1.1 Living with chronic pain

The International Association for the Study of Pain (IASP) has defined pain as “an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage” (International Association for the Study of Pain, 2012). This definition implies that pain is not just a medical problem, but always contains a psychological component. This is especially true for chronic pain, which is pain that lasts beyond the usual course of the acute disease or the expected time of healing. Also, the definition emphasizes the subjective experience of pain. No one can feel someone else’s pain. Thus, “pain is as bad as the patient says it is” (Crul & De Vries Robbé, 2000). In its declaration on pain, the European Federation of the International Association for the study of Pain Chapters (EFIC) defines chronic and recurrent pain as a major health problem and a disease in its own right. Thus, chronic pain should be treated as more than just a symptom.

Chronic pain can impact every life dimension, influencing work, education, household activities, leisure activities, and social, family and intimate relationships. Also, it can have an impact on a person’s sense of self and self esteem and it can lead to feelings of depression, insomnia, fatigue and substance abuse. Chronic pain has a negative impact on employment status and causes absence from work and loss of productivity (Patel et al., 2012). The health related quality of life of chronic pain patients is among the lowest observed for any medical condition (Becker et al., 1997). Chronic pain often coexists with psychiatric disorders. Comorbidity with somatoform disorders and anxiety disorders is common (Reme et al., 2011).

Despite all advances in the medical understanding and treatment of chronic pain, it continues to be a major problem for many people. Often chronic pain cannot be sufficiently reduced by pharmacological or invasive medical treatment. In many cases, patients get to hear from their doctors that their pain cannot be cured and that they have to learn to live with it. For patients this is a very difficult message to receive. It implies that one has to accept that experiencing pain will remain part of one’s life and that medical professionals cannot offer adequate relief. For many patients, this sharply contrasts with the biomedical view they have of illness and disease, in which every physical complaint should be medically explained and treated. Furthermore, how does one do that, learning to live with pain? It is much easier said than done.

1.2 The cognitive-behavioral perspective on chronic pain

As indicated above, it is widely recognized that psychological factors play an important role in chronic pain. However, this has not always been the case. Before the 1970s, pain was viewed from a biomedical perspective and accordingly, was solely seen as a symptom of tissue damage (Gamsa, 1994). Pain which could not be explained by physical causes was, in accordance with the psychoanalytical viewpoint of that time, psychological in origin. Thus, pain was attributed to either psychological (caused by unconscious psychic conflicts) or to organic causes. Around the 1970s, this dualistic conception was abandoned and pain came to be understood as a more complex phenomenon. A shift from linear, sensory models of pain to multi-dimensional explanations took place. Pain was seen as the result of the interaction...
between physical, psychological and social factors. This view was reflected in the biopsychosocial model of pain (Engel, 1980), which to this day is a leading framework in the study and treatment of chronic pain.

Figure 1.1 The biopsychosocial model

In psychology, pain has first been studied from behavioral theory (“pain is a result of operant conditioning or observational learning”), and later from cognitive theory (“the pain experience is determined by the appraisal of the pain”). Nowadays, the cognitive-behavioral perspective on pain is widely accepted and cognitive-behavioral approaches are extensively and successfully used in treatment programs for chronic pain. The cognitive-behavioral approach is based on the assumption that negative, unrealistic thoughts, images and beliefs can have a significant negative impact on the experience of pain sensations, moods, behaviors and other bodily sensations (Winterowd et al., 2003). The modification of a patient’s beliefs will generate change in the experience of pain and in maladaptive pain behavior (Gamsa, 1994).

Currently, the fear-avoidance model is one of the leading cognitive-behavioral models in the study of the psychology of pain (Vlaeyen & Linton, 2000). The fear-avoidance model describes possible pathways by which persons with pain can get caught in a downward spiral towards increasing avoidance, disability and pain. If pain is appraised as threatening (catastrophizing), pain-related fear evolves, which in turn leads to avoidance behavior and hypervigilance to bodily sensations, followed by disuse, disability and depression. This subsequently will maintain the pain experience, thus fueling a vicious circle of ever increasing catastrophizing, fear, avoidance and disability. According to this model, pain-related catastrophizing can also be influenced by negative affectivity and threatening illness information. In non-catastrophizing persons, pain-related fear will not develop and a confrontation with
normal daily activities is likely to occur, leading to fast recovery of the pain experience.

The fear-avoidance model is widely used as a guiding principle in the psychological treatment of chronic pain. The model demonstrates that the appraisal of the pain determines the subsequent pathway of either fear, avoidance and disability or confrontation and recovery. This means that interventions should be aimed at the reduction of catastrophizing and pain-related fear and the promotion of the confrontation with activities and pain.

**Figure 1.2** The fear-avoidance model of Vlaeyen and Linton (2000)

### 1.3 The psychological treatment of chronic pain

Cognitive-behavioral interventions are aimed at helping patients identify maladaptive patterns in responding to their pain and at acquiring, developing and practicing more adaptive ways of reacting to the pain (Turk, 2003). Patients learn to recognize connections between their thoughts, feelings, behaviors and physiological responses, together with the joint consequences. The overriding message of cognitive-behavioral treatment is that people are not helpless in dealing with their pain, but that they can acquire resources and skills in confronting it. In this way, pain no longer has an absolute, all consuming detrimental influence on a person's life. People can become active, resourceful problem-solvers, instead of passive, helpless victims of pain. The overall goal is for patients to live a productive, enjoyable life, despite their pain. The effectiveness of cognitive-behavioral interventions for chronic pain has been demonstrated in various studies (Morley et al., 1999; McCracken & Turk, 2002; Vlaeyen & Morley, 2005).

Cognitive-behavioral treatment is provided for chronic pain patients in various settings and forms: in primary, secondary or tertiary care, as monodisciplinary psychological treatment or as part of a multidisciplinary treatment program, either individually or in a group, and most recently, through the internet.
1.4 The latest developments

Cognitive behavioral treatment helps many patients with chronic pain. However, a substantial proportion of patients do not sufficiently benefit from it. Also, cognitive behavioral interventions are not always easily available or acceptable to patients with disabling pain.

The last decade has seen two important developments in the psychological treatment of chronic pain. Firstly, a new form of cognitive-behavioral treatment had emerged. These third generation CBT interventions include acceptance and commitment therapy (ACT), dialectic behavior therapy (DBT), mindfulness-based cognitive therapy (MBCT) and mindfulness-based stress reduction (MBSR) (Baer, 2006). These interventions seek to change the function of psychological events and the individual’s relationship to them, rather than changing these psychological events directly. Strategies used are mindfulness, acceptance and cognitive de-fusion (Hayes et al., 2006). ACT and mindfulness-based approaches are increasingly used in the treatment of chronic pain. They do not appear to be superior to cognitive behavioral treatment, but can be good alternatives (Veehof et al., 2011).

The second development is the incorporation of the internet in the treatment of chronic pain. With the developments in the world wide web, it became possible to administer psychological treatment programs through the internet instead of face-to-face. Recent years have seen a development of all kinds of treatment programs for patients with various problems, including chronic pain (Cuijpers et al., 2008). These programs vary with regard to the degree of interactivity, personal contact with a therapist and anonymity. The benefits of internet-based interventions include, among others, cost-effectiveness, accessibility and acceptability.

1.5 The outline of this thesis

The objective of this thesis is to investigate psychological mechanisms of chronic pain and to evaluate the effectiveness of cognitive-behavioral treatment of chronic pain. This thesis consists of two parts and an intermezzo.

Part 1 of this thesis focuses on mechanisms of chronic pain. As indicated earlier in this introduction, pain-related catastrophizing is a defining factor in the pain experience. It appears to determine to a large degree whether or not pain becomes chronic. Few studies have investigated the nature of pain-related catastrophizing in people with pain who are not (yet) pain patients. In order to gain more insight into the mechanism of pain-related catastrophizing, we conducted a study investigating pain-related catastrophizing in pain patients and people with pain in the general population. This study is presented in chapter 2 of this thesis.

In recent years, an interest in the role of the metacognitive concepts acceptance and mindfulness in the chronic pain experience has emerged. So far, little is known about the mechanisms by which these metacognitive concept influence the pain experience. Therefore, in chapter 3 a study on the influence of mindfulness and acceptance on pain-related catastrophizing is presented.

Chapter 4 of this thesis forms an intermezzo, in which a survey into pain patients’ use of the internet for pain-related medical information is reported. This study is an inventory study that helped us prepare an internet-based intervention for chronic pain.
Part 2 of this thesis is about psychological interventions for chronic pain. As mentioned above, cognitive-behavioral treatment is currently regarded as the most effective treatment approach for chronic pain and is provided to patients in various forms and settings. In chapter 5, we investigated the effects of psychological treatment of chronic pain by primary care psychologists, and compiled an inventory of the experiences of both patients and primary care psychologists.

CBT treatment can also be provided in the context of group treatment. A group format has a number of advantages, including cost and time effectiveness and the opportunity for patients to share experiences and learn from each other. We developed a cognitive-behavioral group course for patients with non-specific chronic pain. A pilot study into the effects of this cognitive-behavioral group intervention for patients with chronic pain is presented in chapter 6 of this thesis.

After this pilot study, we expanded the course by developing an internet-based version of this cognitive-behavioral program. Recent studies show that internet-based treatment can be effective in treating various problems, including chronic pain. Internet-based programs have various benefits, including accessibility and acceptability, which may be particularly relevant for patients with disabling pain complaints. In chapter 7, a randomized controlled trial comparing an internet-based cognitive-behavioral treatment to a cognitive-behavioral group intervention is presented.

Finally, in chapter 8 the main findings of this thesis are described and discussed and implications for clinical practice and future research are addressed.

1.6 Case vignettes

Case vignettes are provided throughout this thesis to offer examples of the experience of chronic pain. The content of the case descriptions is related to the content of the distinct parts of the thesis. The case examples are fictional and based on interviews with patients in the context of treatment, the studies in this thesis and on the literature. Mrs. A and Mr. B do not really exist, be are representative of patients seen in our Pain Center.

The case vignettes, describing the pain experience of Mrs. A and Mr. B, each consist of three parts. The first part, introducing their respective pain problems, is provided at the end of this introduction. The second part focuses on their pain-related psychological profiles and is provided at the end of part 1 of this thesis. The third part, describing the psychological treatment of these two patients, may be found at the end of part 2 of this thesis.
Chapter 1

Box 1: The prevalence of chronic pain

Chronic pain is highly prevalent. It causes suffering for millions of patients worldwide. Estimates of the prevalence of chronic pain differ widely, depending on the definition of chronic pain used, the types of pain included, the survey method and the population in which the data was gathered. The definition of pain varies widely among surveys. Pain was, amongst others, defined as either persistent pain, obvious pain, widespread pain, recurrent pain or long lasting pain. With regard to the duration of the pain, surveys used timescales of the present moment, the previous week, up to three months or up to six months. Furthermore, surveys differed in whether or not a minimum level of pain intensity was used. Some studies only included participants with pain of a minimum pain intensity (for example, a minimum of 5 on a numeric rating scale (Breivik et al., 2006)), or indicated that the pain should not include aches or pains that are fleeting or minor (for example Johannes et al., 2010), but many studies did not specify a minimum intensity.

In a large scale survey in 15 European countries, approximately 20% of the population suffers from chronic pain with an intensity of 5 or higher on an numeric rating scale and a duration of six months or more (Breivik et al., 2006). The prevalence of chronic pain in the Netherlands in this study was 18%, while figures ranged from 12% in Spain to 30% in Norway. A prevalence of approximately 20% for chronic pain with a duration of more than six months was also found in other studies (Blyth et al., 2001; Eriksen et al., 2003; Ohayon & Schatzberg, 2003; Sjogren et al., 2009), but higher prevalence numbers have also been reported (49% (Andersson et al., 1993), 40% (Brattberg et al., 1989), 31% (Johannes et al., 2010)).

Based on these studies, it can safely be concluded that at least one in five adults suffers from pain complaints with a duration of more than six months. Given a Dutch adult population of approximately 13.2 million people in 2012 (Statistics Netherlands, 2012), this would mean that in the Netherlands about 2.5 million adults suffer from long lasting pain of moderate to severe intensity. Given these numbers and the impact chronic pain has on medical consumption, work absenteeism and disablement, it comes as no surprise that the economic costs of chronic pain are enormous (Van Tulder et al., 1995; Borghouts et al., 1999; Maniadakis & Gray, 2000; Gustavsson et al., 2011; Gaskin & Richard, 2012; Gore et al., 2012; Raftery et al., 2012).
References


The (fictional) case of Mrs. A: Case description

Mrs. A is a 40-year old married woman and mother of two children (5 and 8 years old) who works part-time as an administrative assistant. She visits the Pain Center because of a longstanding pain complaint.

She has suffered from headaches since the age of 12. Ten years later, she also began to experience pain in her lower back, for which physical therapy could offer no relief. In the course of the following years, she also developed pain in the arms and legs. Presently, pain in the shoulder and neck region is her most prominent complaint.

The pain is constantly present and she describes it as “nagging” and “stabbing”. She can indicate no triggering factors and there is nothing she can do to relieve the pain. She says that she sleeps only 3-4 hours per night because of the pain. Currently, physical therapy gives insufficient relief. She uses naproxen (500 mg, 3 times per day) and amitriptyline (10 mg, once a day), without much effect.

Despite her pain complaint, she does her work, never calling in sick. Although she likes her work very much, she does experience working on the computer as physically exhausting. Dealing with her children and her household after a day at work is very tiring. She finds it difficult to ask for help, thinking that she should be able to do it all. She describes herself as a perfectionist.

In the past, psychological counseling for depressive symptoms helped her considerably. She says that she is a much stronger person now. Due to the pain, she currently experiences feelings of sadness and helplessness. The patient thinks nothing or no one can help her in dealing with the pain. She thinks it will never get any better.

On physical examination, a tense musculature of the cervical region was found. No neurological abnormalities were noted. The patient experienced a positive reaction to 14 out of the 18 tender points for fibromyalgia. X-rays and a MRI-scan showed no abnormalities. Asked about the intensity of the pain, she gives a score of 8 on a numeric rating scale for pain (with a range of 0-10).
The (fictional) case of Mr. B: Case description

Mr. B is a 56-year old married man with a 17-year old son, who works as a manager in a retail company. He was referred to the Pain Center by his general practitioner because of disabling pain in the lower back.

The pain in the lower back has been present for 10 years. Before that, he was an active man who played many sports and who never experienced back pain. In recent years, he also began experiencing pain in the thighs; first on the left side, and presently on both sides. The pain in the legs is worst in the morning. The pain in the lower back is constantly present and gets worse with physical activity.

His work, which requires a lot of standing, became too strenuous, leading to sick-leave for the past three months. He regrets that he is no longer able to do his work, but in view of his pain complaints, he does not think he will be able to return to work soon. He also experiences limitations in other physical activities. He has stopped gardening and sports, making his days much more inactive than in the past, mostly at home reading, watching TV and surfing on the internet, while his wife is at work and his son is at school. He does not experience any difference in mood. However, he does experience feelings of fatigue and he is afraid that physical activity will cause more pain.

Despite a normal X-ray, he thinks that there is something wrong with his back. Physical therapy had little effect, discontinuing it four months ago. Presently, he uses ibuprofen, 400 mg twice a day. When asked about his alcohol intake, he admits that he drinks a lot more than previously (on average 3-4 glasses a day, sometimes more).

On physical examination, a slight difference in the length of the legs was found. His gait was normal and the leg musculature was well developed. Neurological findings were normal. Asked about the intensity of the pain, the patient gives a score of 7 on a numeric rating scale for pain (with a range of 0-10).
PART 1

Mechanisms of chronic pain