Fear-avoidance as a risk factor for chronic pain.

Chapter 14

Fear-Avoidance as a Risk Factor for the Development of Chronic Back Pain and Disability

Linda Vancleef, Ida Flink, Steven Linton, and Johan Vlaeyen

14.1 Introduction

Chronic musculoskeletal pain syndromes are responsible for enormous costs for healthcare and society (Linton 1998; Phillips et al. 2008; Picavet and Schouten 2003; Verhaak et al. 1998). Nowadays, the biopsychosocial perspective on pain offers a good foundation for a better insight into how pain can become a persistent problem (Fordyce 1976; Turk and Flor 1999). In this perspective, pain and pain disability are influenced by the dynamic interaction among biological, psychological, and social factors.

The present chapter focuses on the role of fear and avoidance in the development and maintenance of chronic low back pain (CLBP). In the following paragraphs, an overview on the aetiology of low back pain (LBP), the conceptualization of fear and avoidance, and the development of fear-avoidance models will be provided. Furthermore, empirical evidence on the role of fear and avoidance behaviour in chronic pain, stemming from studies conducted in pain patients and in healthy volunteers, will be reviewed. This chapter will then continue with a discussion on how to assess fear of pain both at a direct and indirect level. Finally, this chapter will end with perspectives on the cognitive-behavioural management of chronic pain in patients who are characterized by increased pain-related fear and avoidance behaviour.

14.1.1 Chronic low back pain

LBP is one of the most prevalent complaints in the musculoskeletal apparatus. LBP refers to pain in the area of the lower back that often radiates to the buttocks or the legs. Recent reviews indicated that about 60–90% of the general population report to have experienced complaints in the lower back at some point throughout the course of their lives (Picavet and Schouten 2003). Population-based studies estimate the lifetime prevalence of LBP between 60–80% (Nachemson et al. 2000; Walker 2000). A study in the Belgian population showed that 41.8% of the respondents indicated to have experienced LBP for at least one day in the past period of 6 months. Moreover, 8.2% of this group reported that the pain in their lower back was seriously impeding daily functioning (Goubert et al. 2004a). These figures are comparable to other Western countries (e.g. Schmidt et al. 2007; Walker et al. 2004).

Only in a minority of people with LBP specific causes such as nerve injury, fractures, inflammation or malign disease are found to be responsible for the pain (Waddell 2004). In most cases the pain is denoted as non-specific, meaning that no specific biomedical cause can be found for LBP. For the majority of back pain patients who seek care and refrain from work, the problem of pain

resolves within a few weeks. These patients return to work and resume their daily activities within 4–6 weeks after the onset of the complaints. However, there is a small subgroup of patients (5–10% of the total population), in whom back pain persists for longer than 3 months, and who develop a chronic pain problem (Waddell 2004). Ironically, this relatively small group of back pain patients is responsible for the largest amount of healthcare and societal costs of back problems (Phillips et al. 2008; Waddell 2004). In addition, chronic pain is known to have an enormous impact on the personal and social relations of these chronic back pain patients (Sullivan et al. 2004; Morley and Eccleston 2004).

14.1.2 General explanatory models

Throughout time, several explanatory models have been put forward to explain why a small group of back pain patients become chronic pain sufferers. Biomedically oriented specialists have suggested that these patients have more serious impairments than those who resume daily activities earlier. However, no research supports this assumption. On the contrary, numerous studies have shown that there is no perfect relationship between impairment, pain, and disability. Patients with back problems often show no physical injury, and conversely, it happens that persons who do show physical injury do not report pain or disability (e.g. Jensen et al. 1994). The biomedical perspective that any pain is the result of structural and biomechanical abnormalities can also not account for phantom limb pain, where pain is experienced in missing body parts (Giummarra et al. 2007) or for the large interindividual differences that exist in the way persons experience, respond to, and cope with pain.

A biopsychosocial approach offers a better insight into how pain can become a persistent problem (Turk and Flor 1999; Waddell 2004). According to this approach, pain and pain disability are not only influenced by organic pathology, if present, but also by psychological and social factors. The interrelationship between the biological, psychological, and social factors, as well as their influence on the pain experience can be complex. As such, small content overlap does exist between the various factors, but different processes are assumed in each individual component of the model (Turk and Gatchel 2002; Waddel 2004). For example, processes and factors that influence the biomedical aspects of pain, like an injury, are different from those that influence the daily functioning of individuals in pain, like the affective evaluation of the sensory experience. In this multidimensional approach to pain, pain is conceived as a unique experience that can have divergent outcomes in terms of illness, disability and suffering. The major benefit of the biopsychosocial model concerns its flexibility in allowing a broad variety of factors to influence and determine each individual pain experience. On the other hand, the biopsychosocial model is conceived as a theoretical conceptualization only and does not possess explanatory power for the way in which biological, psychological, and social processes exert their influence on chronic pain. Under the biopsychosocial umbrella, several specific explanatory models have been developed that aim to clarify the role of specific factors in pain. Explanatory models on fear of pain are rooted in one of the most robust explanatory models in psychology, namely conditioning theory. Fear conditioning theories possess the power to explain why fears can exist and become chronic, even when the source of threat is not apparent.

14.2 Fear and avoidance

Fear and avoidance are central concepts to contemporary views on pain development and treatment.

Fear is generally conceived as a basic or pure emotion that represents a present-oriented state, an emotional reaction that is directed at an identifiable, concrete stimulus (Izard 1992;

Rachmann 2004). From an evolutionary perspective, fear serves to protect the individual from immediate threat. However, because fears can be both rational and irrational, fear responses can occur for either accurately or inaccurately perceived dangers. It is important to note at this point that fear cannot be equated to anxiety, although both terms are often used interchangeably. In contrast to fear, anxiety is a future-oriented state that is more diffuse, unfocussed, and less controllable than fear.

What pain patients are afraid of and what is thus seen as the object of fear in pain has been divided into three areas; fear of pain sensations (i.e. the pain itself), fear of pain-causing activities and fear of movement and (re)injury (Vlaeyen and Linton 2000). Other authors have emphasized that also more general aspects, such as threats to life-goals and identity, might be objects of fear in pain patients (Morley and Eccleston 2004). Fear of pain encompasses cognitive, physiologic, as well as motor processes Studies have demonstrated correlations between fear of pain and measures of anxiety, cognitive errors, depression, and disability (McCracken et al. 1992, 1996). CLBP patients may fear not only pain, but also activities that are expected to cause pain. In this case, fear is hypothesized to generalize to other situations that are closely linked to the feared stimulus. A specific fear is fear of movement and physical activity that is (wrongfully) assumed to cause (re) injury. Kori et al. (1990) introduced the term 'kinesiophobia' (kinesis=movement) for the condition in which a patient has 'an excessive, irrational, and debilitating fear of physical movement and activity resulting from a feeling of vulnerability to painful injury or re-injury'.

Avoidance refers to the performance (or withdrawal) of a behaviour so that an undesirable experience or situation is delayed or put off. Although in the case of chronic pain it is not possible to avoid the pain itself, activities that might increase pain or cause (re)injury can be avoided. Therefore, the suboptimal performance of activities is often taken as an index of avoidance behaviour in pain patients.

14.2.1 Fear-avoidance learning

Relying on both *classical* and *operant* conditioning principles, the two-factor theory by Mowrer (1947) has been an influential theory in explaining fear-avoidance acquisition. According to this theory, classical conditioning accounts for the acquisition of fear responses to aversive stimuli through learning of associations between stimuli. Neutral stimuli that are associated with unconditioned aversive stimuli (US) develop fearful qualities and become conditioned fear stimuli (CS). The likelihood of fear development is increased by exposure to high-intensity pain and/or fear situations, and by frequent repetitions of the association between the new conditioned stimulus and the pain/fear. Once objects or situations have acquired fear provoking qualities, they develop motivating properties and elicit conditioned (defensive) responses, including escape, avoidance, and safety seeking behaviours. For example, using a differential classical conditioning paradigm with visual cues as CS and electric shock as the US, Bradley et al. found that individuals responded with greater defensive reactivity in the context of threat cues (CS+) as compared to safe cues (CS−) who were never associate with the US (Bradley et al. 2008). The operant conditioning component of the two factor theory describes how defensive responses (e.g. avoidance) become persistent through learning of associations between behaviour and its consequences. The reduction of fear that is invoked by these responses serves as their negative reinforcement. Although Mowrer's two-factor theory has been very influential in the fear-avoidance literature, it is troubled by a number of shortcomings. For example, it can not explain the persistence of avoidance behaviour when the aversive stimulus has been withdrawn for a repeated number of times. Following conditioning principles, the absence of repeated unpleasant experiences should lead to the extinction of acquired avoidance behaviour. Furthermore, the basic premise of the theory that *all* fears are acquired by classical conditioning cannot be sustained, since several instances are

known in which persons develop fears for stimuli they have never encountered before (e.g. fear of snakes).

Fordyce et al. (1982) described how pain behaviour might result from avoidance learning. In the case of pain, a patient may no longer perform certain activities because he or she anticipates that these activities will increase pain and suffering. In the acute phase, avoidance behaviours such as resting, limping, or the use of supportive equipment are effective in reducing suffering from nociception. Later on, these protective pain and illness behaviours may persist in anticipation of pain, instead as of a response to it. Long-lasting avoidance of motor activities may lead to detrimental consequences, both physically (loss of mobility, muscle strength, and fitness, possibly resulting in the 'disuse syndrome') (Bortz 1984), and psychologically (loss of self-esteem, depression, and somatic preoccupation).

Although classical and operant learning principles are important mechanisms in the development of fear and avoidance behaviour, it seems likely that besides learning principles, other processes are important in fear-avoidance acquisition as well. Favouring a cognitive theory of avoidance learning, Philips (1987) takes the view that avoidance is influenced by the *expectancy* that further exposure to certain stimuli will promote pain and suffering. This expectancy is assumed to be based on previous aversive experiences in the same or similar situations. Since the avoidance behaviour displayed by pain patients and by patients with phobias shows large similarities, Philips suggested that, 'chronic pain and chronic fear—both aversive experiences which result in avoidance behaviour—may share important characteristics' (Philips 1987, p. 277). Several studies have focussed on the relationship between fear/anxiety and chronic pain, of which the object of fear has been fear of pain (Lethem et al., 1983), fear of work-related activities (Waddell 1987), and fear of movement that is assumed to cause (re)injury (Vlaeyen et al. 1995a, 1995b).

Usually, extinction of fear takes place when exposure to the feared stimulus does not lead to the adverse consequences anymore. In the area of pain, Philips was one of the first to argue for the systematic application of graded exposure to produce disconfirmations between expected and the actually experienced pain and harm (Philips 1987) Experimental support for this novel idea was provided by Crombez et al. (1996) in a sample of CLBP patients who were requested to perform four exercises (two with each leg) at maximal force. During each exercise, baseline pain and expected pain before the performance of the movement were recorded as well as the experienced pain during the movement. As predicted, the CLBP patients initially overpredicted pain, but after repeated exposure to the movements the overprediction was readily corrected. These findings were replicated with other movements, including bending forward and straight leg raising (Crombezet al. 2002b; Goubert et al. 2002). However, the later data also showed that these disconfirmations were context dependent. Indeed, when patients were exposed to a different movement, again overpredictions were made as if no exposure to a previous movement had taken place. This restriction of generalization was particularly true for those patients who catastrophically (mis)interpreted the pain. Exposure to the physical activities did not result in a fundamental change in the belief that certain movements are harmful or painful, but rather that the movements involved in the exposure sessions are less harmful or painful than anticipated.

14.2.2 Fear-avoidance model of pain

With the introduction of a 'fear-avoidance model of exaggerated pain perception' in 1983, Lethem and colleagues reserved a critical role for fear of pain and avoidance behaviour in the explanation of perpetuating pain complaints in the absence of organic pathology (Lethem et al. 1983). In this model, 'confrontation' and 'avoidance' are postulated as two extreme responses to the fear of pain.

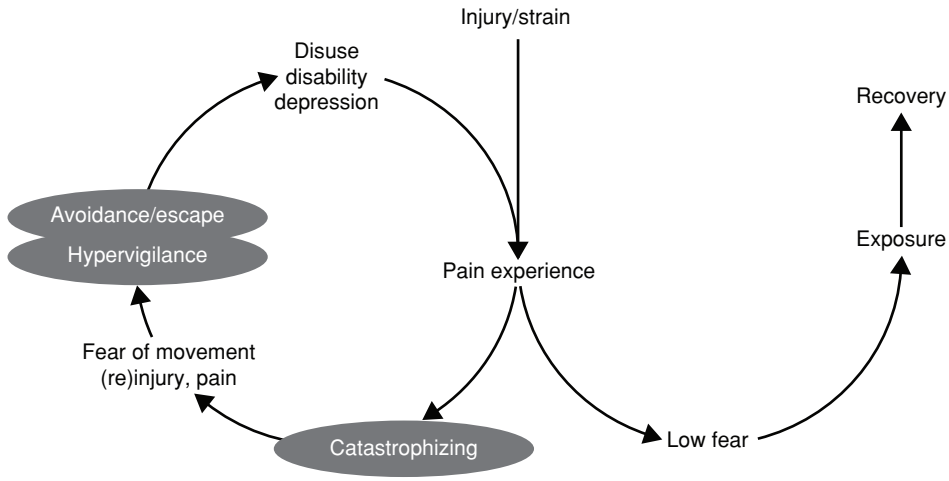

Fig. 14.1 Fear avoidance model of chronic pain. This figure has been reproduced with permission of the International Association for the Study of Pain® (IASP®). The figure may not be reproduced for any other purpose without permission.

While confrontation will lead to the reduction of fear over time, avoidance leads to the maintenance or exacerbation of fear, possible developing into a phobic-like state. The avoidance results in the reduction of both social and physical activities, which in turn can lead to a number of physical and psychological consequences augmenting the disability.

After the introduction of the fear-avoidance model by Lethem and the emphasis on the role of cognitions in avoidance by Philips, various cognitive-behavioural models of chronic pain have been proposed. These models are commonly referred to as contemporary fear-avoidance models, in which pain disability is conceived as the result of a vicious process that is determined by the interaction between cognitions and behaviour (Asmundson et al. 1999; Vlaeyen et al. 1995b; Waddell et al. 1993). Subtle differences aside, contemporary fear-avoidance models all share the same basic tenets, which can be easily understood from the integrated model that is illustrated in Figure 14.1. Upon the initial perception of pain, individuals assign a certain meaning and purpose to the painful experience that is based upon current expectations regarding the pain and prior learning history. Although the majority of individuals will evaluate the pain experience as undesirable and unpleasant at this stage, most persons will not perceive it as an extreme threat or an insurmountable catastrophe. These individuals will proactively and gradually *confront* their pain, and resume their daily activities, promoting health behaviours and early recovery. However, for a minority of individuals, the painful experiences, which are intensified during movement, will elicit catastrophizing cognitions. These catastrophic cognitions can then lead to pain-related fear (fear of pain, fear of movement, fear of (re)injury), which in its turn initiates the *avoidance* of potential painful activities and hypervigilance for potential signals of additional pain and bodily harm. As such, a vicious and self-perpetuating spiral is activated with avoidance of more and more (daily) activities, leading to functional disability and possibly also to social isolation and depression. In addition, physical deconditioning and depression may fuel the fear-avoidance cycle by increasing pain intensity and increasing the fearful appraisal of and selective attention to pain. In addition to the avoidance of fearful activities, pain disability may also persist because of the immediate consequences to which it leads, such as diminished pain, increased attention from others, and the avoidance of social conflicts or responsibility.

14.2.3 Empirical support for the main components of the fear-avoidance model

The fear avoidance model has offered a fruitful framework within which the development and maintenance of persisting pain complaints can be understood. Empirical support for the model has been found within the area of CLBP, osteoarthritis, neck pain, and chronic headache (e.g. Fritz et al. 2001; Leeuw et al. 2007a; Vlaeyen and Linton 2000; Waddell et al. 1993). This paragraph reviews experimental evidence for the main components of the fear-avoidance model.

Pain catastrophizing

Pain catastrophizing is conceived as a cognitive construct that represents the tendency to make exaggerated negative or threatening interpretations of pain (Sullivan et al. 1995). Pain catastrophizing has often been found closely related to fear of pain. In addition, a few studies have reported about the predictive value of pain catastrophizing for pain-related fear (Leeuw et al. 2007c; Vlaeyen et al. 1995b; 2004b). Elevated levels of pain-catastrophizing have been consistently found related to pain disability in chronic pain samples, acute pain samples, and pain-free volunteers (Peters et al. 2005; Severeijns et al. 2005; Sullivan et al. 2005; Turner et al. 2004). Furthermore, persons who tend to catastrophize about pain are found to show more hypervigilance for pain-related information, less tolerance for pain, and to report increased pain intensity levels when experiencing pain (Crombez et al. 2002a; Haythornthwaite et al. 2003; Peters et al. 2005; Sullivan et al. 2005; Turner et al. 2002). In prospective studies, pain catastrophizing has been found predictive of elevated pain intensity levels during a painful procedure or after an operation (Edwards et al. 2004; Sullivan et al. 1995; Vlaeyen et al. 2004b). For more detailed information on pain catastrophizing see also Chapter 13.

Pain-related fear

The importance of pain-related fear has been demonstrated in chronic and acute pain samples as well as in healthy volunteers possessing elevated levels of pain-related fear (Crombez et al. 1999; Leeuw et al. 2007a; Swinkels-Meewisse et al. 2006; Vlaeyen and Linton 2000). As such, LBP patients who are high in pain-related fear perform less well on behavioural (physical) performance tasks, like a walking test or a lifting task (Al Obaidi et al. 2003; Vlaeyen et al. 1995a; Vlaeyen and Linton 2000; Vowles and Gross 2003). Fear of movement/(re)injury showed to be a stronger predictor for detrimental performance on physical tasks then biomedical symptoms or severity and duration of the pain experience (Vlaeyen and Linton 2000). Furthermore, pain-related fears about work have been found related to disability of daily living and work lost in the past year, more so than to biomedical variables such as the anatomic pattern, the time pattern, or the severity of pain (Fritz et al. 2001; Waddell et al. 1993). In pain-free individuals, elevated levels of pain-related fear have been found associated with increased pain intensity ratings for experimentally induced pain (George et al. 2006; Roelofs et al. 2004b; Hirsh et al. 2008). In a number of prospective studies, pain-related fear proved to be a powerful predictors of disability 6 months or 1 year after acute pain onset (Klenerman et al. 1995; Swinkels-Meewisse et al. 2006; Turner et al. 2006; Vlaeyen et al. 1995b)

Avoidance behaviour

In chronic pain research, avoidance behaviour is commonly derived from the suboptimal performance of activities. Several studies have demonstrated that pain patients perform less well on behavioural performance tasks like lifting or walking tasks (Vlaeyen and Linton 2000). In addition, Crombez and colleagues (1999) showed that pain-related fear was associated with

escape/avoidance of physical activities, resulting in poor behavioural performance. More recently, a number of studies have provided support for the relation between pain-related fear and avoidance. Al Obaidi and colleagues (2003) demonstrated that pain-related fear was associated with decreased speed in preferred and fast walking. In addition, Geisser and colleagues (2000) and Vowles and Gross (2003) showed diminished performance on physical tasks in high pain-fearful individuals. Supporting the tenets of the fear-avoidance model, there is thus compelling evidence that pain-related fear underlies avoidance behaviours in chronic pain. Nevertheless, it should be noted that a number of studies failed to demonstrate a relationship between fear and avoidance (George et al. 2006; Huis in 't Veld et al. 2007, Michael and Burns 2004). For example, Reneman and colleagues found a weak to no relation at all between pain-related fear and performance of functional activities in a sample of CLBP patients (Reneman et al. 2003; Reneman et al. 2007). In addition, some studies showed conflicting results, in that pain-related fear was associated with task persistence rather than avoidance. Pain-related fear may elicit different behaviours depending on current goal context, and vice versa, outwardly similar behaviours may be driven by different motivational strategies. Such an affective-motivational perspective will probably initiate a next generation of studies addressing new questions including the following: (1) Can higher order goals inhibit the primary goal to protect the integrity of the body by hypervigilance, escape, and avoidance behaviour?; (2) What is the effect of life goal interference and goal conflict on pain-related fear? (see e.g. Karsdorp et al. 2010; Van Damme et al. 2008; Vlaeyen and Morley 2004).

Hypervigilance and attention

Hypervigilance for pain is defined as the excessive orientation towards pain and pain-related stimuli in both the external and the internal environment. Using Stroop paradigms and dot-probe tasks, a number of studies have provided evidence that pain fearful individuals do show attentional bias towards pain-related information or bodily sensations (Asmundson and Hadjistavropoulos 2007; Keogh et al. 2001; Roelofs et al. 2002, 2003). Furthermore, a series of studies have shown that pain demands attention and disrupts ongoing activities (Crombez et al. 1998a, 2002a; Eccleston and Crombez 1999). This disruptive effect of pain on attention has been demonstrated in pain patients as well as in healthy controls, and is dependent upon the novelty, unpredictability, and intensity of pain (Crombez et al. 1998a). Furthermore, a series of studies showed that pain-fearful patients attend more to pain-threatening signals, are less able to ignore pain-related information, and perform worse on cognitive demanding tasks in comparison to non-fearful patients (Crombez et al. 1998b, 2002a; de Gier et al. 2003; Eccleston et al. 1997; Peters et al. 2002). Supporting the idea that pain vigilance is dependent on pain-related fear, Deghani and colleagues (2004) reported a study in which reductions in pain-related fear account for diminished attentional bias for pain after treatment. In addition, experimental laboratory studies have repeatedly demonstrated the association between elevated levels of pain catastrophizing and deteriorated cognitive task performance under conditions of pain (Crombez et al. 2002a; Van Damme et al. 2002; Vancleef and Peters 2006). Recent evidence has shown that the interruptive effect of pain on attention results from the difficulty to *disengage* attention from pain-related information, rather then from an attentional shift towards pain (Asmundson et al. 2005; Roelofs et al. 2005; Van Damme et al. 2002). This attentional disengagement has been proposed to be enhanced by the anticipation of pain (Van Damme et al. 2004).

Depression

Although depressed mood is one of the presumed consequences of longstanding avoidance of daily activities, a small number of studies have actually examined depression in relation to pain-related fear. Grotle et al. (2004) found only modest associations between pain-related fear and a

measure of distress, both in acute and CLBP patients. Sullivan et al. (2008) examined the effects of a pain rehabilitation program aimed at work resumption on changes in levels of pain and depression. This study revealed that changes in depression were mainly predicted by the level of chronicity, and that this relationship was mediated by pain reduction, and not by changes in pain catastrophizing or fear of movement/re-injury. There is a need for more systematic studies examining the association between pain-related fear and depression.

Disuse

Frequent and enduring avoidance of daily activities may also result in gradual deterioration of a person's muscular system and fitness. The term 'disuse syndrome' refers to the physiological and psychological effects of a reduced level of physical activity in daily life (Bousema et al. 2007; Verbunt et al. 2003). Although often referred to in the literature, the disuse syndrome still is ill-defined (Wittink et al. 2000). Generally, two different aspects are distinguished: physical deconditioning, which can either be expressed in weakened muscle strength or reduced aerobic fitness, and disordered muscle coordination during physical activity (also called 'guarded movements'). Generally, the physical fitness levels of CLBP patients are found to be either lower or equal to that of healthy subjects (Verbunt et al. 2003). Only one current study succeeded in demonstrating that CLBP patients have lower aerobic fitness than matched healthy counterparts, while this could not be explained by pain-related fear or other relevant variables (Smeets et al. 2006). Evidence for disordered muscle coordination was found by (Geisser et al. 2004), who showed that among CLBP patients pain-related fear was not only associated with reduced lumbar flexion and greater EMG in full flexion, but also to abnormalities in the muscle activity during flexion from the standing position. These changes in musculoskeletal functioning and flexion may be important for the understanding of how pain may interfere with daily life functioning. In sum, it still is unclear what the effects of pain-related fear are on physical functioning, both in terms of reduced aerobic fitness as disordered muscle coordination (see also Chapter 12).

14.2.4 Vulnerabilities for fear of pain

The foregoing paragraphs offer support for the importance of pain-related fear and associated avoidance behaviour in chronic pain. However, an interesting issue that presents itself concerns the aetiology of pain-related fear. Complementing fear-learning theories as described in earlier paragraphs, several factors have been proposed to constitute vulnerability for pain-related fear. As such, research has indicated that fear of pain is closely related to a number of negative emotional constructs, like negative affectivity, trait anxiety, anxiety sensitivity, and injury/illness sensitivity (Keogh and Asmundson 2004; for more information see Chapter 12). Elevated levels of anxiety sensitivity and injury illness sensitivity have been frequently found related to maladaptive responses to pain in terms of reduced tolerance for pain, increased pain intensity levels, attention bias for pain etc (Stewart and Asmundson 2006; Vancleef and Peters 2006; Vancleef et al. 2006). In addition, trait anxiety and negative affectivity have been found related to increased pain intensity, increased discomfort and disability by the pain, hypervigilance for internal bodily sensations, and less adequate coping with and perceived control over pain (Keogh and Asmundson 2004; Stegen et al. 2001). One way to conceptualize the various constructs in relation to each other is by representing them in a hierarchical tree structure (Keogh and Asmundson 2004; Vancleef et al. 2006; Vancleef et al. 2009). In this hierarchical tree, fear of pain is conceived as the most *specific* construct that resides at the lowest level of the tree. Fear of pain is subordinated to anxiety sensitivity and injury illness sensitivity that in their turn subordinate to trait anxiety. One level above trait anxiety, negative affectivity represents the most *general* and stable negative emotional construct at the top of the tree. A hierarchical structure offers an elucidating framework for the

conceptualization of pain-relevant negative emotional constructs. As such, content overlap between the constructs is accounted for by interrelations between constructs, while each individual construct possesses unique explanatory value for pain as well. According to the tree structure, pain-related fear will exert the most direct influence on pain, while influences of other like anxiety sensitivity for example are understood to run through the specific fears that are found at the lower positioned levels. It is important to note that the hierarchical structure serves a mere theoretical conceptualization to date that serves to aid our understanding of the relative contribution of various negative emotional constructs to pain. Nevertheless, it seems obvious that general and stable anxiety related constructs entail vulnerability for pain-related fear and pain catastrophizing. Therefore, it is important that diagnostic and treatment approaches to pain keep these other pain anxiety constructs into account in understanding and treating individual pain problems.

14.3 Assessment of pain-related fear

Patients with fear of pain are at risk for developing persistent back pain and disability, which implies a need to make a thorough assessment of pain-related fear and avoidance. As pain-related fear involves cognitions, emotions, overt behaviour and physiological responses, several methods are needed to fully understand patients' reactions to pain. This section provides an overview of assessment tools that are frequently used in current research and clinical practice to assess pain-related fear. As such, both clinicians and researchers rely heavily on interviews and self-report measures to assess fear. Several widely used validated questionnaires are also useful tools in the assessment of fear. Furthermore, another tool based on pictures of every day movements is helpful in determining fear and above all the avoidance of movements. In order to get a more complete picture and to be able to grasp different components of the object of pain-related fear, self-report measures are often combined with observational or physiological measures. A multimodal assessment presumably helps us to reach a better understanding of patients' fear of pain.

14.3.1 Self-report measures

The most common way to assess pain-related fear is through self-report measures which cover different aspects of fear. Most of these focus on cognitive and affective responsivity that may indicate fear. A challenge in developing self-report measures has been isolating the emotional response as opposed to measuring 'beliefs'. Indeed, many of the instruments available appear to tap into beliefs that the patient holds rather than things that actually provoke fear. Similarly, some instruments may measure affect but may be more oriented towards 'worry' rather than to actual fear. Although this may seem to some to be a mute point, the differences may be significant especially if the proposed treatment (see the section on exposure *in vivo*) focuses on fear. At present, a large number of self-report measures are available for the assessment of pain-related fear. The choice for one measure over the other mainly depends on the object of fear (e.g. fear of pain, fear of movement, fear of re-injury), and the fear specific concerns (e.g. cognitive concerns, physical concerns, emotional concerns) one aims to measure. Furthermore, whereas some measures are more generally applicable for assessing fear in both healthy and pain populations, others are more appropriate for assessment in specific pain patient groups only (e.g. cervical pain, back pain). Some of the most commonly used self-report measures of pain-related fear in the current assessment and treatment of pain-related fear are listed below. However, this list is not conclusive, and other measures, including modified versions of the questionnaires described below are eligible for use in pain research and clinical practice as well.

It should be noted that self-report instruments are subject to a number of drawbacks that have to be kept in mind when interpreting results of these measures. As such, respondents might not always report their genuine thoughts and feelings, because of social desirability, response bias, or simply because they are unable to access and grasp their real concerns. Furthermore, no one-to-one relationship between the measure and the latent construct it represents can be assumed. Nevertheless, keeping these drawbacks in mind, psychometric evaluated self-report measures are easy to administer, at low-cost, but still offer valuable information to researchers and clinicians.

Fear of pain

The *Pain and Impairment Relationship Scale (PAIRS)* was an early attempt to capture chronic pain patients' beliefs and attitudes towards pain and ability to function despite pain (Riley et al. 1988). It consists of 15 statements about pain and activity (e.g. 'I can't go about my normal life activities when I am in pain', 'An increase in pain is an indication that I should stop what I am doing until the pain decreases') which are rated on a seven-point scale (0=completely disagree; 6=completely agree). The scale has been found to have good psychometric properties (DeGood and Shutty 1992) and may be used to assess beliefs about pain and activity. As this scale was a relatively early attempt to assess pain-related fear, it is not clear what processes it in fact captures. Indeed, it appears to assess a wide range of attitudes and beliefs concerning living with persistent pain that go beyond fear of pain.

The *Pain Anxiety Symptoms Scale (PASS)* was developed to measure general anxiety and fear in people with chronic pain (McCracken et al. 1992). The original scale consisted of 40 items intended to assess four aspects of pain-related anxiety: (1) fearful appraisal of pain (e.g. 'When I feel pain I am afraid something terrible will happen'): (2) cognitive anxiety (e.g. 'During painful episodes it is difficult for me to think of anything besides the pain'): (3) physiological anxiety (e.g. 'Pain seems to cause my heart to pound or race'): (4) escape and avoidance behaviour (e.g. 'I avoid important activities when I hurt'). Responders how often they have these thoughts or sensations on a six-point scale (0=never; 5=always). Later, a shortened version of the scale was developed and validated (PASS-20) (McCracken and Dhingra 2002). The short form version has 20 items and has been found to be a good reflection of the original PASS (Roelofs et al. 2004a). One of the advantages with this measure is that it includes bodily indicators of fear through questions about physiological arousal. However, as these reactions might appear as a direct consequence of pain, it is difficult to determine whether it actually captures indicators of fear. Furthermore, as bodily reactions are difficult to assess through self-report measures, physiological measures might be preferable if available. In addition, the questions in the PASS presume that the individual has an earlier or present experience of pain problems. This makes the PASS inappropriate for use with people who are not clinical pain patients.

The *Fear of Pain Questionnaire-III (FPQ-III)* (McNeil and Rainwater 1998) was developed to assess fear associated with both acute and chronic pain in healthy individuals. People are asked to rate their fear of pain in 30 situations, which are divided into: (1) severe pain (e.g. 'Breaking your leg'), (2) minor pain (e.g. ' Having a muscle cramp) and (3) medical pain (e.g. "Having a tooth pulled"). Answers are given on a five-point scale (1=no fear at all; 5=extreme fear). Recently, a shortened version of the scale has been developed (FPQ-SF) (Asmundson et al. 2008). The authors suggest that the FPQ-SF is a more psychometrically sound alternative to the original scale. One advantage of the FPQ is that it is possible to use it both with pain and non-pain populations as the questions do not imply any earlier clinical experience of pain. However, the non-clinical focus of the scale might make it less relevant to use for clinical purposes as some of the items describe events that are far from clinical situations (e.g. having sand or dust blowing into your eyes; gulping a hot drink before it has cooled).

Fear of pain-causing activities

The Fear-Avoidance Beliefs Questionnaire (FABQ) (Waddell et al. 1993) is used to assess pain patients' beliefs about possible harm from work and physical activities. It has 16 items which are divided into two subscales; (1) fear-avoidance beliefs about physical activity (e.g. 'Physical activity might harm my back') and (2) fear-avoidance beliefs about work ('My work aggravated my pain'). Answers are given on a seven-point scale (0=completely disagree; 6=completely agree). The scale has been found to have good psychometric properties in patients with both acute and long-term pain (Swinkels-Meewisse et al. 2003; Waddell et al. 1993), and may be used to identify beliefs that are related to pain-related disability and work loss. One of the disadvantages with this questionnaire might be, contrary to what the name of the scale indicates that it assesses *beliefs* rather than fear per se. It might be possible that people hold such beliefs without being particularly fearful, which is important to take into account when using this scale in a clinical context.

Fear of movement and (re)injury

The Tampa Scale for Kinesiophobia (TSK) (Kori et al. 1990) has been developed to assess patients' fear of (re)injury due to movement, and consists of 17 items (e.g. 'Pain always means I have injured my body' and 'If I try to overcome it, my pain would increase').

Later, a shorter version of the TSK has been developed and validated, containing only 13 items as it excludes the four items that are reverse scored. This version has greater internal consistency and is composed of two lower-order factors ('Activity Avoidance' and 'Somatic Focus') that also load on a single higher-order factor (Geisser et al. 2000). A number of studies have corroborated the two-factor structure of TSK, which also appeared invariant across pain diagnoses and Dutch, Swedish, and Canadian samples (Goubert et al. 2004b; Roelofs et al. 2007). One concern that has been highlighted about the TSK is that some items have troublesome wording (Pool et al. 2009). More specifically, some questions seem to be difficult to understand because they employ words such as 'dangerous' and 'injury' that may have different meanings for different patients. Some items also use negations which may be difficult for some patients to understand. These reflections might be important to take into consideration when using the TSK with patients.

Perceived harmfulness of movements: the PHODA

When fear of movement is assessed in a clinical context, the Photograph Series of Daily Activities (PHODA) (Kugler et al. 1999) is a pictorial assessment tool which consists of 98 photographs of various daily-life activities (e.g. walking, lifting, bending, etc.). Patients are asked to rate how harmful they think each activity would be to their back by placing the photographs on a thermometer which ranges from 0 (=not at all harmful) to 100 (=extremely harmful). Although the PHODA mainly is used as a self-report measure, it also provides the clinician with an opportunity to observe and discuss the patient's fear when confronted with different activities. The PHODA is commonly used in the assessment phase of exposure *in vivo*, a treatment for pain-related fear that is described later in this chapter. Recently, an electronic and shortened version of the PHODA (PHODA-SeV) was developed and validated (Leeuw et al. 2007b). It showed excellent psychometric properties, which implies that it is a proper alternative to the original version. One limitation that has been raised is that the PHODA seems to be more appropriate for highly fearful pain patients and less applicable for those with low or mediate levels of fear (Trost et al. 2009). Nevertheless, because the PHODA consists of photographs of real activities, it may be a clinically useful tool for revealing the patients' beliefs and concerns about specific movements. This is an important basis for the exposure treatment and one which may be quite difficult without tools such as the PHODA.

An alternative measure to assess fear of movement is the Pictorial Fear of Activity Scale-Cervical (PFActS-C) (Turk et al. 2008). This instrument was recently developed to assess fear of movement that is specifically related to neck pain. The PFActS-C differs from the PHODA in its specific focus on neck pain and the varying degree of mechanical load that is incorporated in the photographs. The instrument consists of 77 photographs of movements with varying biomechanical stress. Respondents are asked, for each photograph, to rate on a scale from 0 (=no fear at all) to 10 (=extremely fearful) how worried or fearful they would be to perform the activity as shown in the picture A first validation study in a group of neck pain patients indicated that the PFActS-C is a promising tool for assessing fear of movement in patients with cervical pain (Turk et al. 2008). However, since this tool is still rather new, more research is needed to examine its applicability.

14.3.2 Interview

Apart from questionnaires, every assessment of pain-related fear also involves a rigorous interview. The semi-structured interview is an important tool for collecting additional information about the patient's cognitions, emotions and overt behaviour (e.g. avoidance) in relation to pain. The clinician also may get a better picture of the role fear and avoidance may have played in the aetiology and maintenance of the pain and disability problem. However, as the interview provides a purely subjective picture of the pain problem, it should be complemented by other assessment tools. Some of the areas that are covered in the interview are listed in Table 14.1

14.3.3 Self-assessment

Self-assessment is a useful supplement to the interview. Self-assessment is one of the most commonly used methods in psychological research and practice (Sigmon and LaMattina 2006). In self-assessment, the patients systematically observe and record their own behaviour. In pain

Table 14.1 Interview in assessment of pain-related fear

Description of the pain	Where do you have pain? What does the pain feel like? How intense is the pain? (0–10) When does it hurt more? When does it hurt less?
Learning history	When did the pain start? How did it develop? What do you think has made your pain problem worse?
Cognitions	What do you think causes your pain? When you do something that provokes the pain, what goes through your mind? What do you think it will lead to in the future? What is the worst thing that could happen?
Emotions	What emotions do you have in relation to the pain? Are there any activities that you are afraid of doing?
Activities/ movements vs. avoidance	What are you able to do despite the pain? What activities do you avoid because of the pain? How active are you in daily life?
Coping vs. safety behaviours	What do you do to stand the pain? What do you do when the pain gets worse? What do you do to be able to perform activities that are difficult because of pain?

patients, diaries are used to keep record of situations that provoke fear and avoidance. Often, the patients also use the diary to register their daily activities, which may be an indirect measure of fear and avoidance. In the last years, research about the use of electronic diaries in pain assessment has increased (e.g. Jamison et al. 2001; Peters et al. 2000). Maybe this will become more common in clinical practice in the future. At the moment, however, paper-and-pencil diaries are still the most widely used tools in self-assessment of pain-related fear.

14.3.4 Observational measures

Even though it is well known that patients express fear of pain both verbally and non-verbally, there are few standardized tools to assess overt behaviour. Fear of pain has been associated with a number of overt behaviours, such as diminished physical performance and escape/avoidance behaviour (Leeuw et al. 2007a). In a clinical situation, clinicians may instinctively observe how the patient reacts to pain and movement, and use this information in the further assessment. Notwithstanding, a thorough observational assessment is seldom accomplished. There are observational measures which aim to assess pain behaviour (e.g. Weiner et al. 1996). However, these are not developed to capture fear. In verbal assessment of fear, we do not rely solely on one question or on what the patients tell us at first glance, but complement this with standardized questionnaires. A comparable scrupulous assessment of overt behaviour would help us to reach a better understanding of patients' pain-related fear.

Assessment of other overt behaviours may also help to reach a better understanding of pain-related fear. Facial expression has been suggested to be a potential target for assessment (McNeil and Vowles 2004). However, there is still a lack of appropriate assessment tools for facial expression as a non-verbal manifestation of pain-related fear.

14.3.5 Physiological measures

In the last decades, researchers have paid increasing attention to psychophysiological recordings as an assessment tool for pain-related fear and anxiety. In particular, Flor and her colleagues have contributed to the growing knowledge about how psychophysiological measures may be used in the area of pain (Flor et al. 2001), including as indicators of fear. Muscle tension, skin conductance, and heart rate are some of the targets for psychophysiological assessments in pain patients (Andrasik and Flor 2008). Also the startle reflex, an involuntary eye blink movement, has been used in experiments as an indicator of fear (e.g. Carleton et al. 2006; Naliboff et al. 2008). In clinical settings, however, it is still uncommon to include physiological measures when assessing fear. A challenge for the future is the development of sound psychophysiological measures that may be used in the clinical assessment of pain-related fear.

14.3.6 Additional measures

In addition to explicit and physiological measures of fear of pain, researchers have relied on *indirect* cognitive measures of indicators of fear and anxiety related to pain. In these measures, variables of interest (beliefs, attitudes, cognitive biases) are inferred from behavioural responses (e.g. reaction times, reading times) within a specific context. Characteristic to these measures is the fact that they assess cognitive processes, beliefs, and attitudes without the awareness or control of the participant. Experimental research often uses automatized cognitive processing tasks like the modified Stroop task and the dot probe paradigm to assess attention bias for pain. In the modified Stroop task, categories of sensory or affective pain words and neutral words are presented in different colours. Responders are asked to name the colour of each word and response times are compared. Typically, it takes longer to name the colour when the information is threatening; in

this case when pain words are presented. In the dot probe paradigm, one neutral word and one pain-related word are presented simultaneously on a screen. Next, one of the words is replaced by a dot. Response times for when the dot replaces neutral and pain-related words are compared. In pain patients and pain-fearful individuals, reaction time is expected to be shorter when the dot replaces pain words, due to attentional biases. Both the modified Stroop task and the dot probe paradigm are tests of attentional bias which may presumably indicate fear. There are mixed results, however, concerning whether these tests are reliable indicators of fear (e.g. Asmundson et al. 2005; Pincus and Morley 2001; Roelofs et al. 2002).

Furthermore, a few studies have relied on *implicit association measures* to assess the attitudes and beliefs that pain-fearful individuals possess regarding pain and disability. These studies demonstrated that CLBP patient who are high in pain-related fear possess stronger associations between pain and threat than low-fearful patients do. Furthermore, Goubert et al. (2003) reported about a general implicit negative attitude towards back-stressing pictures in healthy individuals, using an affective priming task. Recently, Leeuw and colleagues (2007d) used two association tasks, the implicit association task and the go-no-go association task, to measure implicit fear of movement(re) injury in a group of CLBP patients and pain-free controls. Results did not indicate implicit fear of movement(re)injury in both groups, nor did the authors observe differences in the implicit attitudes between the patient and the control group. Nevertheless, the authors argued that psychometric and methodological difficulties of the paradigms might explain the lack of findings. In general implicit measures are promising techniques that might be able to reveal those aspects of pain-related fear that are inaccessible to explicit measures like self-report and interviews.

14.4 Treating pain-related fear

Exposure *in vivo* is a novel treatment approach which has been developed to target fear of pain. As seen earlier in this chapter, fear and avoidance may be essential factors that maintain pain and dysfunction in some patients. It has been stated that 'Fear of pain and what we do about it may be more disabling than pain itself' (Waddell et al. 1993, p. 164). Based on this, graded exposure *in vivo* recently was developed as a cognitive-behavioural treatment for patients with back pain and high levels of pain-related fear (Vlaeyen et al. 2004a). Today, it is the only standardized and evidence-based treatment which exclusively focuses on reducing pain-related fear and avoidance.

Because exposure *in vivo* is the 'treatment of choice' for patients suffering from excessive fears, e.g. phobias (Barlow 2000), it would also seem to be ideal for patients with pain-related fear. Accordingly, exposure *in vivo* for pain-related fear relies on the same principles as exposure therapy for phobia. In fact, Kori et al. (1990) went so far as to call fear-related pain a phobia, introducing the term 'kinesiophobia' as a description of 'an excessive, irrational, and debilitating fear of physical movement and activity resulting from a feeling of vulnerability to painful injury or reinjury'. Avoidance of the feared stimuli, which here refers to movements, maintains and exaggerates the fear. During exposure, phobic patients confront the feared stimuli until habituation, i.e. until the fear decreases and finally dissipates. The same principles may be transferred to pain patients. During exposure for pain-related fear, the patient is gradually exposed to movements following the hierarchy until extinction of defensive fear responses occur. Besides the effect of extinction there may also be benefits in terms of cognitions. As the fear and avoidance model underscores, performing a feared movement may be associated with catastrophic expectations which, during exposure *in vivo*, are challenged and disconfirmed (Vlaeyen et al. 2008). The main goal in exposure *in vivo* is hence that the patient confronts what (s)he is afraid of as a way to become less fearful. Recent evidence shows that learned associations between certain movements

and pain are not abolished during exposure, but that inhibitory learning occurs. This means that the initial associations remain stored in memory, but that the individual has learned to inhibit the conditioned (defence) responses. Moreover, the inhibitory learning appears to be context dependent, thereby limiting generalization of extinction to other contexts (Craske et al. 2008; Crombez et al. 2002b).

14.4.1 Main components of exposure

Assessment

The first step in graded exposure *in vivo* is to perform a thorough assessment of pain-related fear and avoidance. As assessment has been discussed earlier in this chapter, let us simply review this briefly here. A proper assessment is a prerequisite for the treatment as it serves to identify target movements for the exposure. The intention is to get a complete picture of how the patient's fear and avoidance maintain the pain problem. The PHODA (Leeuw et al. 2007b), an instrument with pictures of daily activities that patients rate for fear, is an especially important tool in the assessment. Thus, the PHODA provides information as to *which* movements the patient is fearful of and also *how* afraid they are of each movement. This information is employed to develop a hierarchy of feared movements. The PHODA may also be used to reveal catastrophic (mis)interpretations and irrational beliefs that patients have about movements and pain. At the end of assessment, the therapist should have a clear idea of what movements the patient avoids and what beliefs and catastrophic thoughts are linked to these movements; this will be the focus of the treatment.

Defining goals

During the assessment phase, the patient and the therapist agree on a limited number of specific treatment goals. Goal setting serves a number of important functions. First, the goals serve as a clear statement of the aim of exposure. A primary aim in cognitive behavioural treatments for pain is to restore functional ability, and not simply to get rid of the pain. Therefore, goals should focus on activities and not on pain reduction. Second, when the patient has been involved in developing goals they view as quite valuable; they become more engaged in the treatment and naturally take a more active role in the treatment. Third, goals help to structure the treatment. By establishing goals the patient and the therapist share a picture of what they are striving towards. The goals also make it easier to establish a hierarchy which involves movements that are important for the patient to restore. Typically, a hierarchy includes daily activities that the patient desires to resume or develop such as hobbies, family life, or work. Fourth, goals are also used as an evaluation tool. With clear goals, both the patient and the therapist may evaluate treatment progress and see whether the exposure has succeeded or not. Typical example of treatment goals are shown in Table 14.2.

Table 14.2 Typical examples of treatment goals

Goal	Description
Play with my kids	Play actively with my kids 30 minutes in the garden twice a week, including lifting them, bending over etc.
Play soccer	Play soccer with my old team 1 hour once a week
Increase my work time	Increase my work time from 25% to 75% at my ordinary work place, including performing all duties.
Do the weekly shopping	Do the weekly shopping by myself, including carrying the bags to the car

Table 14.3 An example of a graded fear-hierarchy of pain-related fear stimuli

Goal: To play with my kids in the garden 30 minutes, twice a week		
Movement/activity	**Pretreatment PHODA score**	**Post-treatment PHODA score**
Running while carrying a child on my shoulders	100	20
Riding off a pavement with a bicycle	90	15
Lifting a child from the floor	80	0
Bending forward to pick up tools from the floor	70	0
Jumping up and down	50	0
Walking up and down the stairs	30	0

Establishing hierarchies

Once treatment goals are identified, the therapist and the patient need to establish a fear hierarchy. The hierarchy consists of movements that provoke pain-related fear starting with those inducing only a little fear to those trigger a maximum of fear. It normally will include 5–10 steps or movements. An example of a graded fear-hierarchy is shown in Table 14.3. Exposure begins with a movement that provokes only a small amount of fear. When habituation occurs and the patient is able to perform the movement without provoking fear, then the next movement in the hierarchy is tackled. This procedure continues until the patient is able to perform all of the movements in the hierarchy, including the goal activity, without provoking very much fear. In this way, function is restored and the clear goals of the treatment are achieved.

Education

Education is an important part of the treatment. The purpose of the psychoeducation is to provide a clear rational and to engage the patient. Before being exposed to any fear-provoking stimuli, the patient should understand how and why exposure should reduce fear, and how this will bring the patient closer to his or her goals. The therapist explains the fear-avoidance model, using the patient's own history and wording as much as possible. If the patient does not use the word 'fear', other words may be more suitable. An essential message in the education is that fear and avoidance are natural and normal responses to acute pain, but that they paradoxically maintain fear and pain in the long term. Another point is that long-term back, neck or shoulder pain typically signals that muscles are working too hard to protect the back (resulting in muscle pain) rather than from damage to the spine. There is some evidence that psychoeducation in itself may have some effect in reducing pain-related fear and disability (Burton et al. 1999; de Jong et al. 2005b; Moore et al. 2000). The psychoeducation aims to enhance the patient's understanding of how the exposure treatment will help them to deal with their fears and achieve their goals concerning function.

Graded exposure

The keystone in exposure is, of course, when the patient actually exposes himself to previously avoided stimuli according to the fear hierarchy. The patient starts at lower level of the hierarchy, with a movement that provokes relatively less intense fear. First, the therapist serves as a role model and demonstrates the movement. Then, the patient performs the movement, with verbal support from the therapist. The general principles for exposure are followed: the patient is exposed to the feared stimuli for a prolonged time, until fear and anxiety decreases significantly. In exposure for pain-related fear, the patient consequently performs the movement several times.

The therapist encourages the patient to do the exposure without using safety behaviours, i.e. subtle strategies that patients use to 'protect' themselves (guarded walking, relaxation, seeking social support, etc.). Safety behaviours are subtle avoidance behaviours which may hinder the effect of exposure (Tang et al. 2007; Vlaeyen et al. 2004a). In between exposure sessions, the patient is told to continue the exposure at home by performing homework assignments. Besides reducing fear and re-establishing physical function, this helps the patient to generalize the effects and enhance self-efficacy. All treatment sessions follow the same structure, each time at a higher level in the hierarchy, to systematically decrease the patient's pain-related fear.

Behavioural experiments

The graded exposure *in vivo* might be combined with behavioural experiments (Bennett-Levy et al. 2004; Vlaeyen et al. 2004a). Behavioural experiments have been developed from cognitive theory, to create a collaborative empiricism. The purpose is to challenge irrational beliefs and catastrophic (mis)interpretations about pain and movement. In a behavioural experiment, the patient first formulates the belief and rates its credibility. Then, an alternative belief is formulated and the patient rates its credibility. Next, the patient performs the movement and describes what happens. Finally, the outcome is compared to the expectation and conclusions are drawn. Table 14.4 displays an example of a behavioural experiment in a patient with pain-related fear. The main goal with behavioural experiments is to challenge and adjust irrational beliefs but may also be used as a way to encourage patients to view the exposure as an experiment in which new behaviours are tested.

14.4.2 Evidence for exposure *in vivo*

Exposure *in vivo* is a promising treatment approach for patients with pain-related fear. Two recent reviews concluded that exposure *in vivo* is currently the treatment of choice for such patients (; Bailey et al. 2010; Lohnberg 2007). The first research about the effect of exposure was a series of studies using a replicated single-case experimental design. These showed that graded exposure *in vivo* was effective in reducing pain-related fear, avoidance behaviour, and to some extent also pain intensity in patients with back pain (Boersma et al. 2004; Linton et al. 2002; Vlaeyen et al. 2001). Later, the same type of design was used to evaluate the effect in other groups of patients. These studies demonstrate the same basic results in patients with complex regional pain syndrome (de Jong et al. 2005a) and in patients with neck pain after a motor vehicle accident (de Jong et al. 2008). Further evidence was then provided in randomized control trials (RCTs). RCTs are generally seen as the most powerful way of demonstrating that an intervention is effective (Kazdin 2003). Recently, three RCTs have been published, evaluating the effect of exposure

Table 14.4 An example of a behavioural experiment in a patient with pain-related fear

Belief/thought	Rating of credibility before the experiment	Rating of credibility after the experiment
Belief/catastrophic thought: 'If I jump from the chair, I will get excruciating pain (10 on a scale 0–10)'	85%	20%
Alternative belief: 'If I jump from the chair, my pain will only increase slightly (2 on a scale 0–10)'	15%	80%
What happened: The pain increased slightly (from 2 to 3 on a scale 0–10)		
Conclusion: The original thought was an overestimation of the harmfulness of the movement. The alternative belief is more realistic.		

in patients with long-term back pain (Leeuw et al. 2008; Linton et al. 2008; Woods and Asmundson 2008). Although the results are not as striking as in the single-subject studies, exposure was found to result in moderate to large effects for reducing pain-related fear, catastrophic thoughts, disability and pain. However, when compared to graded activity, a commonly used treatment in pain rehabilitation, the results were more modest (Leeuw et al. 2008; Woods and Asmundson 2008). The exposure groups showed larger improvements on measures of pain-related fear and anxiety, beliefs, and catastrophizing, but on measures of disability and pain both treatments appeared to be about equally effective. Overall, these studies show that exposure may be an important treatment, but that it cannot yet be recommended as a 'stand alone' treatment. As the authors of one of the studies suggest (Woods and Asmundson 2008), it is important to explore the use of exposure in applied multidisciplinary treatment settings. Given that patients with high levels of pain-related fear become noticeably less fearful and anxious through exposure, it has potential to be a successful addition to ordinary treatment packages for fearful patients suffering from long-term pain. Likewise, new advances in delivering exposure treatments may also improve its utility.

14.5 Future directions

This chapter shows that the literature on fear-avoidance has strong roots in the learning–conditioning theory. The classical conditioning account of fear development predicts that neutral stimuli can develop fearful qualities and become conditioned fear stimuli (CS) when they are associated with unconditioned aversive stimuli (US). Following this theory, the *nature* of the CS and the US determines the kind of fear. Future research should focus more on the nature of both types of stimuli in fear development. On a continuum from 'outside' to 'inside' the body—an exteroceptive-interoceptive continuum—three types of sensorial receptors can be distinguished. *Exteroceptors* are situated closely to the bodily surface and are sensitive to mechanical and electromechanical energetic fields surrounding the organism. *Proprioceptors* are sensitive to the orientation and the action of parts of the body in space. *Interoceptors* are located in the cavities of the body and form the basis for the neural representation of the viscera and the vascular system. Traditionally, human fear conditioning studies have used paradigms in which affectively neutral, exteroceptive stimuli (CSs, e.g. a picture or a tone) become predictors for an aversive physical event (e.g. pain). Pain research has focused more on proprioceptive stimuli (i.e. kinesiophobia). Certain movements may have acquired the features of a CS as they have been associated with a US (more pain), and create fear of movement. Strangely enough, there is much less information in the pain literature on interoceptive fear conditioning. Interoceptive cues (e.g. muscle spasms, mild pain, dizziness . . .) can also become CSs and this might be a particular form of fear conditioning differentiates the fear of 'pain' construct from the fear of 'movement' construct (De Peuter et al. 2010). The fear of pain construct might be more relevant in physical complaints where the musculoskeletal system is less involved. Besides the theoretical importance of examining this idea more into detail, findings may also lead to different therapeutic interventions. For example, interoceptive exposure has been reported as an effective treatment in patients with panic disorder, assumed to be mediated by interoceptive fear conditioning (Walker and Furer 2008). At this point, it is important to note that the term 'fear-avoidance' as introduced by Lethem et al. in 1983 might need reconsideration given the fact that it points only to one defensive mechanism: avoidance. It might be more appropriate to adopt the general term 'pain-related fear', which could be defined as the fear that originated in associations where pain is the US. Depending on the CS, this general term can then be subdivided in fear of movement (proprioceptive fear), fear of pain (interoceptive fear), fear of sounds (exteroceptieve fear, for example in headaches), etc . . . or more diffuse pain anxiety.

A second direction for further research on fear-avoidance stems from commonly observed and complex situations in which the individual cannot identify discrete cues that signal or predict the US. In that case the context in which the US occurs becomes the US, and theorists have introduced the term 'contextual' fear for this form of fear, which has a lot of resemblances with generalized anxiety disorder (Vansteenwegen et al. 2008). Some authors prefer the term 'anxiety' above fear. In the case of contextual fear with pain as the US, one could speak of 'pain anxiety'. The characteristics of pain anxiety are that the defensive responses last longer as contextual stimuli usually are temporally quite stable.

In sum, since the early writings in the 1980s we have made considerable progress in the understanding and management of pain-related fear and anxiety, and we look forward to further exploration and fine tuning of these processes in the near future.

Acknowledgements

The contribution of Johan W. S. Vlaeyen was supported by the NWO Social Sciences Research Council of the Netherlands, Grant No. 453–04-003, and by an Odysseus Grant of the Research Foundation Flanders, Belgium (FWO).

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