioural medicine treatment in physiotherapy that is based on FBA.

5.2 Methodological considerations

The purpose of many clinical studies, be it a large scale randomized controlled study or an experimental single-case study, is to isolate causal relationships between independent and dependent variables. This task is always a question of probability, i.e. what the probability is that the change in the dependent factor is due to the independent factor and not a result of other possible factors. Depending on the study design there are different possibilities to rule out these alternative explanations and secure the internal validity (Morgan & Morgan, 2009).

The experimental single-case design is dependent on replication and repeated measurements. The withdrawal design is probably the most classic way of replicating in experimental single-case design, but that is not possible when the treatment effect is expected to last after cancellation of treatment. In those cases a multiple baseline design is a possible way of replicating. It could be performed across either subjects, settings or behaviours (Morgan & Morgan, 2009). The purpose of the present study was to use multiple baselines across subjects. In an earlier study of individually tailored behavioural medicine treatment targeting musculoskeletal pain, multiple baselines across situations have been used with good results (Asenlof et al., 2005b). However, there are certain differences between TTH and musculoskeletal pain in general, and the multiple baseline across situations design seemed problematic in the current study, since it is usually problematic to pick situations with apparent connection to TTH. Although most patients with TTH are aware of certain behaviours that might elicit or enhance the headache, e.g. excessive contracting of muscles, being stressed, sitting in certain positions, these activities or behaviours might elicit headache one day and not the other day. Also, the headache often turns out afterwards and not during the activity. Therefore, the decision was made not to concentrate on certain activities but on certain behaviours in all kinds of activities that were supposed to affect the headaches, and to try to replicate across subjects instead. The downside is that the more general and diffuse the behaviours get, the harder it is to set well defined goals during treatment, and the harder it is to isolate causal relationships.

Self-report through diary four times a day is recommended for evaluating headache (Penzien et al., 2005). The headache diary has proved to be socially valid, meaning that improvements
detected from headache diary are noticeable by a close relative (Blanchard, Andrasik, Neff, Jurish, & O'Keefe, 1981). Measuring pain intensity concurrently with NRS has proved valid and sensitive to changes (M. P. Jensen, Karoly, O’Riordan, Bland, & Burns, 1989). However, the validity of measuring disability and feelings of loss of happiness with NRS retrospectively for one day is uncertain since these outcome measures were made up for this study. It could be questioned if it is possible for the patient to remember and “sum up” the total amount of disability and loss of happiness throughout one day. Self-reporting of pain retrospectively has proved to differ from concurrent self-reporting (Khoshnejad, Fortin, Rohani, Duncan, & Rainville, 2014). The alternative to restrict disability and loss of happiness scorings to certain activities was regarded difficult since the headaches could influence any activity through the day.

The logic of the multiple baseline across subjects design is that the probability of alternative explanations for the change of the dependent variable is lower if three subjects respond in the same way. During this study it was concluded not to report the results of the three subjects in the same graph as would be recommended according to the chosen design (Morgan & Morgan, 2009). The reason for this was the heterogeneity of the results and the different lengths for treatment that made it hard to form graphs over the three subjects that would be easily visualized.

In order to be sure that the change of the dependent variable is a response to the independent variable and not a confounder or maturation effect, it is necessary to have a stable baseline (Morgan & Morgan, 2009). The more variability the longer baseline is needed. Longer baseline and follow-up phases could for P3 possibly have elucidated differences on level between the phases, and if the slight trend towards less days with headache and lower headache intensity was random or a depicted reality. According to guidelines of behavioural medicine treatments for headache, baselines of a minimum of 4 weeks and preferably 5 weeks to capture monthly hormonal changes, are recommended (Penzien et al., 2005). However, longer baselines would also be a question of ethical consideration, since the patients would have to wait for treatment even longer. In studies that include patients that have been seeking care for their headache, as is the case in this study, longer baselines could also mean that there probably would be less patients agreeing to participate. That would mean a potential distortion of results. This is also a risk in studies that require much effort or sacrifices from the patient. That might have been the case in this study where four patients did not comply through all phases and were therefore excluded.

For the experimental single-case design to be strong in causality it is important to see that the difference of the dependent variable appears in near temporal contact with the introduction of treatment targeting the specific dependent variable (Morgan & Morgan, 2009). In this study, this was only the case for P1 and for medication intake for P3. A delay of the treatment effect makes it more difficult to isolate causal relationships with certainty. It is expected that the treatment effect on headache would be delayed, since the headache is a result of several behaviours in several activities, and also, that a central sensitization is often involved. However, it would have been preferable, but decided not possible in this study, to evaluate the behaviours that were targeted more directly. To, for example, measure tension of jaw
muscles with surface electromyography, or register negative thoughts continuously could have been an option.

A limitation of the study is also that the analysis of data was performed solely through visual inspection. Smaller changes could perhaps have been discovered if a quantitative analysis had been used in addition to visual inspection. However, these changes would not have been regarded clinically significant. It has been a common view that a clinically significant treatment effect should be observable through visual inspection (Nugent, 2010).

To establish external validity might be an objective in experimental single-case research, although never the foremost objective (Morgan & Morgan, 2009). In this study external validity was not a goal and the results should not be generalized beyond the study. The single-case study design has the advantage of not being dependent on homogenous study groups. The risk of group design studies is that they are developed to be so strict that the homogenous client profile is very far from the unique client characteristics that the professionals encounter, and that would be a threat to the external validity. In many trials P3 would have been excluded (Penzien et al., 2005), since she could not always discriminate if she was having migraine or TTH. It is important that patients with two headache diagnoses are subject to research as well, and for that the experimental single-case design is most suitable. To suffer from both TTH and migraine is common (Lyngberg et al., 2005), as it is that the patient cannot always identify which type of headache that is present (Blumenfeld, Schim, & Brower, 2010). An aim of this study was to reflect the reality that meets the clinically working physiotherapist in primary health care.

6 CONCLUSIONS

FBA can be a tool for identifying potential factors with impact on a person’s TTH. An individually tailored behavioural medicine treatment in physiotherapy targeting both physical and psychological skills, and social/environmental factors, seems to have impact on a person’s self-efficacy for managing their headaches. However, future controlled studies are needed.

7 REFERENCES


### BILAGA A - Diagnostisk huvudvärksdagbok

Fyll i dagboken varje kväll om du haft huvudvärk någon gång under dagen. Sätt ett X efter varje fråga i den ruta som stämmer bäst.

<table>
<thead>
<tr>
<th>Datum:</th>
<th>/</th>
<th>/</th>
<th>/</th>
<th>/</th>
<th>/</th>
<th>/</th>
<th>/</th>
</tr>
</thead>
</table>

**När började huvudvärken?**
Indikera närmaste timma:

**Upplevde du några störningar precis innan du fick huvudvärk avseende syn:**

**Känslor:**

**Annat:**

**Var huvudvärken högersidig:**

**Vänstersidig:**

**På båda sidor:**

**Var huvudvärken pulserande/dunkande:**

**Pressande/tryckande:**

**Var huvudvärken mild:**

**Måttlig:**

**Svår:**

**Förändrades huvudvärken av fysisk aktivitet såsom trappgång?**

**Värre:**

**Oförändrad:**

**Bättre:**

**Var du illamående?**

**Nej:**

**Milt:**

**Måttligt:**

**Kraftigt:**

**Blev du störd av ljus?**

**Nej:**

**Milt:**

**Måttligt:**

**Kraftigt:**

**Blev du störd av ljud?**

**Nej:**

**Milt:**

**Måttligt:**

**Kraftigt:**
<table>
<thead>
<tr>
<th>När försvann huvudvärken?</th>
<th>Indikera närmaste timma:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Var det något som provocerade fram huvudvärken?</td>
<td>Specificera:</td>
</tr>
<tr>
<td>Tog du någon medicin? Uppge varje sort, hur mycket du tog och när (närmaste timme)</td>
<td>namn:</td>
</tr>
<tr>
<td></td>
<td>hur mycket:</td>
</tr>
<tr>
<td></td>
<td>tid:</td>
</tr>
<tr>
<td></td>
<td>namn:</td>
</tr>
<tr>
<td></td>
<td>hur mycket:</td>
</tr>
<tr>
<td></td>
<td>tid:</td>
</tr>
</tbody>
</table>

*Mild: Hämmar inte arbetsprestation eller andra aktiviteter
Måttlig: Hämmar men förhindrar inte arbetsprestation eller andra aktiviteter
Svår: Förhindrar arbete och andra aktiviteter
BILAGA B - Huvudvärksdagbok

Skatta huvudvärkens intensitet på skalan 0 – 10 enligt nedan.

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Ingen</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Värsta</em> huvudvärk</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Datum</th>
<th>kl 8</th>
<th>kl 12</th>
<th>kl 16</th>
<th>kl 20</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ev medicin</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Ex.</em></td>
</tr>
<tr>
<td><em>2 Alvedon kl 8</em></td>
</tr>
<tr>
<td><em>1 Ipren kl 15</em></td>
</tr>
</tbody>
</table>
### BILAGA C - Aktivitetsdagbok

A) Hur mycket har din huvudvärk påverkat dina möjligheter att delta i dagens aktiviteter?

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><em>Inte alls</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><em>Oerhört mycket</em></td>
</tr>
</tbody>
</table>

B) Hur mycket har din huvudvärk försämrat det utbyte och den glädje du har av sådant du gjort tillsammans med familj/vänner under dagen?

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><em>Inte alls</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><em>Oerhört mycket</em></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Datum</th>
<th>A (0 – 10)</th>
<th>B (0 – 10)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lista dagens aktiviteter</th>
<th>Ex.</th>
</tr>
</thead>
<tbody>
<tr>
<td>- varit i skolan 8-15</td>
<td></td>
</tr>
<tr>
<td>- trädat fotboll 1tim</td>
<td></td>
</tr>
<tr>
<td>- passat barnbarnen 2 timmar</td>
<td></td>
</tr>
<tr>
<td>- kört bil till S-holm, shoppat 6 timmar</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tankar/känslor kring dagen</th>
<th>Ex.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stressig dag.</td>
<td></td>
</tr>
<tr>
<td>Känt oro över att...</td>
<td></td>
</tr>
<tr>
<td>Funkat bra idag.</td>
<td></td>
</tr>
<tr>
<td>Huvudvärken kom efter att...</td>
<td></td>
</tr>
</tbody>
</table>
BILAGA D - Headache Management Self-Efficacy scale

Instruktioner: Nedan finner du ett antal påståenden relaterade till huvudvärk. Läs varje påstående noggrant och markera hur mycket du är enig eller oenig genom att ringa in en siffra efter påståendet. Använd följande skala:

<table>
<thead>
<tr>
<th>Mycket oenig</th>
<th>Något oenig</th>
<th>Lite oenig</th>
<th>Varken enig eller oenig</th>
<th>Lite enig</th>
<th>Något enig</th>
<th>Mycket enig</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>

1. Jag kan hålla till och med en svår huvudvärk från att förstöra min dag genom att förändra mitt sätt att hantera smärtan. 1 2 3 4 5 6 7

2. När jag är i vissa situationer, finns det ingenting som jag kan göra för att förhindra att jag får huvudvärk. 1 2 3 4 5 6 7

3. Jag kan minska huvudvärkens intensitet genom att slappna av. 1 2 3 4 5 6 7

4. Det finns saker som jag kan göra för att minska huvudvärken. 1 2 3 4 5 6 7

5. Jag kan förhindra huvudvärk genom att känna igen sådant som utlöser den. 1 2 3 4 5 6 7

6. När jag väl har huvudvärk finns det inget jag kan göra för att kontrollera den. 1 2 3 4 5 6 7

7. När jag är spänd kan jag hindra huvudvärken genom att kontrollera spänningen. 1 2 3 4 5 6 7

8. Inget jag gör minskar huvudvärken. 1 2 3 4 5 6 7
9. Om jag gör vissa saker varje dag, kan jag minska antalet huvudvårksattacker.

10. Om jag kan upptäcka huvudvärken innan den börjar kan jag ofta stoppa den.

11. Inget jag gör kan förhindra att en mild huvudvärk blir en svår huvudvärk.


15. Jag kan göra något som påverkar hur länge min huvudvärk håller i sig.

16. Det finns inget av det jag gör som kan hindra att en svår huvudvärk förstör min dag.

17. När jag inte är så stressad kan jag många gånger förhindra huvudvärk.

18. När jag känner att huvudvärken är på gång finns det inget jag kan göra för att förhindra den.

19. Jag kan förhindra att en mild huvudvärk förstör min dag genom att ändra mitt sätt att hantera smärtan.

20. Om jag är mycket stressad finns det inget jag kan göra för att förhindra att jag får huvudvärk.

22. Det finns saker jag kan göra för att hindra huvudvärk.

23. Om jag är upprörd finns det inget jag kan göra för att kontrollera huvudvärken.


25. Jag kan göra saker för att hantera min huvudvärk.

(Notera att poängen för följande punkter är inverterade: 2, 6, 8, 11, 14, 16, 18, 20, 23)