DEVELOPMENT OF THE SENSITIVITY TO PAIN TRAUMATIZATION SCALE (SPTS) USING ITEM RESPONSE THEORY ANALYSIS

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Development of the Sensitivity to Pain Traumatization (SPT) Scale Using Item Response Theory Analysis

By

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ABSTRACT

The aim of this study was to develop a preliminary scale to measure the construct known as 'Sensitivity to Pain Traumatization.' Sensitivity to pain traumatization refers to the anxiety-related cognitive, emotional and behavioural reactions to pain that resemble symptoms of posttraumatic stress disorder. An initial set of 79 items was developed through consultation of experts, literature review, and examining other pain-related anxiety scales. The responses to these items, given to a sample of 116 participants, were analyzed and assessed using nonparametric item response theory-kernel smoothing, parametric item response theory-graded response model and classical test theory approaches. The final Sensitivity to Pain Traumatization Scale, consisting of 12 items, reveals a one-factor structure and shows good preliminary psychometric properties.

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Introduction

A major challenge for pain clinicians and researchers has been the lack of clarity and consensus on the objective measurement of pain (Craig & Hadjistavropoulos, 2004). Pain is typically viewed by clinicians as "whatever the experiencing person says it is, existing whenever and wherever the experiencing person says it does" (McCaffery & Beebe, 1989). Studies often yield highly variable subjective pain ratings from patients who have virtually identical physical tissue damage (Edwards, 1950). The biopsychosocial model of pain provides a potential framework for understanding this phenomenon by viewing the diversity of pain expression and experience as the result of a complex interaction of biological, psychological and social variables (Melzack & Wall, 1965). The movement away from a traditional biomedical understanding of pain to the acknowledgment of psychosocial factors has played an integral role in advancing our knowledge on the differences between individuals in terms of pain experience, and particularly for chronic pain (Gatchel, Peng, Peters, Fuchs, & Turk, 2007).

The research on psychosocial factors related to pain has uncovered: 1) important relationships between psychological disorders (i.e., depression, anxiety, etc.) and pain; 2) numerous pain-related constructs which have been identified and linked with pain experience and expression (e.g., anxiety sensitivity); and 3) various pain-related self-report scales which have been constructed and validated in an attempt to measure these constructs (e.g., Anxiety Sensitivity Index [ASI], Reiss, Peterson, Gursky, & McNally, 1986a). Despite the advances in the understanding of the contribution of psychological

disorders in pain expression and the development of more sensitive measurement tools, there is a need for more research to strengthen the connections between these constructs and scales. In particular, there is a strong need to develop an understanding of the comorbidity of posttraumatic stress disorder (PTSD) and chronic pain, the dispositional and behavioural vulnerability factors that contribute to its maintenance and to develop better measurement tools to assess the comorbidity of the two disorders. Research has shown that PTSD and chronic pain co-occur more frequently than would be expected by chance alone (Asmundson, Coons, Taylor, & Katz, 2002). The significant symptom overlap has lead researchers to call for routine assessments of both chronic pain and PTSD when either one is diagnosed (Asmundson, et al., 2002).

The purpose of the present study was to develop an initial sample of items for the Sensitivity to Pain Traumatization Scale (SPTS) and to assess the preliminary psychometric properties of this new measurement tool. SPT is defined as the behavioural, cognitive and emotional reactions to pain that resemble the symptoms of PTSD (Kleiman & Katz, 2008). The development of a tool that is sensitive to detecting the co-occurrence of PTSD and chronic pain will enable clinicians a better means to implement appropriate management strategies to help patients better cope with these disorders. In the remainder of the introduction, the biopsychosocial theories of pain will be reviewed. In the sections that follow, the comorbidity between PTSD and chronic pain will be explored. Next, I will discuss some of the psychological constructs that have been put forth as possible dispositional or behavioural vulnerability factors contributing to the development and

maintenance of pain disability, as well as, comorbid PTSD and chronic pain. Specifically, I will explore the psychological construct, sensitivity to pain traumatization (SPT) as a potential vulnerability factor for comorbid PTSD and chronic pain.

Biopsychosocial Theories of Pain

One of the greatest contributions of biopsychosocial models of pain was the incorporation of the brain as an active participant in the transmission and perception of pain. Prior to the 1950s, pain was understood as the direct result of external stimuli damaging bodily tissues and transmitted along a passive pathway. The Specificity Theory (reviewed by Melzack & Wall, 1965) viewed pain as a specific and simple sensory projection system. Psychological factors, such as, anxiety and depression, could not be accounted for in this model and pain without bodily tissue damage was viewed as nonexistent or, more concerning, the end result of a disturbed psyche (Melzack & Katz, 2007). Although clinicians and researchers were beginning to acknowledge the importance of psychological factors in pain perception, there lacked adequate and comprehensive theories incorporating psychology and pain up until 1965. At that time, Melzack and Wall (1965) proposed the Gate-Control Theory of Pain. It was the first theory to incorporate the central control processes of the brain (Melzack & Katz, 2007). Here, the transmission of pain is understood to be controlled through a gating mechanism located in the spinal dorsal horn, which can be closed or opened by nerve impulses that descend from the brain. Psychological processes could now be seen as an essential aspect of pain perception. Further, the theory provides probable explanations for the complexity

and extensive variability in pain perception (Turk & Monarch, 2002). Although the Gate Control Theory cannot account for all qualities of pain experience (e.g., phantom limb pain) (Melzack & Wall, 1983), it has made a tremendous impact on the pain community and has been described as the most comprehensive theory of pain to date (Dickenson, 2002).

Despite advances in understanding pain processes by the Gate-Control Theory, there still were areas of pain perception that remained inexplicably mysterious. For example, paraplegics often feel pain below their site of injury. As a result of these, and other, observations, the Gate-Control Theory was expanded by Melzack (1999a) to a conceptual model known as the Neuromatrix Theory. The theory assumes that neural networks in the brain produce all the sensory experiences felt to originate in the body. Melzack posits that the neural networks that generate the experience of pain are widely distributed in the brain and refers to the entire network as a "body-self neuromatrix." The neuromatrix is believed to be initially genetically determined, but shaped by later sensory inputs. The neurosignature refers to the characteristic pattern of neural processing and outputs sculpted by the neuromatrix. The neurosignature is believed to be triggered both through sensory inputs and independent of any such input. According the neuromatrix theory, variations in pain experience can be explained through understanding an individual's unique neuromatrix. Therefore, pain can be re-conceptualized as a past learning experience which alters an individual's neurosignature. Despite the advances for

understanding pain transmission inherent in the Neuromatrix Theory, there is a need for more comprehensive expansion of the theory and supporting empirical research.

Both the Gate-Control Theory (Melzack & Wall, 1965) and the Neuromatrix Theory (Melzack, 1999a) can be conceptualized as biopsychosocial theories of pain. Each provides an enhanced understanding and acceptance of pain as a multidimensional and complex experience produced by numerous influences (Melzack, 1999a). The shift from biomedical-specificity theories of pain to biopsychosocial theories of pain has provided new opportunities to enhance our knowledge of pain and psychopathology (i.e., depression, anxiety and PTSD). Although biological factors are essential to the understanding of pain processes, the remaining text will focus on psychological factors and their relation to pain. The next section will explore one of the most prevalent and complex phenomena in the study of pain and psychopathology: pain and PTSD.

Comorbid PTSD and Chronic Pain

Posttraumatic Stress Disorder (PTSD) and chronic pain are traditionally viewed as distinct medical disorders. 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" (IASP Task Force on Taxonomy, 1994). Chronic pain refers to pain that persists at least six months beyond the expected natural temporal course of healing.

According to the current Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR) (American Psychiatric Association [APA], 2000), PTSD is defined as an

anxiety disorder in which a person is exposed to a traumatic and perceived life threatening event in which he or she responds with specific symptoms including; 1) the re-experiencing of the trauma, 2) persistent avoidance and emotional numbing, and 3) increased arousal, for at least three months. Further, the symptoms described above must be severe enough to cause significant distress or impairment in a person's life.

The challenge in studying both PTSD and chronic pain arises in quantifying their highly subjective and multifaceted symptom structures. Specifically, the symptoms of PTSD are so diverse that two individuals both diagnosed with PTSD can have entirely different symptom expressions (Zlotnick et al., 2004). Similarly, the expression of pain can be vastly different in persons with virtually the same type of tissue damage (Edwards, 1950). Interestingly, chronic pain and PTSD have a high frequency of co-occurrence, which often results in challenging treatment options for clinicians and complex research questions for the scientific community (Asmundson, et al., 2002).

PTSD is a debilitating mental disorder diagnosed using various assessment techniques by a professional clinician (APA, 2000). However, much of the research in PTSD examines subsyndromal PTSD and/or the presence of PTSD symptoms (e.g., Beckham et al., 1997). Subsyndromal PTSD refers to the presence of PTSD symptoms without a formal diagnosis of PTSD due to not meeting sufficient criteria for the DSM-IV-TR (APA, 2000). Although APA has not specified diagnostic criteria for subsyndromal PTSD, Stein and colleagues (1997) have defined subsyndromal PTSD as having at least one symptom in each of the three DSM-IV-TR PTSD symptom clusters.

Studies indicate high prevalence rates of partial PTSD within community samples (3.4% females & 0.3% males: Stein, Walker, Hazen & Ford, 1997), in veterans (22.5% lifetime prevalence, 11.1% current prevalence: Weiss et al., 1992), motor vehicle accident survivors (28.5% of sample: Blanchard, Hickling, Barton, Taylor, Loos & Jones-Alexander, 1996) and individuals with chronic pain (17.2% of sample female veterans with chronic pain: Asmundson, Wright & Stein, 2004). Also, PTSD symptoms are frequently assessed in research using the Posttraumatic Stress Disorder Checklist-Civilian Version (PCL-C: Weathers, Litz, Herman, Huska & Keane, 1993).The presence of PTSD symptoms without an official diagnosis of PTSD can nevertheless have a significant negative impact on an individual's life (Ciechanowski, Walker, Russo, Newman & Katon, 2004; Stein, et al., 1997). Further, one of the best predictors of developing PTSD is having some prior symptoms of the disorder (Forbes, Creamer & Biddle, 2001). Given the high prevalence and negative personal impact of subsyndromal PTSD and PTSD symptoms, it is important for researchers to study the full spectrum of PTSD severity. The current literature review will highlight PTSD symptoms and their relationships with pain while considering how PTSD symptoms relate to a diagnosis of subsyndromal and syndromal PTSD.

Recent studies have found the rates of comorbidity between PTSD symptoms and pain to range from 20-80% in chronic pain samples (Beckham et al., 1997; McFarlane, Atchison, Rafalowicz & Papey, 1994; White & Fausiman, 1989) and 19-50% in samples with PTSD (Amundson, Norton, Allerdings, Norton & Larsen, 1998; Benedict & Kolb,

1986). These results were found both in veterans (50-80%) and civilians (10-30%), and independent of the type of trauma experienced (Asmundson, et al., 2002; McWilliams, Cox, & Enns, 2003). A recent longitudinal analysis of workplace injuries and motor vehicle accidents detected the presence of PTSD symptoms as early as two weeks after the injury or accident and it was found to be the only significant predictor of chronic pain three years later (Jenewein, Moergeli, Wittman, Buchi, Kraemer, & Schnyder, 2009). Evidence suggests that comorbid PTSD and chronic pain sufferers experience more intense pain, report more physical health problems and symptoms, and use health care services more than those without PTSD (see Asmundson et al. 2002 for a review). Furthermore, persons with co-morbid pain and PTSD experience more severe functional limitations (Duckworth & Iezzi, 2005; Palyo & Beck 2005) and greater emotional distress (Geisser, Roth, Bachman & Eckert, 1996) than those without PTSD. Given the negative clinical outcomes associated with comorbid PTSD and chronic pain, there is need for further research to enhance clinical diagnoses and develop better treatment options.

PTSD Symptoms Related to Pain

Of particular interest in understanding the relationship between PTSD and chronic pain are the cognitive and behavioural symptoms associated with these disorders. The DSM-IV-TR (APA, 2000) classifies the symptoms of PTSD into three clusters (i.e., avoidance, hyperarousal and reexperiencing). Research examining symptom overlap between PTSD and pain is frequently confounded. Often studies capture the co-

occurrence between PTSD symptoms and pain following a painful traumatic experience (i.e., motor vehicle accident victims). In those cases, it is difficult to disentangle potential causation between the two disorders. With this limitation in mind, the next section will summarize the pain-related research of individual PTSD symptoms. Research has explored common symptom structures in terms of attentional biases, behavioural avoidance, emotional lability, hyperarousal and anxiety (see Asmundson et al., 2002).

Avoidance

The DSM-IV-TR (APA, 2000) defines avoidance in regards to PTSD as deliberate attempts to avoid thoughts, feelings, conversations, activities, situations, and/or people associated with the traumatic event. In other words, avoidance refers to behaviour and cognitions aimed at preventing or postponing an aversive situation from occurring, whether that aversive situation is a traumatic event or pain (Kanfer & Philips, 1970). In relation to pain, Philips (1987, p. 279) comments that, "the most prominent and extensive behaviour shown by chronic pain sufferers is that of avoidance." Although it is impossible for an individual to avoid their pain completely, it is possible for them to avoid the perceived threat of pain associated with activities assumed to increase pain or (re)injury (Leeuw, Houbenm Severeijns, Picavet, Schouten & Vlaeyen, 2007).

There is some convincing evidence demonstrating that the perceived threat of experiencing exacerbation of pain may impair or affect chronic pain patients. For example, fearful patients with chronic low back pain perform less well on behavioural performance tasks, suggesting that they are withdrawing from, and thus avoiding, these

tasks (Vlaeyen & Linton, 2000). Further evidence of this assumption is illustrated by recent studies that found associations between fear of pain and decreased performance on a variety of physical tasks (Goubert et al., 2005b; Pfingsten et al., 2001; Vowles & Gross, 2003). The manifestation of avoidance often results in increased self-reported disability (Asmundson, Norton, & Norton, 1999; Crombez, Vlaeyen, Heuts, & Lysens, 1999). The overlap in symptom expression of avoidance in both PTSD and chronic pain has led to a better understanding of the etiology and comorbidity of both disorders. Related to avoidance, the PTSD symptom of emotional numbing and its relationship with pain will be explored next.

Emotional Numbing

Emotional numbing is classified in the DSM-IV-TR (APA, 2000) under symptom cluster C: avoidance, given that it is conceptualized as an avoidance of one's own feelings and emotions. Although avoidance may manifest in several ways in a patient, the issue of emotional numbing is an important consideration with regard to comorbid PTSD and pain. Emotional numbing refers to diminished responsiveness to the external world marked by decreased interest or participation in previously enjoyed activities, feeling detached from other people, reduced ability to fully experience emotions, especially those related to intimacy and sexuality, and/or a sense of foreshortened future (APA, 2000). In terms of chronic pain, symptoms of emotional numbing have been reported both in research studies and clinical outcomes. For instance, many people who suffer from chronic pain have reported a sense of detachment, isolation and withdrawal from social

and intimate relationships (Barber, 1996; Passchier, de Boo, Quaak, & Brienen, 1996). The relevance of emotional numbing has been highlighted by two studies that specifically examined PTSD symptom structure in the presence of chronic pain. Both studies found that the presence of greater emotional numbing interacted with pain severity to contribute to overall higher levels of pain disability six months to one year following injury or surgery (Clapp, Beck, Palyo, & Grant, 2008; Katz, Asmundson, McRae & Halket, 2008).

Despite the advances made in understanding how the symptom of emotional numbing relates to pain, it is difficult to disentangle the symptoms of emotional numbing in response to pain from those of other mental disorders, especially depression. Many of the symptoms outlined in emotional numbing overlap with symptoms of depression (i.e., loss of interest in people and activities). As a result, many individuals with chronic pain are concomitantly diagnosed with depression and PTSD (Roth, Geisser & Bates, 2008). Further, research has shown depression not only perpetuates pain but also is often a common reaction to chronic pain (Fernandez, 2002, p. 124-126). Therefore, it is often unclear whether an individual with chronic pain is exhibiting symptoms of depression or PTSD or both. Given this finding, further research and clarification is needed to uncover how emotional numbing and chronic pain interact.

Hyperarousal

Another important PTSD symptom pertaining to pain is hyperarousal. Hyperarousal refers to symptoms of anxiety or increased arousal that were not present before the trauma and may include difficulty falling or staying asleep that may be due to

recurrent nightmares during which the trauma is reexperienced, hypervigilance, exaggerated startle response, irritability or anger outbursts and/or difficulty concentrating or completing tasks (APA, 2000). Hyperarousal has been often referred to as the most important PTSD symptom since it is hypothesized to cause the emotional depletion that leads to the symptom of emotional numbing (Weems, Saltzman, Reiss, & Carrion, 2003). Further, there is evidence suggesting the level of hyperarousal is a strong predictor of all three PTSD symptom clusters (Schell, Marshall & Jaycox, 2004).

Physical health problems, such as, chronic pain, have been found to correlate with the intensity of hyperarousal and avoidance symptoms (Woods & Wineman, 2004), and reduced life satisfaction (Clapp et al., 2008). For example, MVA victims experiencing severe pain reported lower subjective life satisfaction compared to those without pain (Clapp et al., 2008). Further, specific symptoms of hyperarousal have all been found in the pain literature, including: difficulty sleeping (e.g., Okura et al., 2008), irritability (e.g., Sofaer & Walker, 1994), and difficulty concentrating (e.g., Hart, Martelli, & Zasler, 2000). More research is needed into whether or not individuals with chronic pain are having trouble sleeping due to the pain itself or distressing thoughts surrounding the pain; however, again, it is apparent that there is a significant symptom overlap between chronic pain and PTSD.

Reexperiencing

The PTSD symptom of reexperiencing has also been explored as an important symptom in the understanding of comorbid PTSD and pain. Reexperiencing refers to

recurrent and intrusive recollections of the traumatic event. It can also appear as recurrent distressing dreams in which the event is replayed, possibly through experiencing a dissociative-like states or "flashbacks." The reliving is experienced as distressing and physiologically volatile (APA, 2000). These flashbacks are often triggered by an object, person, location, thought, emotion and/or feeling that reminds the individual of the traumatic event. Research on veterans has revealed that compared to those without physical symptoms, veterans with PTSD and physical complaints had greater levels of reported reexperiencing symptoms (Beckham et al., 1997; McFarlane et al., 1994). Also, symptoms of reexperiencing have been linked with pain disability and pain severity (Asmundson, Stapleton, & Taylor, 2004). In the field of pain research, reexperiencing has often been described in terms of pain memories. Research on memory of pain has found these memories to be salient, distressing and prone to distortion (Terry, Niven, Brodie, Jones & Prowse, 2008). Interestingly, each of the symptoms described in PTSD reexperiencing; such as, dissociation (for review see; Bob, 2008), intrusive thoughts (Elfant, Burns & Zeichner, 2008), attentional biases (Beck, Freeman, Shipherd, Hamblen, & Lackner, 2001) and distressing dreams (Zadra & Manzini, 2003) have all been shown in individuals with acute and chronic pain.

Summary

Each of the PTSD symptoms described have been reported, separately or together, in research on chronic and acute pain populations. However, most of the studies that examine the relationship between PTSD and pain have an important limitation.

Specifically, it can be difficult to infer causality following an event (i.e., a motor vehicle accident) in which both PTSD and pain occur at the same time. More studies are needed to fully understand if PTSD symptoms can be understood as a response to pain.

Additionally, it has been theorized that PTSD-like symptoms in response to acute pain are adaptive (Asmundson et al., 2002). Given that pain is an aversive experience symbolizing a dangerous situation, the body reacts in ways to prevent the stimulus from causing further harm in order to allow the body tissue to fully heal and to prevent future damage. As a result, the individual responds to a painful stimulus by avoiding. Specifically, the individual increases their attention to external surroundings and exhibits an elevated somatic focus. They create memories of the painful stimulus that promote further avoidance and can even disassociate from the painful stimulus so as to be able to safely escape (Vlaeyen & Linton, 2000). However, when the acute pain becomes chronic, these reactions (i.e., hyperarousal) are no longer adaptive and begin to cause harm by using up limited resources (Weems, et al., 2003). Although more research is needed to fully understand the PTSD-like symptom expression in response to pain, a preliminary review of the literature suggests that perhaps pain itself can be understood as a traumatic stressor. Further, these symptoms are actually quite adaptive in response to a painful traumatic event. The dysfunction or distress appears only when an individual is coping with chronic pain and avoidance actually can lead to disuse and disability (Asmundson, Norton, & Norton, 1999; Crombez et al., 1999). It is apparent that there is significant symptom overlap between PTSD and pain; however, what is not clear is why this overlap

exists. The following section will explore the development and maintenance of comorbid PTSD and chronic pain.

Etiological Mechanisms

Although there has been a recent upsurge of studies in the past decade regarding comorbid PTSD and chronic pain (see Asmundson et al., 2002 for a review), research into the underlying mechanisms and theoretical explanations of the comorbidity remains in its early stages. There are currently two prominent theories in the literature that describe and explain the psychological factors contributing to the maintenance and etiology of comorbid PTSD and chronic pain: 1) The mutual maintenance model (Sharp & Harvey, 2001; Asmundson et al., 2002); and 2) the shared vulnerability model (Asmundson et al., 2002).

The mutual maintenance model describes how certain symptoms of chronic pain or PTSD maintain or exacerbate symptoms of the other disorder. For instance, Sharp and Harvey (2001) describe how chronic pain can serve as an active reminder of the traumatic event and how the physiological and emotional arousal that results from this reactivation of the trauma memory may serve as a motivator to avoid any pain-related situations. As a consequence, the pain experience and the PTSD symptoms are exacerbated for the individual. Although the ideas presented throughout the model are sound, the model fails to consider instances in which both PTSD and chronic pain develop without a shared-traumatic event and more empirical support is needed to address these limitations (Asmundson et al., 2002).

With regard to the shared vulnerability model, proponents of this framework posit that individual difference factors predispose certain people to develop one or both of these disorders. Research has now shifted to identifying possible psychological constructs that may predispose individuals to developing both PTSD and chronic pain. Although the research is in its early stages, a few promising constructs have been explored. As proposed in Asmundson and colleague's (2002), it is probable that both the mutual maintenance and shared vulnerability model contribute to the symptom overlap between PTSD and chronic pain. For the purposes of this thesis, I will explore potential vulnerability factors outlined in the shared vulnerability model to further understand the comorbidity between these disorders. The following section will outline some of the psychological constructs proposed to be important in contributing to pain disability and comorbid PTSD and chronic pain.

Psychological Constructs Related to Pain

Anxiety Sensitivity

Several psychological constructs have been identified within the shared vulnerability model as being important contributors to the development and maintenance of PTSD and chronic pain (for review, see Turk & Okifuji, 2002). One of the most promising constructs is anxiety sensitivity (AS; Asmundson et al., 2002; Asmundson & Hadjistavropolous, 2006). AS refers to a dispositional tendency to become fearful of anxiety symptoms due to the belief that the physical symptoms of anxiety will have harmful consequences (Reiss, 1991). These distorted beliefs about one's symptoms can

also exacerbate and maintain PTSD symptoms given many PTSD symptoms are physiologically arousing sensations (e.g., intrusive thoughts, concentration difficulties, emotional liability). This is illustrated by the following example. When an individual experiences the PTSD symptom of hyperarousal (e.g., palpitations) in response to an intrusive thought about pain after engaging in physical activity, he or she interprets the symptoms as being dangerous (e.g., "I feel my heart pounding, something must be wrong with me"). This in turn makes the person feel increasingly anxious. The anxiety causes the person to stop the physical activity (i.e., avoidance) and pay increased somatic attention to further symptoms, thereby exacerbating the PTSD symptom of avoidance and hyperarousal.

Considerable research has explored the relationship between AS and PTSD symptoms and pain. AS has been found to exacerbate PTSD symptoms (Taylor, Koch, & McNally, 1992), act as a significant predictor for developing PTSD symptoms (Fedoroff, Taylor, Asmundson & Koch, 2000) and may contribute to patients utilizing more analgesic medications for equal pain compared to those with low or medium anxiety sensitivity (Asmundson & Norton, 1995). Although the findings concerning AS as an underlying vulnerability factor are promising, there is a need for more research to fully comprehend how this factor contributes to comorbid PTSD and pain.

Fear of Pain and Pain Anxiety

Fear of pain has been implicated as an important vulnerability factor related to pain disability. Further, its relationship between the PTSD symptom of avoidance is

essential to understanding the fear-avoidance model of pain. Fear of pain or pain anxiety (PA) have been traditionally viewed as interchangeable within the field of pain (McNeil & Rainwater, 1998) despite a clear distinction between fear and anxiety as separate emotional states (Barlow, 2000). However, the pain literature has not provided sufficient evidence for this distinction nor has it used the terms consistently. PA has been described as a feeling of fear or anxiety about pain (McNeil & Rainwater, 1998). According to the fear-avoidance model (Lethem, Slade, Troup & Bentley, 1983; Vlaeyen & Linton, 2000), patients with a high level of PA develop catastrophic expectations that activity will cause injury and exacerbate pain. As a result, these individuals tend to escape the feared pain situation and the avoidant behaviour is negatively reinforced through the resultant reduction in anxiety. However, avoidance often leads to decreased movement of the body part in pain; thereby, leading to stiffened joints and further contributes to lowered pain tolerance and functional disability (Vlaeyen et al., 1999). In patients with lower back pain, fear-avoidance beliefs predicted functional disability, treatment outcome and length of time for patients to return to work (Pfingsten, Kroner-Herwig, Leibing, Kronshage, & Hildebrandt, 2000). Although there is considerable research that highlights the implications of PA's importance to chronic pain, there is a lack of studies examining the potential of PA as a vulnerability factor to comorbid PTSD and pain, despite the obvious overlap in the symptom of avoidance.

Pain Catastrophizing

Another important psychological variable in the field of pain is pain catastrophizing (PC). PC is the tendency to ruminate, magnify, or adopt a helpless orientation about pain. It is characterized by an exaggerated negative interpretation of pain and overly negative thoughts and ideas about the future (Sullivan et al., 2001; Turk, 2002). Sullivan, Bishop and Pivik (1995) have described pain catastrophizing as one of the most important psychological constructs in understanding pain experiences in individuals with both acute and chronic pain. For instance, several studies have demonstrated that catastrophizing contributes to greater levels of self-reported pain (Sullivan, Bishop & Pivik, 1995; Sullivan & Neish, 1999), greater disability (Sullivan, Stanish, Waite, Sullivan & Tripp, 1998), increased use of health care services, longer hospitalizations, increased medication usage, and longer rehabilitative time periods (Keefe, Rumble, Scripio, Giordano, & Perri, 2004; Turk, 1999, 2003; Turk & Okifuji, 2002; Turner, Mancl, & Aaron, 2004). Even after controlling for pain severity and demographic variables, catastrophizing was found to be a significant predictor of functional disability and depression six months later in chronic pain patients (Keefe, Brown, Wallston, & Caldwell, 1989).

According to fear-avoidance models, pain catastrophizers often overestimate the threat of pain and thus engage in more avoidant behaviours (Vlaeyen & Linton, 2000). The avoidant behaviour serves to reinforce the faulty informational processing and the behaviour subsequently continues. Further, research into the cognitive mechanisms

related to catastrophizing has found the construct to be a significant cognitive vulnerability factor related to depression in chronic pain patients (Lee, Wu, Lee, Cheing, & Chan, 2008). As well, important links between pain catastrophizing and symptoms related to PTSD have been clearly demonstrated. For example, similarly to the PTSD symptom of rexperiencing, attentional biases have been reported in chronic pain patients who tend to catastrophize (Quartana, Burns & Loftland, 2007). Also, avoidant behaviours have been found at increased levels in individuals who have higher levels of pain catastrophizing (Crombez, Eccleston, Baeyens & Eelen, 1998; Crombez, Eccleston, Van der Broeck, Goubert & Van Houndenhove, 2004). Despite the evidence of pain catastrophizing being important to pain perception and disability, research is needed to understand if the construct of pain catastrophizing can be considered a vulnerability factor for developing comorbid PTSD and pain.

Sensitivity to Pain Traumatization

Within the current milieu of pain-related research on AS, PA, and pain catastrophizing, there is a surprising paucity of studies that examine how these constructs relate to one another. However, a study by Kleiman and Katz (2008) analyzed the underlying factor structure of commonly used pain-related anxiety measures collected on 444 patients who were scheduled for major surgery. The exploratory factor analysis revealed that items from three scales, the Anxiety Sensitivity Index (ASI: Reiss, et al., 1986a), the Pain Catastrophizing Scale (PCS: Sullivan, Bishop & Pivik, 1995b), and the Pain Anxiety Symptoms Scale-Short Form (PASS-20: McCracken & Dhingra, 2002), all

loaded on one factor. This factor was termed 'Sensitivity to Pain Traumatization' (SPT). SPT describes: "the anxiety-related cognitive, emotional and behavioural reactions to pain that resemble symptoms of PTSD" (Kleiman & Katz, 2008). SPT was found to show good preliminary convergent validity with symptoms of PTSD as measured by the Posttraumatic Stress Disorder Checklist-Civilian Version (PCL-C: Weathers, et al., 1993), discriminant validity with overall anxiety as evidence by non-significant correlations with the State-Trait Anxiety Inventory (STAI-T: Spielberger, 1983), and concurrent validity between those with and without a history of pain. The authors concluded that SPT may be predisposing vulnerability factor for development of chronic pain, as well as, a shared vulnerability and mutual maintenance for PTSD and chronic pain.

The SPT construct provides a unique opportunity to combine research of important psychological constructs (i.e., fear of pain, pain catastrophizing, anxiety sensitivity) with our knowledge to date of the symptom overlap between PTSD and pain. However, existing scales may not be sufficient for identifying or exploring the relationship between PTSD symptoms in response to pain itself. For example, the Posttraumatic Chronic Pain Test (PCPT; Muse & Frigola, 1987) has been found to consistently and accurately identify patients at high risk for stress-related posttraumatic chronic pain but requires further development, and has not been well-utilized clinically. A possible limitation of the PCPT scale is that it does not incorporate important psychological constructs (i.e. anxiety sensitivity) found to be predictive of PTSD

symptomology. Furthermore, it does not effectively screen for chronic pain. An individual must already have a chronic pain problem prior to being assessed by the PCPT. This is problematic because if an individual is already experiencing chronic pain, the high symptom overlap and continual maintenance between PTSD and chronic pain will likely contribute to poorer treatment outcomes. Given the limitations of the PCPT, an ideal screening test should be one that can identify those individuals at risk for PTSD symptoms in response to pain prior to having a DSM-IV-TR diagnosis of PTSD. In conclusion, there exists a need within the research and clinical arenas for a valid and reliable screening test grounded firmly within the literature to identify individuals at risk for developing stressful traumatic reactions in response to pain.

Summary

In summary, PTSD and chronic pain co-occur at alarmingly high rates and are characterized by similar symptom expressions. In fact, each of the PTSD symptoms, including hyperarousal, avoidance, emotional numbing and reexperiencing, has been shown to occur in chronic and acute pain patients. The best model to explore these relationships is the shared-vulnerability model since it may enhance our understanding of the development and maintenance of the two disorders. As well, it incorporates key psychological constructs (i.e., anxiety sensitivity, fear of pain/pain anxiety and pain catastrophizing) found to be important in the development and maintenance of chronic pain and comorbid PTSD and chronic pain. However, there is a lack of research on how these psychological constructs relate to one another.

A promising construct is SPT since it incorporates key psychological constructs related to vulnerability to PTSD and chronic pain and the PTSD symptom structure as outlined in the DSM-IV-TR (APA, 2000). Given the need for better clinical tools to assess comorbid PTSD and chronic pain, further research is needed for scales that consider current theoretical understandings and empirical knowledge of specific psychological constructs that contribute to pain-related disability and emotional distress.

Present Study

The present study aims to develop a preliminary set of items that will form the basis of a self-report measure of SPT. Based on the results of the factor analysis described in Kleiman and Katz's study (2008) and our theoretical understandings of the contributing factors to PTSD-related symptoms following painful traumatic event(s), categories will be developed to describe the defining features of SPT. Using these categories as a guide, items will be generated with the goal of developing a self-report scale to measure SPT. These items will be generated based on the PTSD symptoms outlined in the DSM-IV-TR and through studying other pain-related scales measuring similar constructs (i.e., pain anxiety, anxiety sensitivity, pain catastrophizing and fear of pain). The scale will then be given to an undergraduate sample with the goal of choosing the most discriminative items to make up the final SPTS. The development of a more robust operational definition and method of quantifying SPT will provide a better understanding of factors contributing to the occurrence of comorbid PTSD and chronic pain.

Hypotheses

It is hypothesized that (1) the final SPTS will have a one-factor structure and items will be highly correlated with one another, and (2) individuals who self-report having pain problems, chronic pain and/or current pain will have an overall higher level of SPT than those without pain.

Method

This study has been reviewed and received ethics approval on January 14th, 2009 by the Human Participants Review Sub-Committee (HPRC) at the Office of Research Ethics at York University in Toronto, Ontario.

Participants

A sample of 116 participants was recruited from the Undergraduate Research Participant Pool (URPP) at York University in Toronto, Ontario. Participants were granted one credit course towards their first year psychology grade. A final sample of 105 [20 males, 18-35 years (M = 21.75, SD = 4.49); 84 females, 18-46 years (M = 20.68, SD = 4.22); 1 missing] participants remained following removal of outliers. Eight participants were removed due to excessive amount of missing data (50% or more) and three were removed for a short completion time (less than nine minutes). The mean age of the participant sample was 20.89 (SD = 4.25). As displayed in Table 1, our sample was ethnically diverse with 10.8% identifying as East Asian, 13.7% Middle Eastern, 8.8% African, 5.9% Hispanic, 10.8% South Asian and 38.2% Caucasian.

Table 1.

Reported Ethnicity of Participants

Ethnicity	Frequency (#)	Percentage of Total Participants
East Asian	11	10.8%
Middle Eastern	14	13.7%
African	9	8.8%
Hispanic	6	5.9%
South Asian	11	10.8%
White	39	38.2%
Other	12	11.8%
Missing	3	2.9%

Procedure

Stage 1: Construct Operationalization and Item Generation

The first step in generating items for the SPTS involved operationalizing the SPT construct. SPT is described as the anxiety-related cognitive, emotional and behavioural reactions to pain that resemble symptoms of PTSD. When considering items for the SPT construct according to the definition, a number of essential components were outlined. First of all, items needed to represent the DSM-IV-TR (APA, 2000) symptoms of PTSD in response to pain, including: hyperarousal, avoidance, emotional numbing and reexperiencing. Second, incorporation of the knowledge gained from the literature review was essential. As a result, inclusion of items related to the psychological constructs; pain

catastrophizing, anxiety sensitivity and fear of pain, would add to the overall utility of the scale in identifying individuals at risk for reacting to pain in a stressful or traumatizing manner and developing symptoms of PTSD and/or chronic pain disability and distress. Third, given that the results of factor-analytic structure found in Kleiman and Katz (2008) of the PCS, PASS-20 and ASI was the basis for development of this construct and scale, it was important to incorporate items reflecting on each of these scales that contributed to the factor termed SPT. With these essential components considered, six item categorizations, or preliminary subscale labels, were formulated. These categories included: 1) Pain and Avoidance, 2) Pain and Emotional Numbing, 3) Pain and Hyperarousal, 4) Pain Experiencing, 5) Fear of Pain, and 6) Pain Sensitivity. Items were generated through consultations of experts within the field of pain, examination of related scales and measures which have been proven both valid and reliable, and review of the literature on pain and PTSD-like symptoms.

The items generated describe the thoughts or feelings that individuals have when they are in bodily (physical) pain or beliefs people have regarding bodily (physical) pain. Participants were asked to read a statement and indicate the level to which they agree with the statement. A five response option rating scale (1 = "Not at all True", 2 = "Slightly True", 3 = "Somewhat True", 4 = "Very True", 5 = "Entirely True") was chosen over a dichotomous option scale (Yes vs. No) because of the advantages of more expansive information about participant's level of the latent trait, SPT. Also, a polytomous scale allows for easily quantifiable responses as compared to open-ended

questions. The following sections will describe each of these categories in more detail, including which sources were consulted to generate the items. Based on these categories, a total of 203 items were generated separately by four researchers. The researchers then met and combined all items and removed those items which had ambiguous or repetitive wording until 146 items remained (See Appendix A, Table A1). Then, researchers further decided which of the 146 items were to make up the final scale for the pilot testing. Researchers selected items to keep and remove collaboratively based on representation of each item category and minimal repetition and ambiguity. Appendix A, Table A1-A2 depicts the items recommended to remove and the final 79-item SPTS for the pilot study. The measures which were used to aid in item generation are described below.

Measures Used to Generate Items:

Anxiety Sensitivity Index. (ASI: Reiss, et al., 1986a). AS refers to a fear of anxiety-related sensations based on the belief that these sensations have harmful consequences. The ASI is a 16-item scale in which participants are asked to select their level of agreeance to a list of statements; such as, "It is important to me not to appear nervous," on a 5-point Likert scale (1="Very Little" to 5="Very Much"). The scale is composed of four subscales: 1) fear of somatic sensations of anxiety, 2) fear of losing emotional control or looking nervous to others, 3) fear of losing mental control, and 4) concern over gastrointestinal sensations (Blais et al., 2001). The scale demonstrates acceptable validity with an alpha coefficient in the range of .80 to .90 (Peterson & Reiss, 1992).

Pain Catastrophizing Scale (PCS: Sullivan, Bishop & Pivik, 1995b). The 14-item PCS measures a participant's level of catastrophizing, which refers to a particular response to pain symptoms; such as, rumination, magnification, and helplessness. Participants are asked to select the degree to which he or she has thoughts and feelings described in the statements; such as, "When I am in pain, I worry all the time about whether the pain will end", when experiencing pain on a 5-point Likert scale (0 = "Not at All" to 4 = "All the Time"). The PCS has shown good validity for clinical and nonclinical popultations (Osman, Barrios, Gutierrez, Kopper, Merrifield & Grittmann, 2000; Sullivan, Bishop & Pivik, 1995).

Fear of Pain Questionnaire-III (FPQ-III: McNeil & Rainwater, 1998): The FPQ-III contains 30 items measuring fears about pain across three painful situations: fear related to severe pain, fear related to minor pain and fear related to medical pain. The FPQ-III demonstrates high validity for both clinical and nonclinical samples (Albaret, Munoz-Sastre, Cottencin & Mullet, 2004; McNeil & Rainwater, 1998; Osman, Breitenstein, Barrios, Gutierrez & Kopper, 2002).

Pain Anxiety Symptoms Scale, short form (PASS-20: McCracken & Dhingra, 2002). The PASS-20 is a 20-item self-report scale which measures pain-related anxiety. Participants rate their responses on a 6-point Likert scale (0 = "Never" to 5 = "Always"). The scale is composed of four subscales: 1) cognitive (i.e., "I can't think straight when in pain"), 2) fear (i.e.," pain sensations are terrifying"), 3) escape/avoidance (i.e., "I will stop any activity as soon as I sense pain coming on"), 4) physiological (i.e., "Pain makes

me nauseous"). Validity has been demonstrated both for the total and subscale scores for clinical (Coons, Hadjistavropoulos & Asmundson, 2004) and nonclinical samples (Abrams, Carleton, Stapleton & Asmundson, 2006).

Posttraumatic Stress Disorder Checklist – Civilian Version (PCL-C: Weathers, et al., 1993). The PCL-C is a 17- item self report meausre based on the current DSM-IV symptoms for Posttraumatic Stress Disorder (APA, 2000). Participants are asked to indicated how much they have been bothered by the listed problems or complaints in the past month (i.e., "Trouble falling or staying asleep") on a 5-point Likert scale (1 = "Not at all" to 5 = "Extremely"). There are three subscale scores: 1) reexperiencing, 2) avoidance/numbing, and 3) hyperarousal and a total score, in which a score above 50 indicates a possible diagnosis of PTSD. The PCL-C demonstrates good test-retest reliability (0.96 over 3 days) and high diagnostic ability between those with and without PTSD (Weathers et al., 1993).

Impact of Events Scale (IES: Horowitz, Wilner, & Alvarez, 1979). The IES is a 15-item self report measure used to assess posttraumatic stress symptoms for any specific life event. It extracts symptom expression outlined in the DSM-IV criteria for PTSD. The IES consists of two subscales: 1) intrusion or reexperiencing cognitions and 2) avoidance or avoidant behaviours and denial of trauma related thoughts. The total score, consisting of summed up subscales, represents higher distress levels at higher total scores. Although the IES is a measure only of intrusion and avoidance symptom criteria for PTSD (APA, 1994), previous studies have found the IES to be strongly correlated with a PTSD

diagnosis (Wohlfarth, van den Brink, Winkely & ter Smitten, 2003). Participants rate each item as experienced during the previous week using a 4-point Likert scale (0 = "Not at All" to 5 = "Often"). The scale is reported to have high internal consistency with a Chronbach's alpha of .86 for the Intrusion subscale and .90 for the Avoidance subscale (Fischer & Corcoran, 1994).

Categorizations/Preliminary Subscales and Initial Item List of SPT Scale:

Pain and Avoidance

This item category was selected for its identification with the DSM-IV-TR (APA, 2000) cluster C (Criterion C1: avoid thoughts, feelings or conversations; C2: avoid activities, situation or people; & C3: amnesia) symptom structure for diagnosing PTSD. Pain and avoidance refers to a tendency to respond to pain experiences by engaging in behaviours that escape thoughts/feelings related to the pain or avoid making it worse. Researchers studied the PCL-C, IES and PASS-20 measures. The pain literature on avoidance (Asmundson, Norton, & Norton, 1999; Leeuw et al., 2007; Vlaeyen & Linton, 2000) was also carefully considered. An example of an item in this category reads; "I go to bed when I feel severe pain." A total of 10 items were generated for this category and are presented in Appendix A, Table A2.

Pain and Emotional Numbing

This item category was selected for its identification with the DSM-IV-TR (APA, 2000) cluster C (Criterion C4: diminished interest or participation in previously enjoyed activities; C5: feeling detached or estranged from other people; C6: reduced ability to feel

emotions & C7: sense of foreshortened future) symptom structure for diagnosing PTSD. Pain and emotional numbing refers to a response in the experience of pain in which an individual has a diminished sense of emotional experience and disconnects from their feelings of distress over the pain. Researchers studied the PCL-C, IES, PASS-20 and PCS measures for item generation. The pain literature on emotional numbing was considered (Clapp, et al., 2008; Katz, et al., 2008). An example of an item from this category reads; "When I feel pain, I can't connect with people." A total of 14 items were generated for this category and are outlined in Appendix A, Table A2.

Pain and Hyperarousal

This item category was selected for its identification with the DSM-IV-TR (APA, 2000) cluster D (Criterion D1: difficulty falling or staying asleep; D2: irritability or angry outbursts; D3: difficulty concentrating or completing tasks; D4: hypervigilance; & D5: exaggerated startle response) symptom structure for diagnosing PTSD. Pain and hyperarousal refers to a response to pain in which an individual becomes physiologically aroused due to increased attention to somatic symptoms and high levels of distress. Researchers studied the PCL-C, IES and PASS-20 measures in order to generate items. The literature on physiological arousal in response to pain (Clapp, et al., 2008; Woods & Wineman, 2004) was also carefully considered. An example of an item in this category is; "I feel sick to my stomach when I am in pain." A total of 12 items were generated for this category and are outlined in Appendix A, Table A2.

Pain Experiencing

This item category was selected for its identification with the DSM-IV-TR (APA, 2000) cluster B (Criterion B1: recurrent and intrusive recollections; B2: recurrent or distressing dreams; B3: dissociative states or flashbacks; B4: intense physiological distress; & B5: physiological reactivity) symptom structure for diagnosing PTSD. However, there is an important distinction between the Reexperiencing Cluster B symptom of PTSD and our conceptualization of Pain Experiencing. The SPT construct and scale refers to the PTSD-like symptoms expressed in response to pain. It does not require an individual to experience a trauma in order to experience the symptoms related to PTSD in response to pain, which can itself be traumatizing, and score high on the SPT construct. As a result, we changed the title from "Reexperiencing" as outlined in the DSM-IV-TR (APA, 2000) to "Experiencing". Pain experiencing is characterized by generally traumatic responses to pain sensations marked by distressing and intrusive thoughts, often resulting in an interruption of regular sleep, attempts to disassociate or alter consciousness (i.e., distraction) when in pain and physiological reactions in response to pain. Researchers studied the PCL-C, IES and PASS-20 measures to uncover items related to the intrusive and distressing behaviours/thoughts/feelings/cognitions in response to pain. The pain literature on reexperiencing (Asmundson, Stapleton, & Taylor, 2004) was also incorporated when generating items for this category. An example of an item from the category reads; "When I am in pain, I can think of nothing else." A total of 14 items were generated for this category and are outlined in Appendix A, Table A2.

Fear of Pain

This item category was selected for its importance in the literature as a psychological construct that contributes to pain tolerance, disability and avoidant behaviours (Vlaeyen & Linton, 2000). Fear of pain refers to fear related to experiencing pain and the consequences and meaning attributed to that pain. Researchers studied the FPQ-III, PCS and PASS-20 measures to generate fear of pain items. An example of a fear of pain item is; "Pain sensations terrify me." A total of 20 items were generated for this category and are outlined in Appendix A, Table A2.

Pain Sensitivity

This item category was selected in order to account for individual differences in self-reported pain sensitivity and tolerance. Pain sensitivity refers to one's tendency to feel pain more or less severely than others (Nielsen, Staud, & Price, 2009). In research, this is generally measured in terms of pain tolerance in which individuals receive equally painful stimuli and report varying degrees of pain (See Neilsen, Staud, & Price, 2009 for review). Although there were no scales to draw upon and the literature on comorbid pain and PTSD does not mention this quality in any substantial manner, it has been implied as an important factor. For example, in the shared vulnerability model (Asmundson et al., 2002), the authors discuss a dispositional quality in which some individuals are more or less sensitive to the effects of pain and trauma, partially due to their genetic makeup and learning history with pain. An example of a pain sensitivity item reads; "I am especially

sensitive to pain." A total of nine items were generated for this category and are outlined in Appendix A, Table A2.

Stage 2: Pilot Testing

The next step in developing the SPT scale was to administer the 79 items to a sample of participants. Due to the large number of items and the preliminary nature of the initial pilot testing, a readily available and easily accessible sample of first year undergraduate students from York University was chosen. The following self-report scales were administered to participants through the online survey distribution provided by York University's URPP: 1) the Demographic Information Sheet, 2) the Current Pain and Pain History Questionnaire, and 3) the Sensitivity to Pain Traumatization Scale. Participants were first asked to read over the consent form and agree to the terms and conditions of the study. Then, they were asked to respond to the various scales described below.

Measures:

Demographic Information Sheet. The demographics form includes questions about the participant's gender, ethnicity, occupational status, and level of education. The Demographic Information Sheet can be found in Appendix B, Table B1.

Current Pain and Pain History Questionnaire (Pagé, Kleiman, Asmundson & Katz, in press). The Current Pain and Pain History questionnaire was based on a version used in clinical research and includes seven questions about the participant's current pain

conditions and their previous pain experiences. The Current Pain and Pain History Questionnaire can be found in Appendix B, Table B2.

Sensitivity to Pain Traumatization Scale (SPTS). The SPTS was developed for the Master's Thesis study and was initially composed of 79 items. SPT refers to the anxiety-related cognitive, emotional and behavioural reactions to pain that resemble symptoms of PTSD. Items fall under the following six categories: 1) Fear of Pain, 2) Pain Sensitivity, 3) Pain Avoidance, 4) Experiencing of Pain Symptoms, 5) Hyperarousal in response to pain, 6) Emotional Numbing in response to pain. Participants were asked to respond to each statement by circling how true the statement is for them on a 5-point Likert Scale (1= "Not at all true"; 2 = "Slightly True"; 3 = "Somewhat True"; 4 = "Mostly True"; 5 = "Entirely True"). The full scale can be found in Appendix B, Table B3.

Stage 3: Item Reduction and Refinement

The number of items was reduced and refined using item response theory (IRT). Several authors have discussed the advantages of applying IRT models to aid in the construction psychological scales given IRT models provide more detailed information and greater flexibility than classical test theory (CTT) when analyzing response patterns (e.g., Embretson & Reise, 2000; Waller, Tellegen, McDonald and Lykken, 1996). IRT refers to a body of theory outlining the application of statistical models to questionnaire-based data in order to measure an underlying latent trait, such as, SPT. According to IRT, the probability of endorsing a specific item on a self-report scale can be understood as a

mathematical function of both the person (i.e.: level of SPT) and the item (i.e.: difficulty level, or probability of endorsing the item at equal levels of SPT) parameters (van der Linen & Hambleton, 1997). The performance of a specific item can be presented as an Item Characteristic Curve (ICC). This graphical representation of participant responses to an item reveals the probability an individual with a specific level on the underlying trait (i.e.: SPT level) will endorse the item.

Given the SPTS is made up of polytomous data, or Likert-scale style with five response options for each item, and our small sample size, we used an exploratory nonparametric item response theory (NIRT) to examine each item of the SPTS. Further, there is little research examining psychological measures of PTSD and chronic pain using IRT; hence, we did not want to make any a priori assumptions about how our items would behave in a set statistical model. NIRT models are highly recommended in recent research and reviews as they allow for a more flexible model for fitting the data than parametric IRT (Meijer & Baneke, 2004). Items were analyzed using the nonparametric regression model since it is a popular model and has the added benefit of accessible and user-friendly software (Ramsay, 2000). We used Testgraf98 software from Professor Jim Ramsey's website through McGill University. Testgraf98 is most useful when the number of examinees is in the order of 100 and the number of choices or questions exceeds 20 (Ramsay, 2000).

The first step in analyzing the data in an NIRT model was to ensure the assumption of local independence was met. Local independence occurs when there is no

relationship between participant's responses to the scale's items after the latent trait being measured by the scale is taken into account (Sijtsma & Molenaar, 2002). The items were reviewed and those items which were essentially the same items with slightly different wording were examined (i.e., Item 53: "When I am in pain, I feel like I am going to die" and Item 51: "When I feel pain, I think I might die"). The item with the least variance across participants was removed. Following this form of item reduction, 67 items remained. The next step was to estimate the best Item Response Function (IRF) through a process known as kernel-smoothing (Meijer & Baneke, 2004). Kernel smoothing fits a parametric function to the entire set of data using a weighted average at each point of the IRF. After the IRF is established, items were selected to make up the final SPT scale of no more than 20 items based on: 1) item characteristic curves (ICCs); 2) option characteristic curves (OCCs) and 3) representation of items in each of the six predetermined categorizations outlined above. Researchers met and carefully examined each of the 67 items' graphical representations within the categories and selected two of the best items for each category. A total of 12 items for the final SPTS was chosen to allow for an overall short administration time.

The scale was finalized to a total of 12- items and a parametric item response theory (IRT) model was chosen to examine the items. Parametric IRT differs from nonparametric IRT in the underlying assumptions between the latent trait (i.e., SPT) and the probability of responding to higher response options for each item. As explained above, parametric models have more restrictive assumptions and require the data to fit

within pre-specified boundaries. Parametric models have the added benefit of providing a numeric estimate of the latent trait (i.e., SPT) within each of the SPT items rather than using a less accurate visual estimation method provided in NIRT. Parametric IRT makes two important assumptions (Hambleton, Swaminathan, & Rogers, 1991): 1) unidimensionality, and 2) local independence. Unidimensionality refers to the property of a scale in which only one latent trait is measured by a set of items. Local independence refers to the property of a scale in which once the SPT construct is controlled for, no other relationships exist between the scale items.

An Exploratory Factor Analysis (EFA) was conducted in order to investigate the underlying factor structure proposed in hypothesis one and ensure that the SPTS was unidimensional. Principal axis factor analysis with Varimax rotation (Costello & Osborne, 2005) was used. There are no definitive sample size requirements for EFA (Costello & Osborne, 2005). The statistical literature recommendations range from at least five subjects for one factor (Bryant & Yarnold, 1995) to a minimum recommendation of 150-300 subjects (Hutcheson & Sofroniou, 1999). There is near universal agreement that factor analysis is inappropriate when the sample size is below 50 (Garson, 2009). Our sample of 105 participants for 12 items is sufficient according to Bryant and Yarnold (1995). However, further tests (i.e., correlation matrix, Bartlett's test of sphericity and Kaiser-Meyer-Olkin measure of sampling adequacy) were conducted to determine the suitability of our data set for EFA prior to analyzing the results. The overall factor structure was assessed with through parallel analysis (Pallant, 2007), eigenvalue >1

and Cattell's scree test (Costello & Osborne, 2005). Factor analyses were performed using the statistical analysis software, SPSS 16.0 for Windows.

Next, the assumption of local independence was tested through examining the correlational matrix of the 12 items. Exceptionally high correlations (i.e., $r > 0.70$) between items were flagged for the removal of one of the items. Once the assumption of unidimensionality and local independence were determined, the 12-items were analyzed in a parametric item response model.

A graded response model (Samejima, 1969) was chosen as the parametric IRT model. The graded response model fits well with polytomous ordered categories, such as that found in a 5-point Likert scale (Hambleton, Swaminathan, & Rogers, 1991). This 2-parameter model describes the basis for measuring the level of discrimination of an item (level of *a*) and the item difficulty level (level of *b*). Items were assessed for having a relatively constant value of difficulty level across items (*b*-level) and maximum discrimination capacity (*a*-level). The graded response model was analyzed using the installed "ltm" package in the R software for latent variable modeling and item response theory analysis (Rizopoulos, 2006).

Stage 4: Item/Scale Analyses

The scale's preliminary psychometric properties were tested using an EFA, as described above, to determine the underlying factor structure. The scale's internal consistency was examined using Chronbach's alpha and the inter-correlational matrix in SPSS 16.0.

Finally, hypothesis two was tested through a series of six one-way analyses of variances (ANOVA). The main dependent variable was the SPT item means and the total SPT level. The independent variables included: chronic pain status (present vs. not present), current pain level (present vs. not present), pain problems (presence vs. not present), pain sensitivity ratings (high vs. low), regular use of medications (regular use vs. no regular use) and past surgery (past surgery vs. no past surgery).

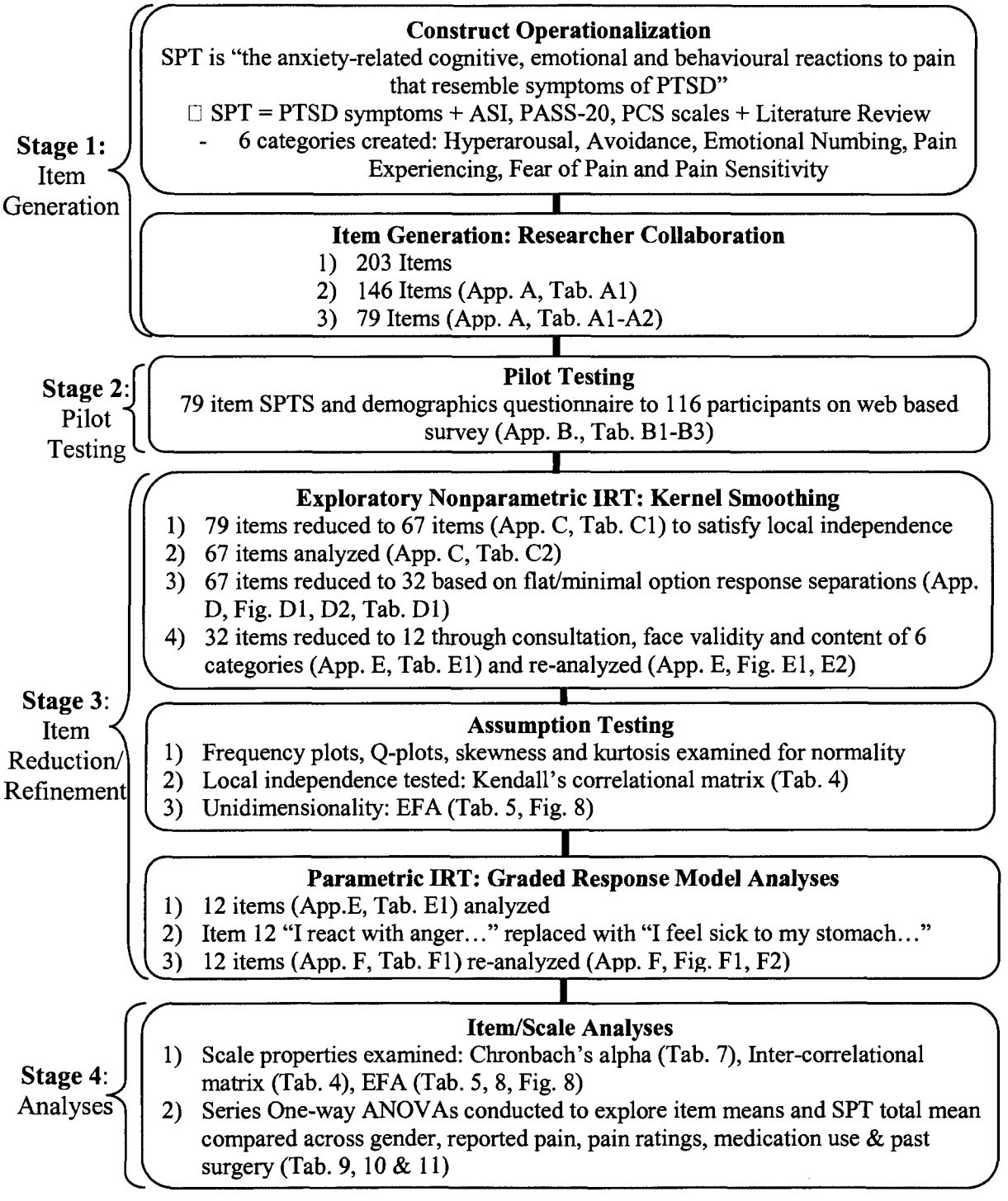


Figure 1. Summary of Method and Results

Results

Data Preparation

Prior to analyses, the data were examined for missing data, outliers in participant completion time (< 9 minutes), and violation of the assumptions for nonparametric and parametric IRT and analysis of variance (ANOVA). The initial sample of 116 participants was reduced to 105 participants after removing those with excessive missing data (> 50%) and a completion time of less than nine minutes.

Participant Characteristics

A summary of participant characteristics can be found in Tables 2 and 3. There was a greater number of females in our study ($n = 84$) as compared to males ($n = 20$). In 2006, the population of Toronto, Ontario, Canada had a gender breakdown of 51.4% females and 48.6% males (Statistics Canada, 2006). Our population is significantly over-represented with females as compared to the general population in Toronto ($t\,(103) = 7.92$, $p < .001$). This discrepancy was considered when comparing output according to gender and interpreting the results of the scale. The SPT 79 item scale took participants an average of 17.29 ($SD = 6.68$) minutes to complete. Approximately 33.3% of participants reported the presence of ongoing pain problems and, of those participants, 15 indicated their pain occurred daily, 10 indicated weekly and 10 reported monthly. This finding is consistent with other studies which have found the rates of pain problems within a community sample to range from 7% to 55% (for review, see Currie & Wang, 2004). The majority reported their pain as mild ($n = 18$) or moderate ($n = 20$), with only

two participants reporting severe pain. Participants reported that the pain slightly (n = 23), moderately (n = 10) or did not at all (n = 6) interfere with their life, while only three participants reported pain severely interfered with their life. Further, 30.5% of participants reported experiencing current pain (25 participants reported mild pain, 11 reported moderate pain and 0 participants reported severe pain), 24.8% reported chronic pain persisting for more than one month, 55.2% reported using medication for their pain, 26.7% were currently using medication for pain, and 27.6% had a previous surgery. Also, the average pain ratings for common pains (i.e., paper cut) on a scale from 0 - 'not at all intense' to 10 - 'as intense as can be' was 4.86 (SD =2.04). The average pain relief provided by common pain relief methods (i.e. muscle rub) on a scale from 0 - 'not at all effective' to 10 - 'completely effective' was 5.81 (SD = 2.07). A series of independent sample t – tests and chi-square analyses examined the differences between reported pain and demographic characteristics by gender (see Table 3). There was no statistically significant demographic data difference between male and female participants with the exception of medication use ($\chi 2$ (1) = 8.882, p = .003), average pain ratings (t (79) = -2.321, p = .023) for common pains and average pain relief (t (16) = 3.212, p = .005) for common pain relief methods, which all had higher mean values for female participants.

Table 2.

Pain Information from the Current Pain and Pain History Questionnaire

Question	Total
Do you have any ongoing pain problems?	Yes = 35 No = 69
How often do you have pain?	Daily = 15 Weekly = 10 Monthly =10
On the days that you feel pain, what is the average intensity of your pain?	Mild = 18 Moderate = 20 Severe = 2
How much does your pain interfere with your life?	Not at all = 6 Slightly = 23 Moderately = 10 Severely = 3
Do you currently feel any pain?	Yes = 32 No = 69
How intense is the pain you feel right now?	Mild = 25 Moderate = 11 Severe = 0
Do you regularly use pain killers or medicines?	Yes = 29 No = 70
Which pain killer or medicine are you taking?	Aspirin = 12 Acetaminophen = 32 NSAIDS = 19 Opioids = 6
Have you taken pain killers or medicines in the past 24 hours?	Yes = 28 No = 77
Which pain killer or medicine did you take?	Aspirin = 7 Acetaminophen = 12 NSAIDS = 4 Opioids = 3
Have you ever had a pain problem that persisted for more than one month?	Yes = 26 No = 71
Have you ever had surgery?	Yes = 29 No = 70
Average pain intensity of a...Tooth Ache (0 = not at all intense - 10 = as intense as can be)	Mean = 5.51 SD = 3.09
" " ...Paper cut	Mean = 3.15 SD = 2.74
" " ...Stubbed Toe	Mean = 5.62 SD = 2.78
" " ...Biting your tongue	Mean = 5.56 SD = 2.82
" " ...Sunburn	Mean = 4.08 SD = 2.78
" " ...Ear ache	Mean = 5.37 SD = 3.08
Average pain intensity across all Types of Pain	Mean = 4.86 SD = 2.04
Average pain relief of a ...Muscle Rub (0 = not at all effective -10 = completely effective)	Mean = 5.89 SD = 2.60
" " ...Local anesthetic – needle	Mean = 7.28 SD = 2.99
" " ...Local anesthetic – cream	Mean = 5.12 SD = 2.90
" " ...Tiger balm	Mean = 5.14 SD = 2.78
" " ...Advil/Tylenol	Mean = 6.48 SD = 2.43
" " ...Herbal/Alternative Remedies	Mean = 5.18 SD = 3.47
Average pain relief across all Forms of Pain Relief	Mean = 5.81 SD = 2.07

Note: The total number exceeds the number of patients who reported taking pain medications because some patients reported taking more than one type of drug.

Table 3.

Demographic and Self-Reported Pain Data for Participants According to Gender

Demographic	Males (M) **(n=20)**	Females (F) **(n=84)**	Statistical Significance M vs. F (* = *Significant at the p <.05 level*)
Age (years)	*M* = 21.75 *SD* = *4.49*	*M* = 20.68 *SD* = 4.22	*t* (100) = 1.002 *p* = 0.319
Duration to complete SPT Scale (minutes)	*M* = 17.55 *SD* = 7.71	*M* = 17.24 *SD* = 6.50	*t* (102)= .186 *p* = .853
Presence of Ongoing Pain Problems? (Frequency of responses)	Yes = 4 No = 16	Yes = 31 No = 52	*χ2* (1) = 2.162 *p* = .141
Current Pain (Frequency)	Yes = 4 No = 14	Yes = 28 No = 50	*χ2* (1) = 1.231 *p* = .267
Chronic Pain (Frequency)	Yes = 5 No = 13	Yes = 21 No = 57	*χ2* (1) = .005 *p* = .941
Medication Use for Pain (Frequency)	Yes = 5 No = 15	Yes = 52 No = 32	*χ2* (1) = 8.882 *p* = .003*
Medication Use for Pain past 24 hours (Frequency)	Yes = 4 No = 16	Yes = 23 No = 61	*χ2* (1) = 0.458 *p* = .499
Past Surgery (Frequency)	Yes = 5 No = 14	Yes = 24 No = 55	*χ2* (1) = .121 *p* = .728
Average Pain Rating of Common Pains (0 'not at all intense'-10 'as intense as can be')	*M* = 3.76 *SD* =1.90	*M* = 5.07 *SD* = 2.00	*t* (79) = -2.321 *p* = .023*
Average Pain Relief of Common pain relievers (0 'not at all effective' to 10 'completely effective')	*M* = 3.00 *SD* = 1.61	*M* = 6.38 *SD* = 1.67	*t* (16) = 3.212 *p* = .005*

Exploratory Nonparametric IRT: Regression Kernel-Smoothing

Prior to analyses, 12 items were removed in order to satisfy the assumption of local independence. Items were flagged and removed that were essentially stating the same idea with a few words difference and/or for having a high correlation value (*r* >

0.70). A list of these items can be found in Appendix C, Table C1. The 67-items that remained were submitted to nonparametric response analysis. The statistical software, TestGraf, produces graphical information from IRT statistical methods of participant's respondent characteristics or latent trait values based on the choices they make on the self-report scale (Ramsay, 2000). Participants are ranked based on their total SPT score and these rankings are then converted to standard normal scores. The nonparametric kernel smoothing method then estimated the participant's probability of endorsing each item option at every level based on these standard normal scores. This method would allow the reliability of the SPT scale to be evaluated at differing levels of SPT (Ramsay, 2000). Items were selected based on their response properties as depicted by their option characteristic curves (OCC) and item characteristic curves (ICC).

The OCC displays graphically the probability of endorsing each response option as a function of a participant's standard normal level of SPT. As a result, participants with higher levels of SPT should endorse higher response options. The point at which the curves intersect represents the threshold level of SPT where participants would be more likely to endorse a higher option. For the SPT scale, there are five response options (1 = "Not at all True", 2 = "Slightly True", 3 = "Somewhat True", 4 = "Very True", 5 = "Entirely True"). Hence, when analyzing the OCCs, four thresholds were examined for adequate separation between option responses (i.e., each option response has a distinct curve and does not overlap with one another) and predetermined order, otherwise known as monotonicity (i.e., option curve 1 should be displayed at lowest level of SPT, followed

by option curve 2, with option curve 5 being at the highest SPT level). Figure 2 gives an example of an item with good response properties and an item with poor response properties. All 67 option characteristic curves are displayed in Appendix D, Figure D1. Items which did not show any discrimination between options were eliminated. This iterative process resulted in the removal of 35 items (See Appendix D, Table D1 for a list of these items).

The ICCs were also analyzed. The ICC reveals an item's ability to estimate the participant's SPT level based on their response option on that particular item. In other words, it demonstrates whether or not individuals high on SPT also generally select higher response items on this particular item. Items with good psychometric properties were displayed by a straight line with an increasing slope. Figure 3 shows the ideal ICC beside both a good and poor item. The ICCs were less discriminative between items than the OCCs. Therefore, the ICCs were considered as an additional confirmatory property when the 'best' items were selected based on the OCCs (see Appendix D, Figure D2).

Next, researchers met to select the final items for the final SPT scale from the remaining 32 items. Items were separated based on their previous categorizations (i.e., Fear of Pain, Sensitivity to Pain, Pain Experiencing, Pain and Hyperarousal, Pain and Avoidance, Pain and Emotional Numbing) and two items were selected to represent each category. Researchers were also careful to select not only the best OCC and ICC, but also items which had good face value, were conceptually different from each other and were

not already represented in another well-established scale (e.g., the Pain Anxiety Symptoms Scale-20).

Option Characteristic Curves Nonparametric IRT

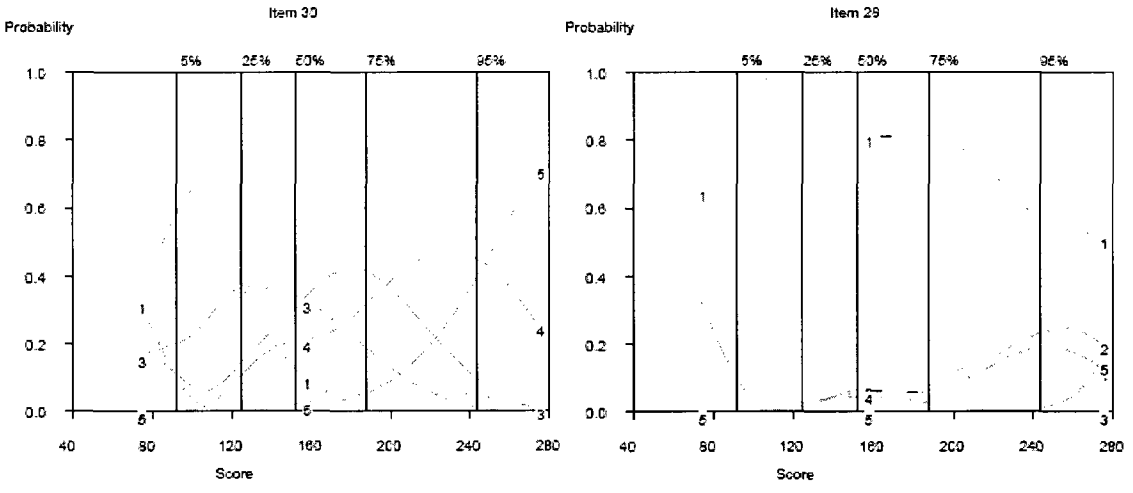


Figure 2. Option characteristic curves obtained from the nonparatmetric response model. Item 30 demonstrates good psychometric properties in that each response option was effective in making a unique discrimination across levels of SPT. Item 28, in comparison, reveals no discrimination between items, with most participants, across all levels of SPT, selecting option 1.

Item Characteristic Curves Nonparametric IRT

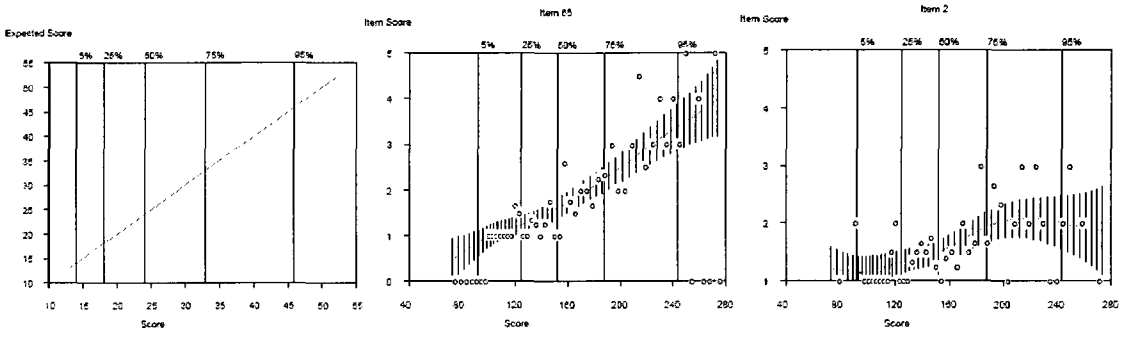


Figure 3. Item characteristic curves obtained from the nonparametric response model. The expected score figure shows the ideal linear relationship: as SPT level increases, expected score based on option responses increases. Item 65 demonstrates an increasing slope and small confidence intervals. In comparison, item 2 displays wide confidence intervals and a flat shape.

A total of 12-items were selected (See Appendix E, Table E1). These 12-items were then re-analyzed using nonparametric kernel smoothing. The OCCs and ICCs became somewhat less efficient at discriminating between those high and low on SPT for each option (See Appendix E, Figures E1-E2). However, all items had at least 2 threshold intersections displayed between the 5th and 95th percentiles suggesting a minimum efficiency in separating individuals from the majority of the sample across levels of estimated SPT (Zvolensky, Strong, Bernstein, Vujanovic & Marshall, 2009). TestGraf also computes results of the reliability and information of the total scale. Figures 4-7 displays this output for both the 67-item and 12-item SPTS. As expected, due to less information about level of SPT, the 12-item scale, as compared to the 67-item scale, demonstrated lower reliability ($\gamma_{(12\text{-item})} = 0.88$ for SPT levels between 20-40 vs. $\gamma_{(67\text{-item})} = 0.964$ for SPT level between 120-200). The distribution of scores was more positively

skewed for the 12-item scale than the 67-item scale which shows a more normal distribution. The 12-item scale gave more information about participants as compared to the 67-item scale, thus supporting our choice of the most discriminative items in the scale. Further, the 12-item scale had less deviation of scores as compared to the 67-item scale. The SPTS, as shown in the reliability and information curves, in this sample, is best at discriminating between those at the extreme scores of SPT (very high or very low scores). It is less able to discriminate those who have moderate levels of SPT and tend to endorse option responses between 2 and 4. This can be confirmed by examining the OCCs, which show clear distinctions between options 1 and 5 and are more flat in shape for options 2-4.

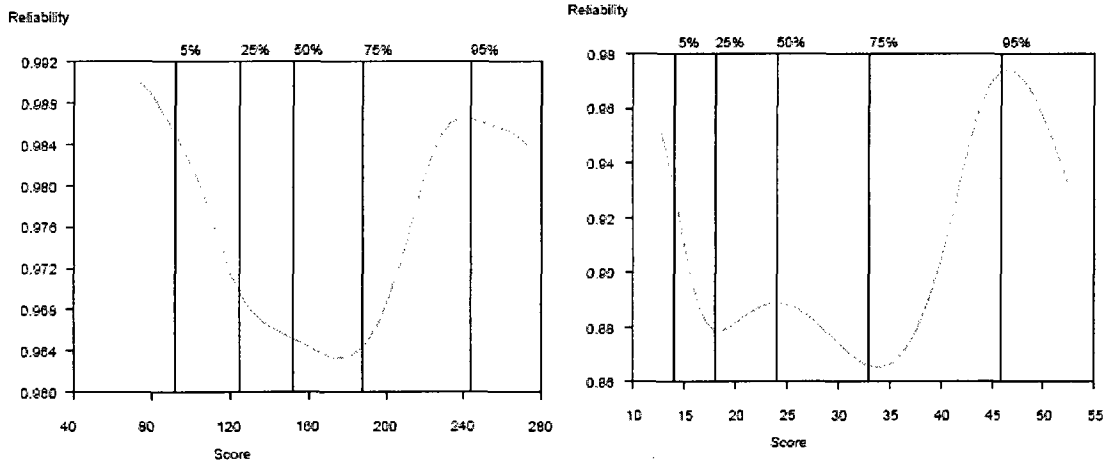
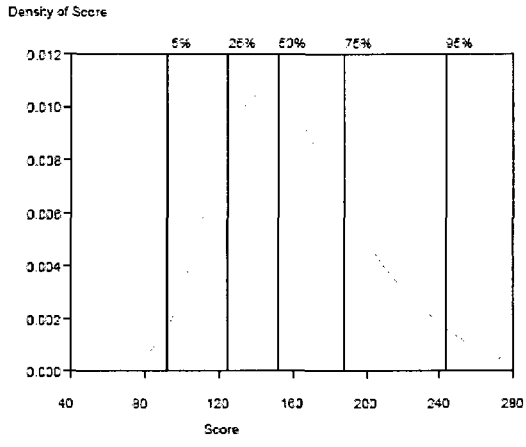


Figure 4. Reliability of 67-item SPTS *Reliability of 12-item SPTS*



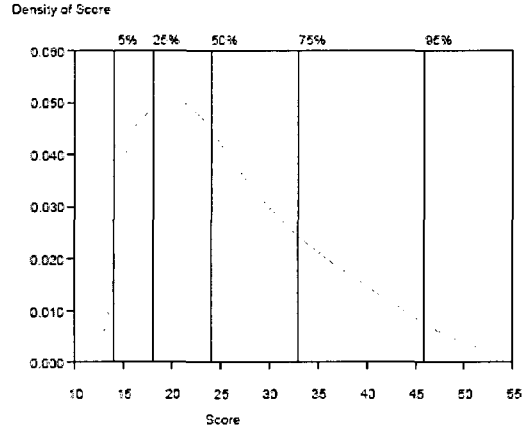
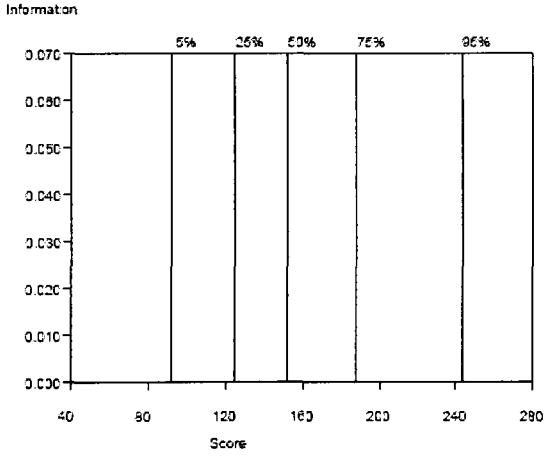


Figure 5. Density of Scores for 67-item SPTS *Density of Scores for 12-item SPTS*



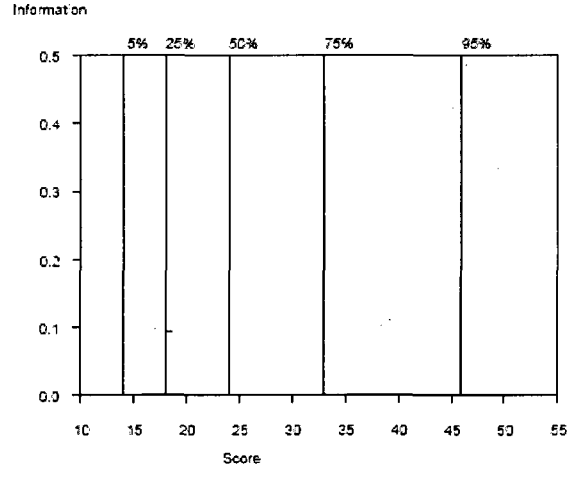


Figure 6. Total Information for 67-item SPTS *Total Information for 12-item SPTS*

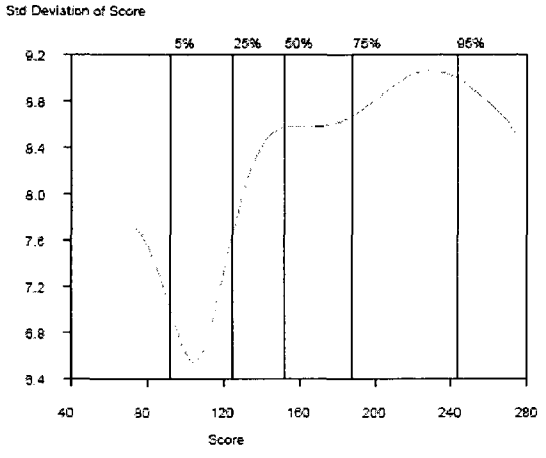
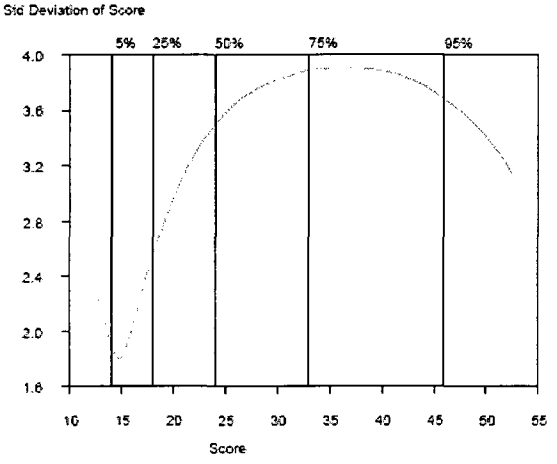


Figure 7. Total deviation of scores for 67-item SPTS



Total deviation of scores for 12-item SPTS

Assumptions for Parametric Statistics

The Kolmogoroz-Smirnov test and Shapiro-Wilk test for non-normality were conducted given that normality is an assumption for parametric IRT and ANOVA. The results show that the SPT total score was non-normally distributed at the $p < 0.001$ level and the SPTS was positively skewed ($SK = 0.895$, $SD = 0.24$). The frequency plots and Q-plots were also examined for each item and the deviation from the norm revealed a positive skew in which the majority of participants selected items 1 (Not at all True) or 2 (Slightly True) on the SPTS. Although the violation of the normality assumption was considered, analyses were conducted nonetheless given the normality assumption is often considered unrealistic for latent variables pertaining to psychology (Woods, 2008). However, simulation studies indicate IRT item parameters can be biased with nonnormal data (van den Oord, 2005; Zwindermin & van den Wollenberg, 1990); therefore, results

should be interpreted with caution. With regard to the remaining analyses, ANOVA is often considered as robust against any violation in normality (Glass & Hopkins, 1996). Another important assumption of parametric models is homogeneity of variance. In other words, the variance across variables should be the same. This assumption was tested using Levene's test of homogeneity of variance for each item distribution and ANOVA test. If the test was found to be significant, the Welch's statistic was used to account for the heterogeneous variances (Glass & Hopkins, 1996).

Parametric IRT: Graded Response Model

The 12-items selected using the nonparametric item response model were further analyzed using a parametric graded response model. Parametric IRT employs more assumptions than nonparametric IRT. First, parametric models require a large sample size, including a large ratio of participants to number of items. Although there is no specific sample size recommendation, some studies demonstrated a sample of 200 to 300 per item as sufficient for IRT (see Chuah, Drasgow, & Luecht, 2006 for review; Cook, Taylor, Dodd, Teal & McHorney, 2007). Therefore, our sample of 105 may be vulnerable to positive biases in slope (Woods, 2008). Prior to entering the data into the model, it was essential to reduce the number of items for our small sample size. Next, parametric models, similar to nonparametric models, require local independence of items. A Kendell correlational matrix was examined of the 12-items[1] and revealed no intercorrelations greater than $r > 0.70$ (See Table 4[1]). Therefore, no items appeared to be dependent on each other.

Table 4.

Kendall Item Correlation Matrix of 12-item SPTS

	1	2	3	4	5	6	7	8	9	10	11	12
1	*****	0.491	0.277	0.380	0.413	0.397	0.431	0.200	0.300	0.431	0.377	0.337
2		*****	0.352	0.437	0.480	0.562	0.517	0.379	0.254	0.553	0.526	0.447
3			*****	0.293	0.399	0.402	0.344	0.250	0.179	0.382	0.420	0.418
4				*****	0.436	0.442	0.351	0.265	0.217	0.470	0.409	0.394
5					*****	0.592	0.496	0.352	0.282	0.478	0.455	0.378
6						*****	0.484	0.448	0.226	0.534	0.453	0.374
7							*****	0.391	0.345	0.629	0.417	0.437
8								*****	0.290	0.463	0.350	0.339
9									*****	0.341	0.322	0.182
10										*****	0.528	0.470
11											*****	0.401
12												*****

$p < .05$ for all item correlations.

Another assumption of parametric IRT is that of unidimensionality. An EFA[1] was conducted to reveal the scale underlying factor structure. Given the novelty of the scale, EFA was deemed the best approach when not making apriori assumptions about a scale (Costello & Osborne, 2005). Prior to conducting the EFA, the Kaiser-Meyer-Olkin's measure of Sampling Adequacy was 0.92 (EFA recommendation $KMO > 0.60$) and Bartlett's Test of Sphericity was statistically significant (χ^2 (66) = 659.91, $p < 0.001$). Hence, our sample of 105 participants for 12-items was considered sufficient to conduct an EFA. As Table 5 displays, principal axis factor analysis with varimax rotation with eigenvalues > 1 resulted in a one factor solution explaining 53.67% of the total variance. Further, Cattell's scree test also revealed a one-factor solution with no other factors displaying an eigenvalue > 1 (See Figure 8).

Table 5.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.440	53.667	53.667	6.440	53.667	53.667
2	.922	7.680	61.347			
3	.772	6.434	67.781			
4	.691	5.757	73.538			
5	.589	4.908	78.446			
6	.555	4.627	83.073			
7	.525	4.377	87.450			
8	.401	3.342	90.792			
9	.388	3.235	94.027			
10	.275	2.295	96.321			
11	.244	2.030	98.351			
12	.198	1.649	100.000			

Extraction Method: Principal Component Analysis.

EFA principal component analysis with varimax rotation: 53.67% of the total variance was explained by a one-factor solution.

[1] The correlational matrix (Table 4) and EFA assumption testing & tables/figures (Table 5, Figure 7) displayed reflect that of the final SPT scale. Item 12 was replaced from the initial scale. Tests of local independence and unidimensionality were conducted for the original scale, but not displayed here.

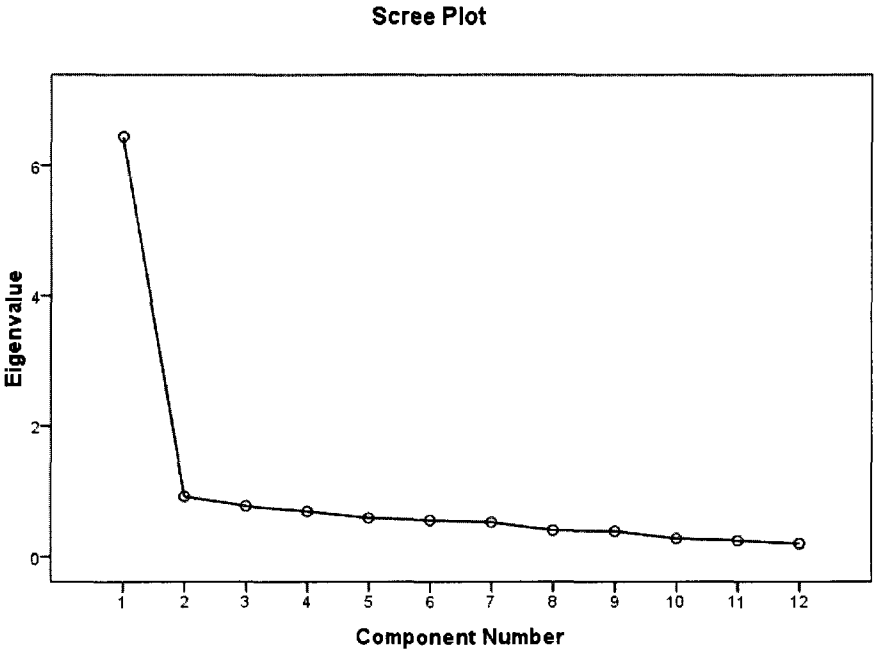


Figure 8. Cattell's scree test: One-factor solution is the only result demonstrating eigenvalue > 1.

Once the assumptions for parametric IRT were examined, the 12-items were put into a graded response model (GRM). Similar to nonparametric response modeling, the GRM provided OCCs and IICs (similar to ICCs in NIRT) for each item, as well as, total information scores for the entire scale. In addition, the GRM provided a numeric estimate to reflect the level of SPT associated with each of the SPT items and each item's discrimination level. The first step was to visually inspect the option characteristic curves (OCCs) and item information curves (IICs) to see if the 12-item scale performed well. Similar to the nonparametric model, OCCs display good psychometric properties if each option response curve had its own distinct peak separate from other option response

curves and were ordered from smallest to largest values across SPT level (See Figure 9). The IICs in the parametric model displayed how much information each item provided across a range of SPT levels. For example, Figure 10 displays an item with a poor IIC and an item with a good IIC. Item 9 gives only 0.30 level of information across ~30% of participants (Range: -0.5 to 1.5). In comparison, item 10 gives 3.0 level of information across ~35% of participants (Range: -0.5 to 2). We also examined each item's discrimination capacity (*a*-level) and the item's thresholds (the point at which participants with higher levels of SPT select the higher option response). An item's numeric discrimination level reveals the ability of an item to differentiate between individuals at varying levels of the latent trait (SPT). An item's threshold levels are easier analyzed visually through the OCCs, but can be interpreted numerically (*b*-levels) if more details are required or if it is not clear at what SPT level participants select a different option response.

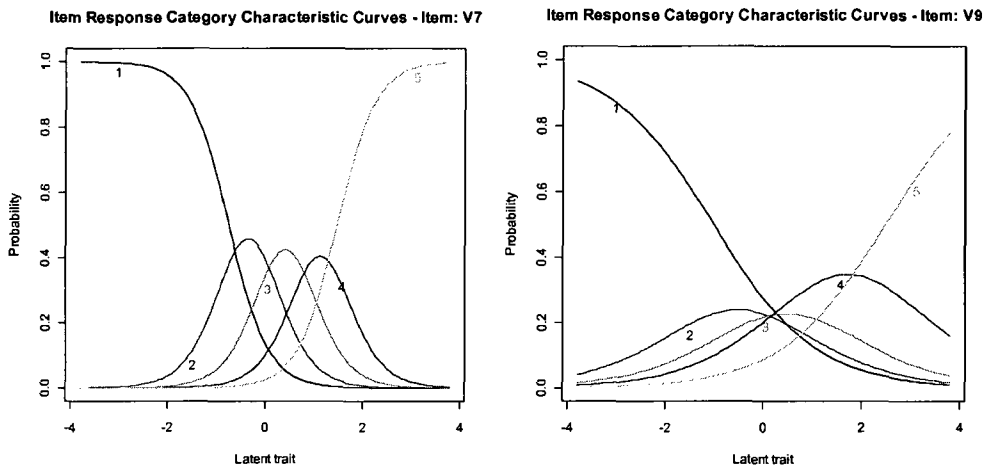


Figure 9. Parametric graded response model OCCs: Item 7 displays good psychometric properties as compared with Item 9, which displays flat option response curves with less separation.

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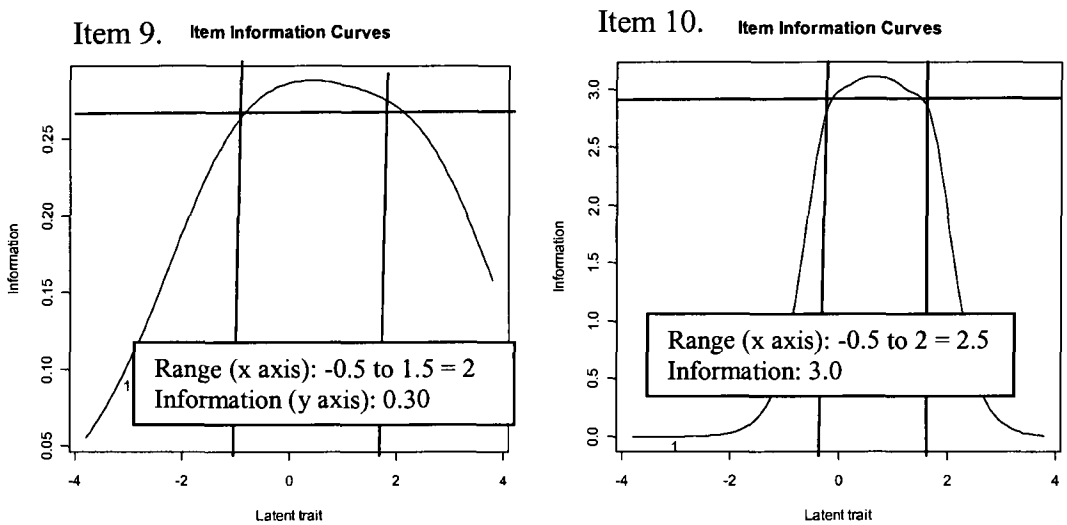

Figure 10. Parametric graded response model IICs: Item 9 shows poor level of information as compared to Item 10 which gives a large level of information across a good range of participants SPT level.

The first inspection revealed two items which did not discriminate well between options (OCCs: see Figure 11), did not give a substantial level of information about participants (IICs: see Figure 12) and had the lowest discrimination levels (*a*-level). Item 9, "As soon as I sense pain coming on, I take medications to reduce it," had a discrimination value (*a*) of 1.004 and item 12, "I react with anger when in pain," had a discrimination value (*a*) of 1.107. As a result, these items were replaced one at a time with other items which performed well in nonparametric output, fit into the same category (i.e., avoidance and hyperarousal), and had good face value. There was no suitable replacement for item 9 and it was kept to maintain good face validity. Item 12, "As soon as I sense pain coming on, I take medications to reduce it," was replaced with item 1 in the 67-item SPT scale "I feel sick to my stomach when I am in pain." The assumptions of local independence and unidimensionality were re-analyzed prior to inputting items into the graded response model.

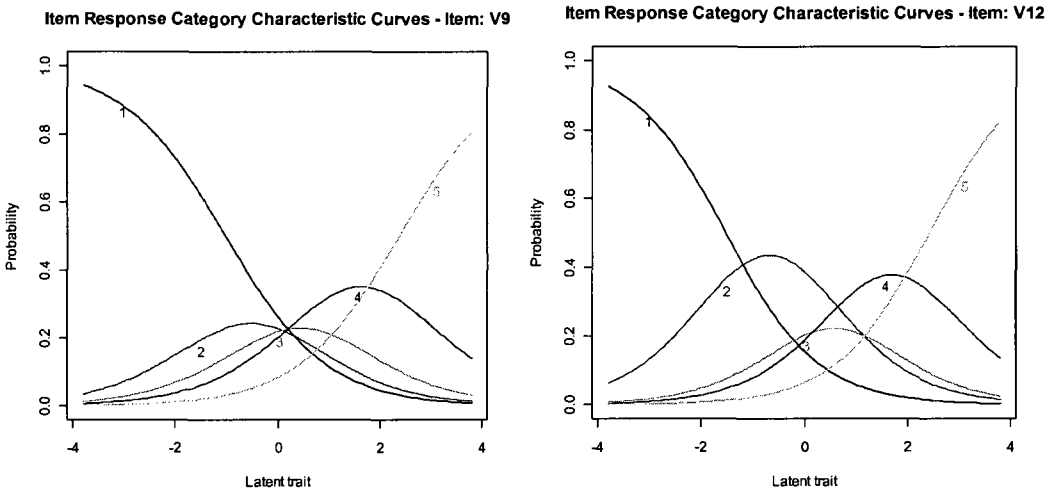

Figure 11. OCCs for Item 9, "As soon as pain comes on, I take medications to reduce it" and Item 12, "I react with anger when in pain" show poor discrimination between options 2-4.

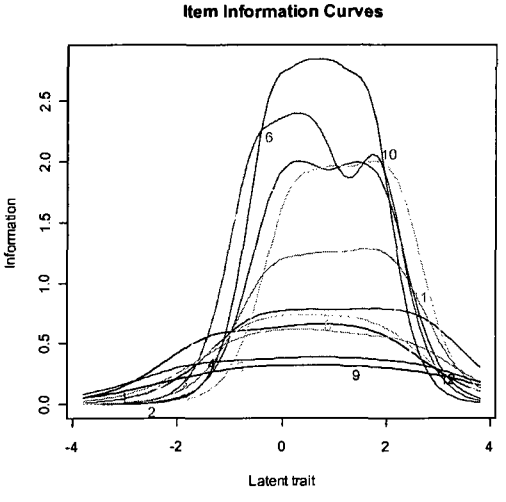

Figure 12. IICs for all 12 original items: Item 9, "...I take medications to reduce it" and Item 12, "I react with anger..." give the least amount of information

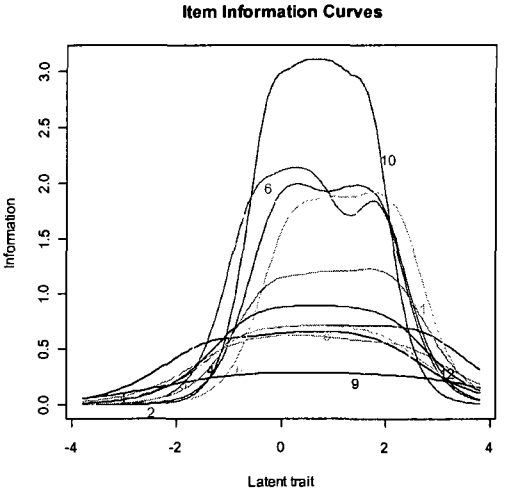

Figure 13. IICs for modified 12 items Item 12 replaced with "I feel sick to my stomach..." Item 9 gives the least amount of information.

Appendix F, Figure F1 displays the final 12-item OCCs. All 12-items demonstrated sufficient separation between option response curves, with the exception of item 9, "As soon as the pain comes on, I take medications to reduce it." Appendix F, Figure F2 shows the IICs for all 12-items and Figure 13 demonstrates the improvement in the level of information for the replaced item 12 as compared to Figure 12. Table 6 provides a summary of each item's mean, standard deviation, threshold levels (*b* parameter), IIC range, IIC information amount and discrimination level (*a* parameter). Item 10: "Pain sensations terrify me," item 6: "When I am in pain, I think about it even when I don't mean to," item 2: "When I am in pain, everything I see or do reminds me of the pain," 5: "Pain seems to bother me more than it does other people," and item 7: "I can't stand pain" had the highest discrimination ability and provided the most information overall about levels of SPT. Although the majority of the remaining items performed similarly, not surprisingly, item 9 "When I am in pain, I take medications to reduce it," performed poorly, providing the least amount of overall information and discrimination. Figure 14 gives the total information curve for the SPT scale. The SPT scale provided information primarily in the top 50% of SPT scores and the majority items appear to be most relevant among those with the highest levels of SPT.

Table 6.

Item means, level of SPT where each item option is expected to be observed, and each item's level of discrimination estimated by the graded response model.

#	Item Content	*M* *(S.D.)*	Slightly True	Some what True	Very True	Entirely True	Low-er R	Up-per R	Info.	a Discrim.
			Threshold1	Threshold 2	Threshold 3	Threshold 4				
1	Pain keeps me awake at night.	2.57 (1.29)	-1.33	0.06	0.89	1.82	-1	2	0.80	1.45
2	... Everything I see or do reminds me of..	2.00 (1.24)	-0.11	0.47	1.29	1.91	0	2	1.81	2.56
3	I try to avoid activities that cause pain.	2.46 (1.34)	-0.79	0.21	0.80	2.27	-1	2	0.55	1.41
4	... I'm scared that it's the beginning of a ..	2.10 (1.13)	-0.58	0.55	1.67	2.73	-0.5	2.5	0.70	1.53
5	Pain seems to bother me more	1.70 (1.08)	0.18	0.93	1.68	2.22	0	2.5	1.80	2.50
6	...I think about it even when I don't mean to.	2.35 (1.31)	-0.53	0.16	0.71	1.85	-0.5	2	1.70	2.64
7	I can't stand pain.	2.50 (1.34)	-0.75	0.05	0.78	1.47	-1	2	1.70	2.49
8	... I feel distant from people	2.41 (1.38)	-0.61	0.10	0.97	1.88	-0.5	2	0.65	1.50
9	... I take medications to..	2.56 (1.39)	-1.02	-0.01	0.96	2.48	-1	2	0.30	0.95
10	Pain sensations terrify me.	2.09 (1.30)	-0.22	0.41	0.98	1.64	0	2	2.80	3.23
11	...Things don't feel real.	1.96 (1.16)	-0.22	0.76	1.66	2.18	0	2	1.10	2.00
12	I feel sick to my stomach...	2.30 (1.29)	-0.56	0.29	1.13	2.02	-0.5	2	0.80	1.69

"..." = When I am in pain, R = Range, Item Content may not be written full item

Note: SPT scores range from 1-5 with 1="Not at all True", 2="Slightly True", 3="Somewhat True", 4="Very True", & 5="Entirely True". Threshold 1 represents the level of SPT when participants begin to report "Slightly True" rather than "Not at all True". Thresholds 2-4 represent the level of SPT at which participants begin to report the next highest category. B item range and information represents the Item Information Curves found in Figure 4. Range is the level (z-scores) of SPT which the item gives the most information about participants.

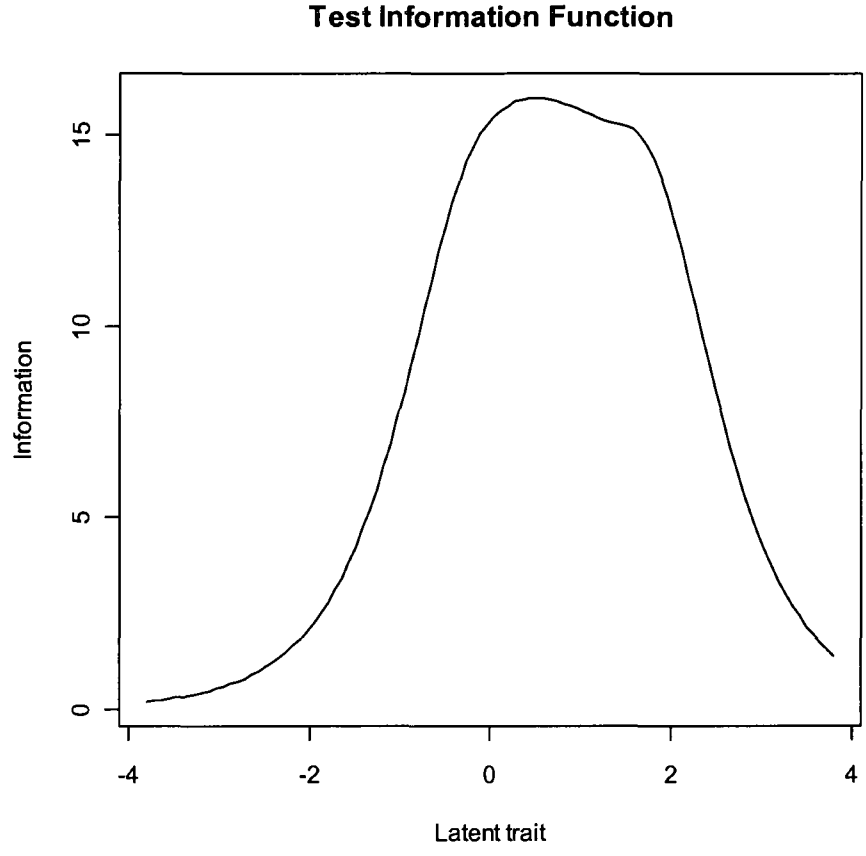

Figure 14. Total test information function: Parametric graded response model. The SPTS gives the most information for the top 50% SPT level of participants.

Preliminary Scale Properties

The preliminary psychometric properties of the final SPT 12-item scale were further examined and results confirm our first hypothesis. Internal consistency for the SPTS was high ($\alpha = 0.9167$) and each item contributed to this high Chronbach's alpha level (See Table 7). Kendall's inter-correlational matrix displays adequate correlations ($0.80 \leq r \geq 0.30$, $p < 0.001$) between items (See Table 4). An EFA supports a one factor

solution for the SPTS. When the criterion of factor loading ≥ 0.40 was employed (Guadagnoli & Velicer, 1988), all items in a one factor solution were sufficient (See Table 8). Further, all of the items in a one factor solution were > 0.60, supporting a stable and reliable factor solution (Guadagnoli & Velicer, 1988). All other factor solutions greater than one did not have sufficient factor loading values to be considered. Although splitting our sample into groups (i.e., male vs. females) was not an option for Differential Item Functions (DIF) in IRT analyses, preliminary analyses examined group differences in each of the items through a series of one way ANOVA tests. The Welch test (F_w) was used when the assumption of homogeneity of variance was not met. Inconsistent with hypothesis two, Table 9 reveals that item response means were similar between individuals who reported pain problems, chronic pain and current pain as compared to those who did not. However, there were significant differences on the majority of items between males and females and between those who reported common pains (i.e., paper cut) as highly painful and not painful on a scale of 1 "Not at all intense" to 10 "As intense as can be" (See Table 10). Females and individuals who report common injuries as highly painful had higher means on SPT items. Therefore, they were more likely to select the higher option responses (i.e., 3 "Somewhat True", 4 "Very True" and 5 "Entirely True"). Item number 1: "Pain keeps me awake at night", 4: "...I'm scared that it's the beginning of a terrible problem," and 5:"Pain seems to bother me more than it does other people" did not show any differences between gender. Also, item 4: "...I'm scared that it's the

beginning of a terrible problem" did not reveal any differences between those who reported common injuries as highly painful or not.

Table 7.

Chronbach's Alpha Values for 12-item SPTS.

	Value
All Items	0.9167
Excluding 1	0.9109
Excluding 2	0.9055
Excluding 3	0.9139
Excluding 4	0.9113
Excluding 5	0.9082
Excluding 6	0.9050
Excluding 7	0.9048
Excluding 8	0.9137
Excluding 9	0.9207
Excluding 10	0.9028
Excluding 11	0.9086
Excluding 12	0.9111

Table 8.

		Factor Extraction						
#	**Item Content**	**1**	**2**	**3**	**4**	**5**	**6**	**Comm-unality**
1	Pain keeps me awake at night	**.697**	.101	**-.543**	.137	-.048	-.025	.813
2	...Everything \I see or do reminds me of the pain	**.818**	-.16	-.178	-.192	.100	-.305	.842
3	I try to avoid activities that cause pain	**.645**	-.356	.330	**.469**	-.068	.032	.878
4	...I'm scared that it's the beginning of a terrible problem	**.697**	-.153	-.200	-.294	-.148	.120	.672
5	Pain seems to bother me more than it does other people	**.769**	-.177	.120	.015	-.313	.232	.790
6	...I think about it even when I don't mean to	**.818**	-.101	.156	-.185	-.280	-.022	.818
7	I can't stand pain	**.816**	.079	-.130	.058	.053	.230	.748
8	...I feel distant from people even when I'm talking to them	**.634**	.318	**.451**	-.394	.197	.066	.904
9	...I take medications to reduce it	**.476**	**.755**	.068	.323	-.051	.069	.912
10	Pain sensations terrify me	**.853**	.096	-.093	-.015	.053	.062	.752
11	...Things don't feel real	**.753**	-.19	.139	.121	-.016	-.552	.906
12	I feel sick to my stomach...	**.699**	-.280	-.010	.107	**.562**	.146	.916

EFA principal component analysis. Bold font loadings are > |0.4|

Table 9.

Item Characteristics: Mean Responses According to Gender and Pain Problems

Item Content	Mean *(SD)*	M vs. F	Current Pain vs. None	Chronic Pain vs. None	Pain vs. None	High vs. Low Pain Ratings
1. Pain keeps me awake at night.	2.57 (1.29)	*ns*	*ns*	*ns*	*ns*	.005
2. When I am in pain, everything I see or do reminds me of the pain.	2.00 (1.24)	.001	*ns*	*ns*	*ns*	.007
3. I try to avoid activities that cause pain.	2.46 (1.34)	< .001	*ns*	*ns*	*ns*	.003
4. When I feel pain, I'm scared that it's the beginning of a terrible problem.	2.10 (1.13)	*ns*	*ns*	*ns*	*ns*	*ns*
5. Pain seems to bother me more than it does other people.	1.70 (1.08)	*ns*	*ns*	*ns*	*ns*	.002
6. When I feel pain, I think about it even when I don't mean to.	2.35 (1.31)	.007	*ns*	*ns*	*ns*	.001
7. I can't stand pain.	2.50 (1.34)	.026	*ns*	*ns*	*ns*	< .001
8. When I'm in pain, I feel distant from people even when I am talking to them.	2.41 (1.38)	.041	*ns*	*ns*	*ns*	.040
9. As soon as the pain comes on, I take medications to reduce it.	2.56 (1.39)	.046	*ns*	*ns*	*ns*	.020
10. Pain sensations terrify me.	2.09 (1.30)	.005	*ns*	*ns*	*ns*	< .001
11. When I'm in pain, things don't feel real.	1.96 (1.16)	.015	*ns*	*ns*	*ns*	< .001
12. I feel sick to my stomach when I am in pain.	2.30 (1.29)	.002	*ns*	*ns*	*ns*	.004

Note: Means of Females > Males and Means of High Pain Ratings > Low Pain Ratings. Please see Table 10 for mean SPT scores per item across gender and pain ratings.
**ns = not significant*

Table 10.

Item Characteristics According to Gender and Subjective Pain Ratings.

Item Content	*M* *(SD)*	Males *M* *(SD)*	Fe-males *M* *(SD)*	Statistical Significance (* = Sig. $p < .05$)	Low Pain Raters *M* *(SD)*	High Pain Raters *M* *(SD)*	Statistical Significance (* = Sig. $p < .05$)
1. Pain keeps me awake at night.	2.57 (1.29)	2.25 (1.21)	2.62 (1.28)	$F(1,102) = 1.37$, $p = .244$	2.22 (1.13)	3.02 (1.37)	$F(1, 80) = 8.43$, $p = .005$*
2. When I am in pain, everything I see or do reminds me of the pain.	2.00 (1.24)	1.35 (0.74)	2.13 (1.28)	$F_w(1,49.61) = 12.92$, $p = .001$*	1.62 (0.98)	2.37 (1.37)	$F_w(1,72.36) = 7.84$, $p = .007$*
3. I try to avoid activities that cause pain.	2.46 (1.34)	1.55 (0.89)	2.69 (1.34)	$F_w(1,42.21) = 21.48$ $p < 0.001$*	2.07 (1.13)	2.98 (1.49)	$F_w(1,74.44) = 9.56$, $p = .003$*
4. When I feel pain, I'm scared that it's the beginning of a terrible problem.	2.10 (1.13)	1.70 (0.80)	2.18 (1.18)	$F_w(1,41.32) = 4.69$, $p = .036$*	1.98 (0.94)	2.27 (1.32)	$F_w(1,71.97) = 1.34$, $p = .251$
5. Pain seems to bother me more than it does other people.	1.70 (1.08)	1.30 (0.66)	1.80 (1.15)	$F_w(1,50.60) = 6.64$, $p = .013$*	1.34 (0.69)	2.10 (1.30)	$F_w(1,61.04) = 10.80$, $p = .002$*
6. When I feel pain, I think about it even when I don't mean to.	2.35 (1.31)	1.65 (0.88)	2.52 (1.35)	$F_w(1,43.39) = 12.74$, $p = .001$*	1.90 (1.07)	2.85 (1.37)	$F_w(1,75.49) = 12.29$, $p = .001$*
7. I can't stand pain.	2.50 (1.34)	1.90 (1.17)	2.64 (1.35)	$F(1,102) = 8.91$, $p = .026$*	1.93 (1.19)	3.05 (1.28)	$F(1, 80) = 25.81$, $p < .001$*
8. When I'm in pain, I feel distant from people even when I am talking to them.	2.41 (1.38)	1.85 (0.93)	2.55 (1.45)	$F_w(1,44.09) = 7.20$, $p = .010$*	2.10 (1.28)	2.73 (1.47)	$F(1, 80) = 8.24$, $p = .040$*
9. As soon as the pain comes on, I take medications to reduce it.	2.56 (1.39)	2.00 (1.17)	2.69 (1.41)	$F_w(1,33.59) = 5.17$, $p = .030$*	2.20 (1.29)	2.90 (1.41)	$F(1, 80) = 10.26$, $p = .020$*
10. Pain sensations terrify me.	2.09 (1.30)	1.35 (0.67)	2.26 (1.36)	$F_w(1,61.19) = 18.64$, $p < .001$*	1.56 (0.98)	2.73 (1.38)	$F_w(1,72.04) = 19.69$, $p < .001$*

11. When I'm in pain, things don't feel real.	1.96 (1.16)	1.40 (0.50)	2.10 (1.24)	F_w (1,76.87) = 15.63, $p < .001$*	1.45 (0.75)	2.44 (1.32)	F_w (1, 63.54) = 17.23, $p < .001$*
12. I feel sick to my stomach...	2.30 (1.29)	1.50 (0.69)	2.49 (1.33)	F_w (1,57.46) = 21.81, $p < .001$*	1.90 (1.09)	2.71 (1.37)	F (1, 80) = 13.28, $p = .004$*

Mean Comparisons according to Pain History & Gender

The remaining analyses of the SPTS aimed to test hypothesis 2; namely whether differences were evident in total SPT level between those with reported pain as compared to those without through a series of one-way ANOVAs. When the homogeneity of variance test was significant, the Welch statistic was used (F_w). A summary is provided in Table 11. The mean female total SPT score ($M = 2.39$, $SD = 0.95$) was statistically larger than the mean male total SPT score ($M = 1.65$, $SD = 0.46$) (F_w (1, 64.09) = 11.37, $p < 0.001$) with a large observed power of 0.92. Inconsistent with hypothesis two, there was no statistical difference between those who reported pain problems, chronic pain or current pain as compared to those who did not. Medication use and past surgery also did not impact participants SPT scores. Participants who rated common pain problems as highly painful (≥ 5 on a scale from 1 "Not at all intense" to 10 "As intense as can be") had a higher mean total SPT score ($M = 2.68$, $SD = 0.95$) than those who rated common pain problems as not very painful (< 5; $M = 1.84$, $SD = 0.67$) (F_w (1, 69.82) = 19.59, $p < 0.001$) with a large observed power of 0.99.

Table 11.

Six One-way ANOVAs comparing demographic characteristics to total SPTS Scores.

	SPT 1 *M* **(SD)**	**SPT 2** *M (SD)*	***F or*** F_w *(df1, df2)*	***p***	**Power**
Gender (F vs. M)	Females 2.39 (0.95)	Males 1.65 (0.46)	F_w (1, 64.09) = 11.37	< .001	0.92
Current Pain (Yes vs. No)	Pain 2.19 (0.77)	No Pain 2.26 (1.04)	F (1, 92) = 0.12	*ns*	-
Chronic Pain (Yes vs. No)	Pain 2.36 (1.05)	No Pain 2.18 (0.89)	F (1, 93) = 0.68	*ns*	-
Pain Problems (Yes vs. No)	Pain 2.20 (0.95)	No Pain 2.27 (0.92)	F (1, 100) = 0.13	*ns*	-
Pain Ratings (High vs. Low)	High 2.68 (1.00)	Low 1.84 (0.67)	F_w (1, 69.82) = 19.59	< .001	0.99
Medication Use (Yes vs. No)	Medication 2.34 (0.95)	No Medication 2.13 (0.88)	F (1, 101) = 1.44	*ns*	-
Past Surgery (Yes vs. No)	Surgery 2.10 (0.86)	No Surgery 2.28 (0.94)	F (1, 95) = 0.78	*ns*	-

**ns = not significant*

Discussion

The aims of the present study were to generate an initial set of items for the development of a new questionnaire called the Sensitivity to Pain Traumatization Scale (SPTS) and to test the preliminary psychometric properties of the scale using IRT and CTT methods. It was predicted that choosing psychometrically discriminative items through IRT would result in a reliable, unidimensional scale that would have the ability to differentiate between those with and without a history of pain problems. Following the generation of items for the scale through consultation of experts and the literature, the scale was reduced to 12 items using nonparametric item response theory. These 12 items were further analyzed under the parametric IRT graded response model and classical test theory. The results of the present study reveal a unidimensional 12-item scale with a majority of highly discriminating items that provide an adequate amount of information towards an individual's SPT level and good preliminary reliability. Although the SPTS did not discriminate between those with and without a reported history of pain problems, a series of one-way ANOVAs did find SPT levels significantly varied across gender and subjective pain ratings.

The hypotheses were partially supported in this study. The final SPTS did exhibit good preliminary psychometric properties. All of the items on the final SPTS loaded onto one factor. This result is consistent with Kleiman & Katz's (2008) discussion of their findings that items from the Anxiety Sensitivity Index (ASI), Pain Anxiety Symptoms Scale (PASS-20) and Pain Catastrophizing Scale (PCS) all loaded on one higher order

factor. However, without further evaluation of the SPTS in relation to other pain-related anxiety scales, it is difficult to speculate exactly what construct the one-factor found on SPTS consisted of. The remainder of the discussion will explore the findings of the thesis. First, I will examine the outcomes and challenges of the SPTS construction process itself. Second, differences between gender and pain ratings across total SPT scores will be explored. Third, the potential implications of the thesis and the SPTS will be outlined. Fourth, I will discuss some of the major limitations of the study. Finally, I will conclude the discussion by highlighting some future directions to be taken with the SPTS.

Discussion of Main Findings

The SPTS

The test construction process of the SPTS had many challenges. Some of these challenges will be explored in order to gain an understanding of the definition of the SPT construct and the limitations and future directions of the SPTS. According to the study by Kleiman & Katz (2008) and the literature review, six categories of SPTS (i.e., Hyperarousal, Emotional Numbing, Avoidance, Pain Experiencing, Sensitivity to Pain and Fear of Pain) were identified to which equal representation of items was ideal. Item generation revealed that these six categories had some definitional overlap. For example, the item "I can't stand pain" could be conceptualized as 'sensitivity to pain' or 'fear of pain'. The item was relegated as 'sensitivity to pain' because it seemed to be the least complicated choice (i.e., a participant could 'not stand pain' due to other reasons besides

fear of the pain, such as, a medical doctor indicating his or her preference to not treat patients in pain). Also, some item categories allowed easier generation of items than others. The category of pain experiencing was a challenging item to operationalize. Pain experiencing is based on the PTSD-related symptom of reliving a stressful trauma. Because the SPTS was developed to measure individuals at risk for responding to painful stimuli with PTSD-like symptoms, it was challenging to describe items representing intrusive thoughts related to pain experiencing without cementing the intrusive thoughts to a specific memory or past experience. As found in the literature review, PTSD has its own controversies when outlining exactly which symptoms construct its definition (Breslau, Chase, & Anthony, 2002). Therefore, it is not surprising that we would have similar difficulties outlining symptoms of the construct sensitivity to pain traumatization.

Apart from the issues of developing an operational definition of the SPT construct and item generation, a number of other considerations arose when deciding which items the final SPTS should include. First of all, when selecting the most discriminative and monotonic items for the SPT scale using nonparametric IRT, some scale categories had fewer items from which to choose as compared to others. Although we were able to select at least two suitable items for every category, some categories had an extremely limited range of choices. Interestingly, the hyperarousal and emotional numbing categories had the most abundant number of good items; whereas, the sensitivity to pain category had the least amount (See Appendix C, Figure C1-C2). Upon closer examination of each category, many of the items which did well in hyperarousal and emotional numbing were

also already established items in the Pain Anxiety Symptoms Scale (PASS-20: McCracken & Dhingra, 2002). Further, the symptoms of emotional numbing and hyperarousal are conceptually more diverse than sensitivity to pain. It was challenging to develop items for sensitivity to pain when an individual can either be sensitive or not. There is little variance in the descriptions. Therefore, the fact that hyperarousal and emotional numbing items were more symptomatically diverse and consist of items from the PASS-20, provides a probable explanation for this discrepancy in the number of psychometrically good items for each category in our nonparametric IRT analyses.

The number of total items is an important consideration when designing a scale. On the one hand, a relatively larger number of items improve the scale's reliability and level of information regarding the latent trait being measured. On the other hand, the more items in a scale, the greater administration time for participants. This increased time often results in difficult recruitment and, as a result, a smaller sample size and greater fatigue on behalf of the participants (Irvine & Kyllonen, 2002). The SPTS's reliability and level of information was tested with 67-items and 12-items. The 67-item scale was more reliable, had a normal distribution pattern and provided less information overall regarding the level of SPT than the 12-item scale. Although the fact that the 12-item scale provided more information than the 67-item scale seems counterintuitive, upon closer examination, the 67-item scale had a much larger standard deviation of scores (see Figure 5). Therefore, the 67-item scale had a greater number of poor items, which in-turn, overshadowed the benefits of having a greater number of items. Further, the reliability of

the 12-item scale was still high and the non-normal distribution was not overly skewed. Overall, the benefits of improved level of information about SPT and shorter administration time outweigh the disadvantages of reduced reliability and a positively skewed distribution of scores.

SPT across Gender and Pain History

Besides examining the scale's item properties, there was also an examination of how SPT scores differed across gender and presence of pain problems. Hypothesis two, that individuals with greater pain problems would have higher total SPTS scores, was not supported. Although there were no significant differences between those with reported pain problems with those without across SPTS total score, the SPTS scores were significantly different across high vs. low pain raters.

Although there was no hypothesis related to gender, it is interesting to note that females tended to score higher than males on most of the SPT items and on the total SPTS score. This finding is consistent with the literature in pain and PTSD which shows females are more likely to report PTSD symptoms (APA, 2000), exhibit chronic pain (Tsang, et al., 2008) and score higher on pain-related psychological scales; such as, the ASI (Stewart, Conrod, Gigna & Phil, 1998; Stewart, Taylor, & Baker, 1997; Zvolensky et al., 2009), PCS (D'Eon, Harris & Ellis, 2004), and PASS-20 (Osman, Barrios, Osman, Schneekloth & Troutman, 1994). Interestingly, females were also more likely to rate common injuries as more painful than males. Mean pain ratings were also found to significantly differentiate between those with high and low levels of SPT. Considering

one of the categories of SPT is sensitivity to pain, this finding is not surprising. In fact, further support of our findings shows females to be more sensitive to pain overall as compared to males in lab-based studies measuring pain tolerance and subjective intensity (Sullivan, Tripp, & Santor, 2000).

Given there was no significant difference between those with and without reported pain problems in total SPTS scores, questions arise regarding the content actually being measured by the SPTS. It was hypothesized that individuals with greater reported pain problems would be more likely to react to pain as if it were traumatizing. According to the Neuromatrix Theory of Pain (Melzack, 1999a), an individual's pain perception is determined by their biological makeup and their past learning experiences with pain. Once a person experiences pain, the painful stressor can alter the individual's neuromatrix, or the network of neurons that determine pain transmission. In fact, a person's pain history and expectations have been found to predict decreased tolerance to experimental pain (Cipher & Fernandez, 1997; Rollman, Abdel-Shaheed, Gillespie, & Jones, 2004) and increased pain intensity and duration following surgery (Bachiocco, Scesi, Morselli & Carli, 1993). The fact that there was not a significant difference in SPTS scores between those with and without a history of pain problems is somewhat perplexing.

Although the result that SPT score level did not differentiate between individuals with and without a history of pain problems was not expected, it is not necessarily a limitation of the SPTS. The SPTS was designed to measure the sensitivity to reacting to

painful stimuli with symptoms that resemble those of PTSD. An individual does not have to have had experienced past pain in order to be sensitive to such a reaction. Furthermore, not every pain experience will result in traumatization. An individual may experience a painful traumatic event, or witness such an event, and consequently witness the painful event being resolved. For example, a child who witnesses her mother live through breast cancer and survive may internalize this experience by further incorporating an idea of pain as something that can be difficult, but also can be resolved. This individual's experience of how pain is felt will be imprinted with her increased sense of self efficacy. Therefore, pain experiences can not only make an individual sensitive to traumatization, but they can also serve as a buffer that protects an individual from future traumatization by enhancing self-efficacy and contributing to reinforce their beliefs that pain can be resolved.

The only significant finding comparing pain groups with SPTS total score was between high and low pain raters. Perhaps the SPTS is only measuring those who are particularly sensitive to pain. The question then becomes; "Are individuals with high SPTS scores simply high pain raters or are they also the individuals most likely to develop chronic pain and PTSD?" However, further analyses and testing of the SPTS are needed to uncover probable explanations to these questions. Also, considerations of the limitations of the study are warranted prior to any interpretations of these unexpected findings.

Study Implications

At the heart of this study was the growing concern over the high co-occurrence of PTSD and chronic pain. The SPT construct has been proposed as a possible underlying vulnerability factor towards development and maintenance of both these disorders (Kleiman & Katz, 2008). Although more research is needed to compare the SPT construct with other pain anxiety-related constructs and PTSD symptomology, the SPTS could be used in future studies to support SPT as a possible higher order factor within the context of pain anxiety. Despite being made up of six item categorizations when developing the SPTS (i.e., hyperarousal, avoidance, emotional numbing, pain experiencing, fear of pain and sensitivity to pain), the EFA supported a single factor structure. The challenge for future studies now arises in ensuring the one factor, assumed to be SPT, is in fact different from already established constructs, such as, pain anxiety. The implications of the SPT construct as a vulnerability factor for developing PTSD and chronic pain are promising and could provide support to Asmundson and colleagues' (2002) shared vulnerability model.

The present study highlights the need for reliable and valid scales that can be easily and relatively quickly, administered to clinical populations. Few studies in the psychological sciences have employed IRT analyses for the assessment of scales (Nunnally & Bernstein, 1994). IRT analyses, compared to classical test theory, provide important advantages; such as, exploring how reliability of an item within and between items varies (Hambleton, Swaminathan & Rogers, 1991). Within the field of pain and anxiety, IRT analyses have provided recent interesting and important information

regarding various scales; including, but not limited to, the gender biases inherent in the ASI (Zvolensky et al., 2009), the identification of poor items in the Pain Assessment Checklist for Seniors with Limited Ability to Communicate (PACSLAC: Fuchs-Lacelle & Hadjistavropoulos, 2004) (van Nispen tot Pannerden, Candel, Zwakhalen, Hamers, Curfs, & Berger, 2009), and the awareness that the Roland-Morris Disability Questionnaire has difficulty sufficiently evaluating disability in persons with mild disability (Davidson, 2009).

IRT's strength lies in its ability to identify highly discriminative items, item biases between groups and item response patterns. Despite the advantages of IRT, its lack of utilization within the field of psychology remains a constant challenge (Nunnally & Bernstein, 1994). Researchers have postulated that IRT methods are too technical for social science researchers. Additionally, IRT models are designed to measure intellectual abilities and are not easily applied to psychological constructs (Fraley, Waller & Brennan, 2000). Therefore, it is hoped that this study will encourage more research and psychometric testing, specifically using IRT analysis, in the field of psychology, pain and anxiety.

Interestingly, analyses of scales with IRT have supported the continual use of classical test theory (CTT). IRT methods often yield identical conclusions regarding good compared to poor items on scales (Zvolensky et al., 2009). Similarly, the present study, which utilized both IRT and CTT methods, highlights the value of employing both theories. First of all, nonparametric IRT supported the selection of the most

discriminative and monotonic items from a large item bank and small sample size. Then, parametric IRT provided information about each item's ability to provide information about participant's SPT level. Finally, CTT provided further information regarding the scale's reliability, underlying factor structure and inter-correlations between items. Therefore, it is important for future studies to utilize both IRT and CTT in order to benefit from each unique method.

Limitations

There are several limitations to the present study. IRT and CTT each have assumptions (i.e., unidimensionality, local independence & normality) regarding the sample on which the analyses are conducted. Unfortunately, the fact that our sample size is relatively small is a considerable disadvantage towards the generalizability of our results and the final SPTS. Although there is no set sample size recommendation, one study recommends a sample of at least 200 participants for parametric IRT (Chuah, Drasgow, & Luecht, 2006). As a result, there is considerable evidence to suggest our parametric graded response modeling estimates of slope and discriminability are positively biased (Woods, 2008). Also, a smaller sample size contributes to a non-normal distribution. Although deviations from normality are the norm, rather than the exception, in social science research, studies have found non-normal samples to bias the results of IRT (van den Oord, 2005; Zwindermin & van den Wollenberg, 1990). Future applications and research on this scale would be encouraged to collect a larger sample with a relatively normal distribution and re-analyze the scale using parametric IRT.

Furthermore, our sample was too small to compare between groups of participants. One of the major advantages to IRT is its ability to examine how groups of individuals respond differently across an item and therefore permit detection of biased items (i.e., items that were more difficult for one group as compared to another). However, our small sample size made such a group analysis impossible. Our results and the literature on gender differences in mental disorders (i.e., PTSD) and pain, suggest there may be important gender differences in the response characteristics of the SPT scale. Further exploration into this potential difference is needed.

Additionally, it was questionable to compare between groups with and without a history of pain problems in the present study for the following reasons. First of all, the data was collected on a sample of first year undergraduate students. Most of these students are young (*M* age = 20 years) and not representative of the general population. Furthermore, it is speculated that the SPTS will eventually be employed within a sample of individuals with acute and chronic pain. Therefore, any future use of the SPTS would necessitate its validation with a clinical population; such as, individuals in the acute phase of an injury or surgery. The next concern in comparing between those with and without pain involves the method by which this information was collected. Self-report methods were used to evaluate history of pain problems. Although 25% of the sample reported experiencing chronic pain, we did not validate this finding with medical records. This may help explain the negligible difference in total SPT level between those with and without chronic pain. Lastly, the fact that our sample was not a clinical sample with a

significant history of pain problems, likely contributed to our highly positively skewed data. Most of the participants selected lower option responses, indicating they were less likely to endorse the symptom being described. It is predicted that a clinical sample would be more likely to endorse specific symptoms in response to pain; such as, avoiding the pain or thoughts related to the pain.

Future Directions

The limitations of this study highlight useful targets for future research and applications of the SPTS. First off, the SPTS needs to be validated with a larger sample size and within a clinical population. These validations would increase the confidence that our 12-item SPTS does have good psychometric properties and could potentially differentiate between individuals with and without a history of pain problems. Next, the SPTS needs to be tested alongside related pain anxiety scales, especially those scales which were the motivating factors underlying the SPT construct (i.e., PCS, PASS-20, ASI, FPQ-III). Further, the SPTS needs to be validated towards discriminating between individuals who exhibit PTSD-related symptoms in response to pain. Therefore, it would be useful to collect information related to a clinical sample's level of SPT and their corresponding scores on the Posttraumatic Stress Disorder Checklist-Civilian Version (PCL-C: Weathers, et al., 1993). Finally, longitudinal analyses would be exceptionally helpful in examining the clinical usefulness of the SPTS. If, as predicted, the SPTS will eventually have the capability to discriminate between individuals at high and low risk for developing comorbid PTSD and chronic pain, then, an individual's level of SPT

should be a significant contributing factor as to whether or not that individual develops PTSD and chronic pain. The difficulty in the above-mentioned analyses would be to isolate a sample for the purposes of tracking their development in the slight chance that they may experience a painful and/or traumatic experience. Given the complexity of such a study, it would be preferable to follow a sample going through major surgery who are somewhat guaranteed to experience pain and some trauma. Although the future of the SPTS is uncertain at this time, it is clear that there exists great potential, as well as, room for further research and psychometric validation.

Conclusions

In conclusion, the present study provides the initial stages in developing the SPTS. Items were generated through expert consultation and review of the literature. The large item bank was reduced and refined using IRT. Preliminary IRT and CTT analyses suggest the 12-item SPTS consists of a majority of highly discriminative items that provide a considerable amount of information regarding an individual's SPT level. Additionally, the SPTS shows good preliminary reliability and unidimensionality. The results of this study can be applied to offer a more robust and clinically meaningful approach to psychological assessment of cognitive and behaviour-based vulnerability to PTSD-like symptoms following pain, or pain traumatization. Further, this knowledge can be applied to promoting increased utilization of combined IRT and CTT methods in the psychological sciences. It is hoped that the SPT scale, following considerable psychometric testing and refinement, may be used as a screening device for individuals at

risk for comorbid PTSD and chronic pain and enhance our understanding of these complex disorders.

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Appendix A: Item Generation SPTS

Table A1.

Original Comprehensive List of 146 Items SPTS Separated by Category

*Note: *** Items suggested to be removed after research consultation.*
** Items suggest to keep.*

Fear of Pain Items

Experiential

1) I can't stand pain*
2) When I am in pain, it is an awful experience*
3) I hate pain***
4) Pain is an excruciating experience***
5) I feel absolutely helpless when I am in pain*
6) When I am in pain, I lose control***
7) When I am in pain, I am ready to do almost anything just to stop the pain*
8) I feel overwhelmed when in pain*
9) I can't think or do anything when in pain***
10) There is nothing more unpleasant than feeling pain*
11) Pain frightens me***
12) When I feel pain, I get scared***
13) Pain sensations are frightening***
14) Pain sensations terrify me*
15) Pain sensations are terrifying***
16) The stronger pain gets, the more frightened I feel*
17) Regardless of how much I dislike pain, I am not afraid of it*
18) I'm not afraid of pain*
19) I am not scared of pain***
20) When I feel pain, I still can control myself***
21) I can tolerate pain easily*
22) Pain does not bother me that much*

Consequences

1) Pain is dangerous*
2) When I am in pain, it means something awful is going to happen to me*
3) When I feel pain, I think I might die*
4) When I feel pain, I am scared that I might have a terrible disease***
5) When I feel pain, I am scared that it is the beginning of a terrible problem*
6) I fear pain because it means there is something wrong with my body***
7) Being in constant pain is the worst fate imaginable*

8) Pain is a signal that something is very wrong in my body*
9) If pain gets strong enough, it can lead to death***
10) I am afraid of being useless if I am in pain***
11) When I am in pain, I feel like I am going to die*
12) Pain can kill***
13) Too much pain can kill*
14) Extreme pain can kill***

Sensitivity to Pain Items:

1) I feel pain more intensely than other people do***
2) I am especially sensitive to pain*
3) Pain seems to hurt me more than it does other people*
4) Pain seems to bother me more than it does other people*
5) I am no more sensitive to pain than other people are*
6) I have always been more sensitive to pain than other people***
7) I can tolerate more pain than most people*
8) I cannot stand even the slightest bit of pain*
9) I cannot stand the feeling of pain*
10) Pain does not bother me*
11) There is nothing more unpleasant than feeling pain*
12) I have always been one to react emotionally when I am in pain***
13) Some people feel pain more strongly than others***

Experiencing Items:

Fear of Sensations Associated with Experiencing

1) When I am in pain, I can ignore it easily*
2) I cry when I am in pain***
3) When I am in pain, my life stops***
4) I can work despite the pain***
5) I don't let my life stop because of pain***
6) I feel useless when I am in pain***
7) When I am in pain, all I can do it hope it ends***
8) When I am in pain, upsetting thoughts about pain pop into my mind***
9) When I feel pain, I think about it even when I don't mean to [IES]*
10) When I feel pain, it keeps me from falling asleep***
11) Pain keeps me awake at night*
12) When I feel pain, I have trouble falling asleep or staying asleep because pictures of thoughts about the pain come into my mind [IES]***
13) When I am in pain, I have unpleasant dreams or nightmares about the pain*
14) I sometimes dream about the pain I have***
15) Feeling pain takes up all of my attention***
16) When I am in pain, I am constantly thinking about my pain***

17) When I feel pain, I can think of nothing else*
18) When I am in pain, I keep thinking about how much it hurts*
19) When I am in pain, I keep thinking about how much I want the pain to stop [PCS]*
20) When I am in pain, I can't seem to keep it out of my mind***
21) When I am in pain, everything I see or do reminds me of the pain*
22) When I hurt I think about pain constantly***
23) When I am in pain, I worry about it*
24) When I feel pain, I have trouble concentrating on anything else*
25) When I am in pain, I feel overwhelmed*
26) Waves of strong feelings overcome me when I am in pain [IES]***
27) Talking about pain makes it more intense*

Consequences of Experiencing

28) When I feel pain, I am scared that it will never end*
29) When I am in pain, I think my life will change forever***
30) When I am in pain, I feel that my body is falling apart*

Avoidance Items:

Fear of Sensations associated with avoidance

1) When I feel pain, I avoid moving***
2) When I feel pain, I don't use the part of my body that hurts***
3) When I feel pain, I try not to move or do anything that would make the pain worse*
4) When I feel pain, I stay in bed***
5) I go immediately to bed when I feel severe pain [PASS-20]*
6) I will stop any activity as soon as I sense pain coming on [PASS-20]*
7) I avoid important activities when I hurt [PASS-20]***
8) I try to avoid activities that cause pain [PASS-20]*
9) When I feel pain, I try not to think about it*
10) When I feel pain, I try to keep it out of my mind***
11) When I am in pain, I don't like to talk about it*
12) When I feel pain, I try to distract myself*
13) When I feel pain, I try to avoid the distressing feelings.***
14) When I am in pain, I will do anything I can to reduce it.***
15) I will do almost any activity if it will distract me from the pain***
16) As soon as the pain comes on I take medications to reduce it [PASS-20]*

Fear of the consequences associated with avoidance

17) When I feel pain, I don't want to know what is wrong with me*
18) When I feel pain, I am afraid it will get worse if I talk about it*

Emotional Numbing Items:

Fear of Sensations associated with emotional numbing

1) When I feel pain, I don't feel like doing anything***
2) When I am in pain, I lose interest in activities I used to enjoy [PCL-C]*
3) I lose interest in many things when I am in pain [PASS-20]***
4) When I am in pain, I don't enjoy the things I used to love*
5) Nothing seems important when I am in pain [PASS-20]***
6) When I am in pain, I do not care about anything except the pain*
7) When I am in pain, I feel all alone in the world*
8) When I feel pain, I can't connect with people*
9) When I am in pain I feel less emotionally connected to people***
10) I feel emotionally detached from others because of my pain***
11) Pain makes me feel detached from other people*
12) When I am in pain I don't have the same loving feelings as I used to***
13) I am unable to have loving feelings for those close to me during periods of pain [PCL]***
14) When I am in pain, I feel distant from people even when I am talking to them [PCL]*
15) When I am in pain, nothing makes me happy*
16) When I am in pain, I feel emotionally numb [PCL-C]*
17) When I am in pain, I do not feel any emotions***
18) When I am in pain, I feel dead to the world***
19) When I feel pain, I feel like I'm watching myself from outside***
20) When I am in pain, things don't feel real*
21) When I am in pain, I feel like I am living on autopilot***
22) When I am in pain, I feel as if I am in a dream*
23) When I am in pain, time seems to move more slowly than usual*

Fear of the consequences associated with emotional numbing

24) When I feel pain, I think I will end up alone***
25) When I feel pain, I don't see the point of going on***
26) I think that if my pain gets too severe, it will never get better***
27) When I am in pain, I feel like I don't have much of a future*
28) When I feel pain, I think I don't be able to love again*

Hyperarousal Items

Fear of Sensations associated with hyperarousal

1) I feel sick to my stomach when I am in pain*
2) Pain makes me nauseous [PASS-20]*
3) I can feel my stomach sink when I know I am about to feel pain***
4) When in pain, my entire body gets tense*
5) When I feel pain, I have feelings of tightness in my chest***

6) I get a feeling of dread when I am in pain*
7) Pain seems to cause my heart to pound or race [PASS-20]*
8) My body does not function properly when I am in pain***
9) I find it difficult to breathe when I am in pain*
10) My mouth goes dry when I am in pain***
11) My knees feel weak when I am in pain***
12) When I sense pain, I feel dizzy or faint [PASS-20]*
13) Pain makes my whole body shake uncontrollably***
14) I begin trembling when engaged in an activity that increases pain [PASS-20]*
15) I find it difficult to calm my body down after periods of pain [PASS-20]*
16) When I am in pain, I don't sleep as well as usual***
17) I feel irritable when I am in pain*
18) I react with anger when I am in pain*
19) I can't think straight when I am in pain*
20) When I am in pain, I feel the blood drain from my face***
21) Pain brings out the worst in me

Table A2.

SPTS 79 Items for Pilot Testing Split into Categories

Note: [--]Squared brackets indicate original scale which item was retrieved.
Legend: PASS-20 = Pain Anxiety Symptoms Scale
IES = Impact of Events Scae
PCL-C = Posttraumatic Stress Disorder Checklist – Civilian Version
PCS = Pain Catastrophizing Scale
FPQ = Fear of Pain Questionnaire-III

Fear of Pain Items
Experiential

1) I can't stand pain
2) When I am in pain, it is an awful experience
3) I feel absolutely helpless when I am in pain
4) When I am in pain, I am ready to do almost anything just to stop the pain
5) There is nothing more unpleasant than feeling pain
6) Pain frightens me
7) Pain sensations terrify me
8) The stronger pain gets, the more frightened I feel
9) Regardless of how much I dislike pain, I am not afraid of it
10) I'm not afraid of pain
11) I can tolerate pain easily
12) Pain does not bother me that much

Consequences

13) Pain is dangerous
14) When I am in pain, it means something awful is going to happen to me
15) When I feel pain, I think I might die
16) When I feel pain, I am scared that it is the beginning of a terrible problem
17) Being in constant pain is the worst fate imaginable
18) Pain is a signal that something is very wrong in my body.
19) When I am in pain, I feel like I am going to die
20) Too much pain can kill

Sensitivity to Pain Items:

1) I am especially sensitive to pain
2) Pain seems to hurt me more than it does other people
3) Pain seems to bother me more than it does other people
4) I am no more sensitive to pain than other people are
5) I can tolerate more pain than most people

6) I cannot stand even the slightest bit of pain
7) I cannot stand the feeling of pain.
8) Pain does not bother me.
9) There is nothing more unpleasant than feeling pain

Experiencing Items:

Fear of Sensations Associated with Experiencing

1) When I am in pain, I can ignore it easily
2) When I feel pain, I think about it even when I don't mean to [IES]
3) Pain keeps me awake at night
4) When I am in pain, I have unpleasant dreams or nightmares about the pain.
5) When I feel pain, I can think of nothing else
6) When I am in pain, I keep thinking about how much it hurts
7) When I am in pain, I keep thinking about how much I want the pain to stop [PCS]
8) When I am in pain, everything I see or do reminds me of the pain
9) When I am in pain, I worry about it
10) When I feel pain, I have trouble concentrating on anything else
11) When I am in pain, I feel overwhelmed
12) Talking about pain makes it more intense

Consequences of Experiencing

13) When I feel pain, I am scared that it will never end.
14) When I am in pain, I feel that my body is falling apart.

Avoidance Items:

Fear of Sensations associated with avoidance

1) When I feel pain, I try not to move or do anything that would make the pain worse
2) I go immediately to bed when I feel severe pain [PASS-20]
3) I will stop any activity as soon as I sense pain coming on [PASS-20]
4) I try to avoid activities that cause pain [PASS-20]
5) When I feel pain, I try not to think about it
6) When I am in pain, I don't like to talk about it.
7) When I feel pain, I try to distract myself
8) As soon as the pain comes on I take medications to reduce it [PASS-20]

Fear of the consequences associated with avoidance

9) When I feel pain, I don't want to know what is wrong with me.
10) When I feel pain, I am afraid it will get worse if I talk about it.

Emotional Numbing Items:

Fear of Sensations associated with emotional numbing

1) When I am in pain, I lose interest in activities I used to enjoy [PCL-C]

2) When I am in pain, I don't enjoy the things I used to love.
3) When I am in pain, I do not care about anything except the pain
4) When I am in pain, I feel all alone in the world
5) When I feel pain, I can't connect with people
6) Pain makes me feel detached from other people
7) When I am in pain, I feel distant from people even when I am talking to them [PCL-C]
8) When I am in pain, nothing makes me happy
9) When I am in pain, I feel emotionally numb [PCL-C]
10) When I am in pain, things don't feel real
11) When I am in pain, I feel as if I am in a dream
12) When I am in pain, time seems to move more slowly than usual

Fear of the consequences associated with emotional numbing

13) When I am in pain, I feel like I don't have much of a future
14) When I feel pain, I think I won't be able to love again.

Hyperarousal Items

Fear of Sensations associated with hyperarousal

1) I feel sick to my stomach when I am in pain
2) Pain makes me nauseous [PASS-20]
3) When in pain, my entire body gets tense
4) I get a feeling of dread when I am in pain
5) Pain seems to cause my heart to pound or race [PASS-20]
6) I find it difficult to breathe when I am in pain
7) When I sense pain, I feel dizzy or faint [PASS-20]
8) I begin trembling when engaged in an activity that increases pain [PASS-20]
9) I find it difficult to calm my body down after periods of pain [PASS-20]
10) I feel irritable when I am in pain
11) I react with anger when I am in pain
12) I can't think straight when I am in pain

Appendix B: Scales Administered to Participants

Table B1.

Demographic Information Sheet

Demographic Information

1. Sex: Male Female

2. Date of Birth: _____
dd/mm/yyyy

3. Current age: _____

4. Height: _____

5. Weight: _____

6. Ethnic Background (check as many as apply to you):

1. African-Caribbean
2. African-Canadian
3. South Asian (e.g., India, Pakistan, Sri Lanka)
4. East Asian (e.g., Hong Kong, China, Vietnam, Korea)
5. Middle Eastern or North African (e.g., Iran, Israel, Egypt, Morocco)
6. White
7. Hispanic / Latino/a
8. Aboriginal
9. Other (please specify) _____

_____

In the above question, a list of ethnic backgrounds was provided. However, this list may or may not specify how you identify. Regardless of your answer to the previous question, how do you identify your ethnic background (s)?

Ethnically, I identify as:

_____

7. Degree you are pursuing at York:

_____

8. Year of study: _____

Table B2.

Current Pain and Pain History Questionnaire

Part II. Pain Experiences

1. Do you have any ongoing pain problems? Yes No (Go to Question 2)

   a. If Yes, list diagnosis or type of pain and location: _____
   _____
   _____

   b. For how long have you had the pain? _____

   c. How often do you have pain?

   - ❑ Daily
   - ❑ Weekly
   - ❑ Monthly
   - ❑ Other _____

   d. On the days that you feel pain, what is the average intensity of your pain?

   - ❑ Mild
   - ❑ Moderate
   - ❑ Severe

   e. How much does your pain interfere with your life?

   - ❑ Not at all
   - ❑ Slightly
   - ❑ Moderately
   - ❑ Severely

2. Do you currently feel any pain? Yes No

   a. If yes, how intense is the pain you feel right now?

   - ❑ Mild
   - ❑ Moderate
   - ❑ Severe

   b. Where is the pain? _____
   _____

3. Do you regularly use any of the following pain killers or medicines? Y / N
   If yes, please check which you are taking:

   - ❑ ***Aspirin***
   - ❑ ***Acetaminophen (eg: Tylenol)***
   - ❑ ***NSAIDs (eg: Naproxen, Advil, Motrin)***
   - ❑ ***Opioids (eg: Tylenol # 3)***
   - ❑ ***Other*** _____

4. Have you taken any of the following pain killers or medicines in the past 24 hours? Y / N
   If yes, please check which you have taken followed by the amount:

   - ❑ ***Aspirin:***_____
   - ❑ ***Acetaminophen (eg: Tylenol) :***_____
   - ❑ ***NSAIDs (eg: Naproxen, Advil, Motrin):***_____
   - ❑ ***Opioids (eg: Tylenol # 3):***_____
   - ❑ ***Other:***_____

5. Have you ever had a pain problem that persisted for more than one month (other than what you have mentioned above)? Yes No

   Type or diagnosis and location:_____
   _____
   _____
   _____

6. Have you ever had surgery? Yes No

   If yes, please list:

Type of surgery	Date of surgery
1.	
2.	
3.	

7. We would like to find out about your experiences with common types of pain. Please rate the **intensity** of the following pains you may have had in the past.
Circle the number that best describes the intensity of the experience where:
0 = not at all intense and 10 = as intense as can be

Circle n/a for "not applicable" if you have never experienced the pain

Type of Pain	Intensity (0-10)											
Tooth ache	0	1	2	3	4	5	6	7	8	9	10	n/a
Paper cut	0	1	2	3	4	5	6	7	8	9	10	n/a
Stubbed toe	0	1	2	3	4	5	6	7	8	9	10	n/a
Biting your tongue	0	1	2	3	4	5	6	7	8	9	10	n/a
Sunburn	0	1	2	3	4	5	6	7	8	9	10	n/a
Ear ache	0	1	2	3	4	5	6	7	8	9	10	n/a

8. We would like to find out about your experiences with various forms of pain relief. Please rate the effectiveness of the following forms of pain relief you may have used in the past. Circle the number that best describes how effective you usually find each method, where:
0 = not at all effective and 10 = completely effective

Circle n/a for "not applicable" if you have never used this form of pain relief.

Type of Pain	Effectiveness (0-10)											
Muscle Rub	0	1	2	3	4	5	6	7	8	9	10	n/a
Local Anesthetic – needle	0	1	2	3	4	5	6	7	8	9	10	n/a
Local Anesthetic – cream	0	1	2	3	4	5	6	7	8	9	10	n/a
Tiger Balm	0	1	2	3	4	5	6	7	8	9	10	n/a
Advil/Tylenol	0	1	2	3	4	5	6	7	8	9	10	n/a
Herbal/Alternative Remedies (please describe) _____ _____	0	1	2	3	4	5	6	7	8	9	10	n/a

Table B3.

79-Item SPTS used in pilot testing.

SPTS

INSTRUCTIONS: The statements listed below describe beliefs, thoughts, feelings and actions that people have or do when they are in (physical) pain or beliefs you have regarding bodily (physical) pain. Read each statement carefully and place a checkmark (√) in the box to the right that best reflects how true that statement is for you. Please check only one rating per statement.

		Not at All True	Slightly True	Somewhat True	Very True	Entirely True
1	Pain frightens me					
2	I feel sick to my stomach when I am in pain					
3	When I am in pain, I feel as if I am in a dream					
4	I go immediately to bed when I feel severe pain					
5	When I am in pain, it is an awful experience					
6	I'm not afraid of pain					
7	When I am in pain, it means something awful is going to happen to me					
8	Too much pain can kill					
9	I cannot stand even the slightest bit of pain					
10	Pain keeps me awake at night					
11	When I am in pain, everything I see or do reminds me of the pain					
12	When I feel pain, I have trouble concentrating on anything else					
13	When I am in pain, I feel that my body is falling apart					
14	I try to avoid activities that cause pain					
15	When I am in pain, I lose interest in activities I used to enjoy					
		Not	Slightly	Somewhat	Very	Entirely

		at All True	True	True	True	True
16	When I feel pain, I can't connect with people					
17	When I am in pain, I feel like I don't have much of a future					
18	I find it difficult to breathe when I am in pain					
19	I feel irritable when I am in pain					
20	There is nothing more unpleasant than feeling pain					
21	I can tolerate pain easily					
22	When I feel pain, I am scared that it is the beginning of a terrible problem					
23	Pain seems to bother me more than it does other people					
24	When I feel pain, I think about it even when I don't mean to					
25	When I am in pain, I worry about it					
26	When I feel pain, I try not to move or do anything that would make the pain worse					
27	When I feel pain, I try not to think about it					
28	When I feel pain, I don't want to know what is wrong with me.					
29	When I am in pain, I feel all alone in the world					
30	When I am in pain, I feel emotionally numb					
31	When I feel pain, I think I won't be able to love again.					
32	I begin trembling when engaged in an activity that increases pain					
33	I can't think straight when I am in pain					
34	I can't stand pain					
35	The stronger pain gets, the more frightened I feel					
		Not	Slightly	Somewhat	Very	Entirely

		at All True	True	True	True	True
36	Pain is a signal that something is very wrong in my body					
37	I am no more sensitive to pain than other people are					
38	Pain does not bother me					
39	When I am in pain, I keep thinking about how much it hurts					
40	When I feel pain, I am scared that it will never end					
41	I will stop any activity as soon as I sense pain coming on					
42	When I am in pain, I don't like to talk about it					
43	When I am in pain, I don't enjoy the things I used to love					
44	When I am in pain, I feel distant from people even when I am talking to them					
45	When I am in pain, time seems to move more slowly than usual					
46	When in pain, my entire body gets tense					
47	I find it difficult to calm my body down after periods of pain					
48	When I am in pain, I am ready to do almost anything just to stop the pain					
49	Regardless of how much I dislike pain, I am not afraid of it					
50	Pain does not bother me that much					
51	When I feel pain, I think I might die					
52	Being in constant pain is the worst fate imaginable					
53	When I am in pain, I feel like I am going to die					
54	Pain seems to hurt me more than it does other people					
55	I can tolerate more pain than most people					

		Not at All True	Slightly True	Somewhat True	Very True	Entirely True
56	I cannot stand the feeling of pain					
57	When I am in pain, I can ignore it easily					
58	When I am in pain, I have unpleasant dreams or nightmares about the pain.					
59	When I am in pain, I feel overwhelmed					
60	As soon as the pain comes on I take medications to reduce it					
61	When I feel pain, I am afraid it will get worse if I talk about it					
62	When I am in pain, I do not care about anything except the pain					
63	When I am in pain, nothing makes me happy					
64	Pain makes me nauseous					
65	I get a feeling of dread when I am in pain					
66	When I sense pain, I feel dizzy or faint					
67	When I feel pain, I try to distract myself					
68	I feel absolutely helpless when I am in pain					
69	Pain sensations terrify me					
70	Pain is dangerous					
71	I am especially sensitive to pain					
72	There is nothing more unpleasant than feeling pain					
73	When I feel pain, I can think of nothing else					
74	When I am in pain, I keep thinking about how much I want the pain to stop					
75	Talking about pain makes it more intense					

		Not at All True	Slightly True	Somewhat True	Very True	Entirely True
76	Pain makes me feel detached from other people					
77	When I am in pain, things don't feel real					
78	Pain seems to cause my heart to pound or race					
79	I react with anger when I am in pain					

Appendix C: Item Reduction for Local Independence Assumption

Table C1.

12 Items Removed after Flagged as violating Local Independence Assumption.

Items Removed		**Items Remained**	
Item #	**Item Content**	**Item #**	**Item Content**
1	Pain frightens me	69	Pain sensations terrify me
12	When I feel pain, I have trouble concentrating on anything else	73	When I feel pain, I can think of nothing else
39	When I am in pain, I keep thinking about how much it hurts		
43	When I am in pain, I don't enjoy the things I used to love	15	When I am in pain, I lose interest in activities I used to enjoy
46	When I am in pain, my entire body gets tense	32	I begin trembling when engaged in an activity that increases pain
49	Regardless of how much I dislike pain, I am not afraid of it	6	I'm not afraid of pain
50	Pain does not bother me that much	38	Pain does not bother me
51	When I feel pain, I think I might die	53	When I am in pain, I feel like I am going to die
54	Pain seems to hurt me more than it does other people	23	Pain seems to bother me more than it does other people
56	I cannot stand the feeling of pain	34	I can't stand pain
64	Pain makes me nauseous	2	I feel sick to my stomach when I am in pain
72	There is nothing more unpleasant than feeling pain	20	There is nothing more unpleasant than feeling pain

Table C2.

67-item SPTS	*Item Category*
1. I feel sick to my stomach when I am in pain	HA
2. When I am in pain, I feel as if I am in a dream	EN
3. I go immediately to bed when I feel severe pain	AV
4. When I am in pain, it is an awful experience	FP
5. I'm not afraid of pain	FP
6. When I am in pain, it means something awful is going to happen to me	FP
7. Too much pain can kill	FP
8. I cannot stand even the slightest bit of pain	SP
9. Pain keeps me awake at night	PE
10. When I am in pain, everything I see or do reminds me of the pain	PE
11. When I am in pain, I feel that my body is falling apart	PE
12. I try to avoid activities that cause pain	AV
13. When I am in pain, I lose interest in activities I used to enjoy	EN
14. When I feel pain, I can't connect with people	EN
15. When I am in pain, I feel like I don't have much of a future	EN
16. I find it difficult to breathe when I am in pain	HA
17. I feel irritable when I am in pain	HA
18. There is nothing more unpleasant than feeling pain	FP
19. I can tolerate pain easily	SP
20. When I feel pain, I am scared that it is the beginning of a terrible problem	FP
21. Pain seems to bother me more than it does other people	SP
22. When I feel pain, I think about it even when I don't mean to	PE
23. When I am in pain, I worry about it	PE
24. ..., I try not to move or do anything that would make the pain worse	AV
25. When I feel pain, I try not to think about it	AV
26. When I feel pain, I don't want to know what is wrong with me.	AV
27. When I am in pain, I feel all alone in the world	EN
28. When I am in pain, I feel emotionally numb	EN
29. When I feel pain, I think I won't be able to love again.	EN
30. I begin trembling when engaged in an activity that increases pain	HA
31. I can't think straight when I am in pain	HA
32. I can't stand pain	SP
33. The stronger pain gets, the more frightened I feel	FP
34. Pain is a signal that something is very wrong in my body	FP
35. I am no more sensitive to pain than other people are	SP
36. Pain does not bother me	SP
37. When I feel pain, I am scared that it will never end	PE
38. I will stop any activity as soon as I sense pain coming on	AV

39. When I am in pain, I don't like to talk about it	AV
40. ..., I feel distant from people even when I am talking to them	EN
41. When I am in pain, time seems to move more slowly than usual	EN
42. I find it difficult to calm my body down after periods of pain	HA
43. When I am in pain, I am ready to do almost anything just to stop the pain	FP
44. Being in constant pain is the worst fate imaginable	FP
45. When I am in pain, I feel like I am going to die	FP
46. I can tolerate more pain than most people	SP
47. When I am in pain, I can ignore it easily	PE
48. When I am in pain, I have unpleasant dreams or nightmares about the pain.	EN
49. When I am in pain, I feel overwhelmed	PE
50. As soon as the pain comes on I take medications to reduce it	AV
51. When I feel pain, I am afraid it will get worse if I talk about it	AV
52. When I am in pain, I do not care about anything except the pain	EN
53. When I am in pain, nothing makes me happy	EN
54. I get a feeling of dread when I am in pain	HA
55. When I sense pain, I feel dizzy or faint	HA
56. When I feel pain, I try to distract myself	AV
57. I feel absolutely helpless when I am in pain	FP
58. Pain sensations terrify me	FP
59. Pain is dangerous	FP
60. I am especially sensitive to pain	SP
61. When I feel pain, I can think of nothing else	PE
62. When I am in pain, I keep thinking about how much I want the pain to stop	PE
63. Talking about pain makes it more intense	PE
64. Pain makes me feel detached from other people	EN
65. When I am in pain, things don't feel real	EN
66. Pain seems to cause my heart to pound or race	HA
67. I react with anger when I am in pain	HA

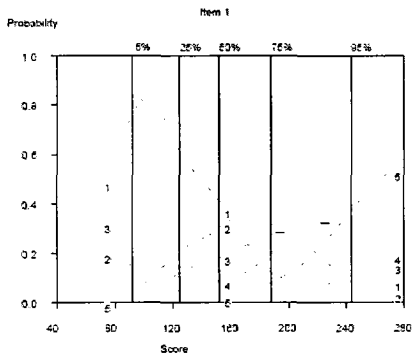
Legend:

EN = Pain and Emotional Numbing Item
HA = Pain and Hyperarousal Item
AV = Pain Avoidance Item
PE = Pain Experiencing Item
SP = Sensitivity to Pain Item
FP = Fear of Pain Item

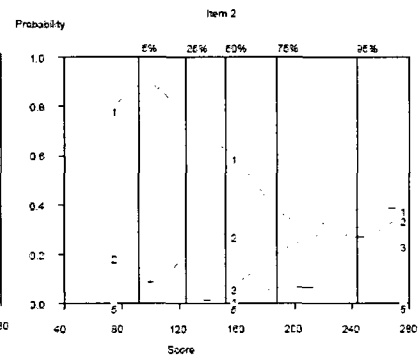
Appendix D: Nonparametric IRT 67-item SPTS

Figure D1.

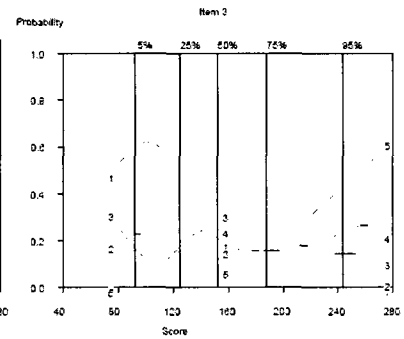
Option Characteristic Curves
Note: "..." = When I am in pain



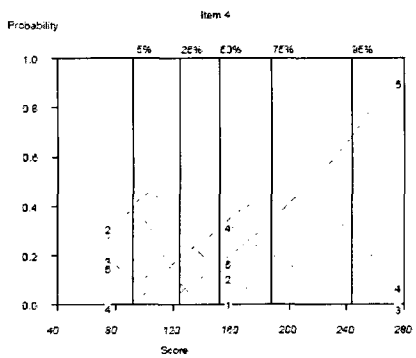
I feel sick to my stomach...



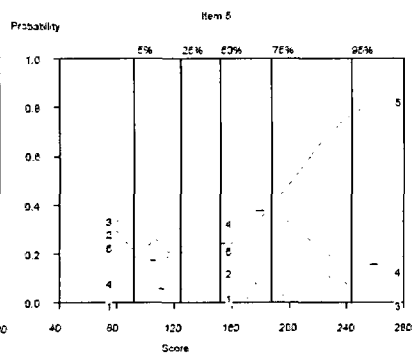
...I feel as if I am in a dream



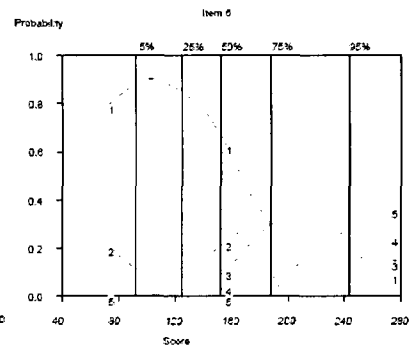
I go immediately to bed...



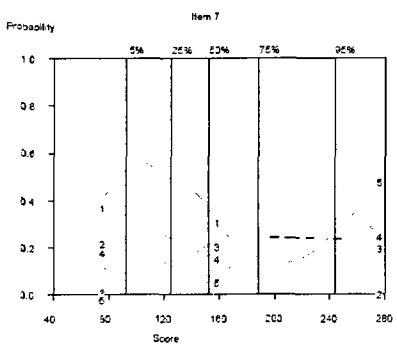
...It is an awful experience



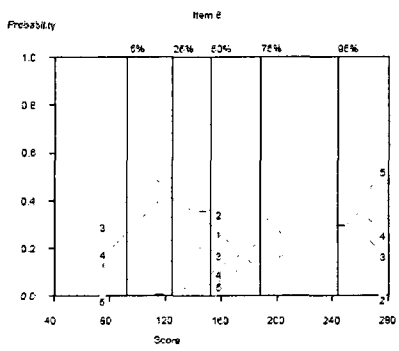
I'm not afraid of pain



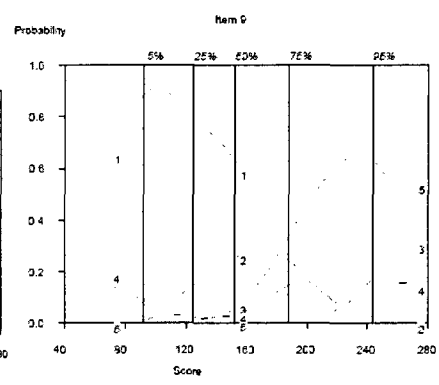
...It means something awful is going to happen to me



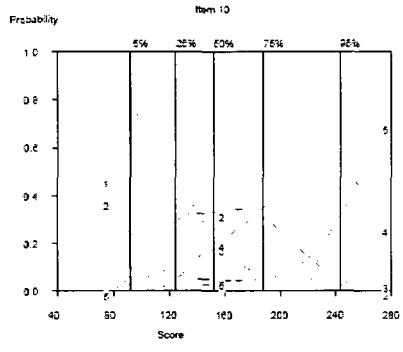
Too much pain can kill



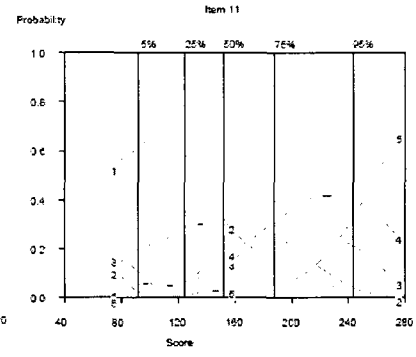
I cannot stand even the slightest bit of pain



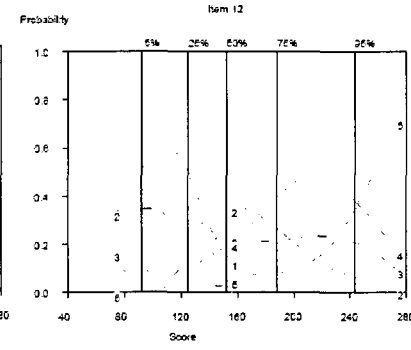
Pain keeps me awake at night



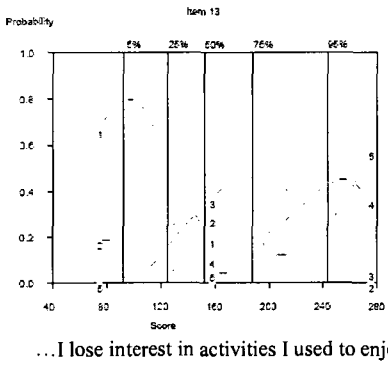
...Everything I see or do reminds me of the pain



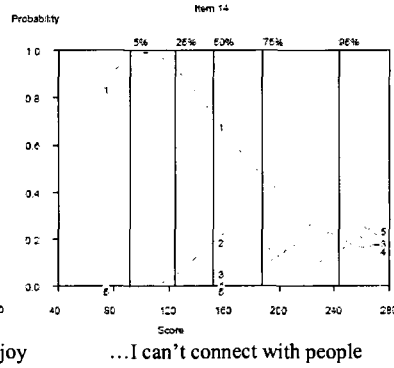
...feel that my body is falling apart



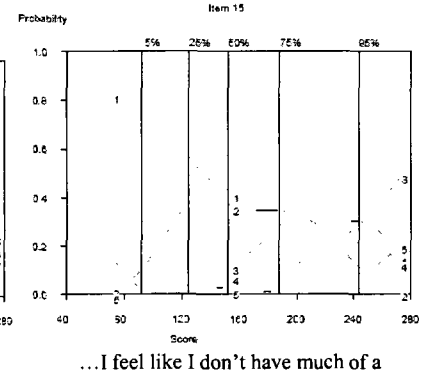
I try to avoid activities that cause pain



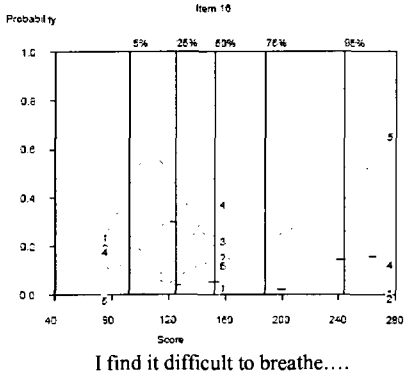
...I lose interest in activities I used to enjoy



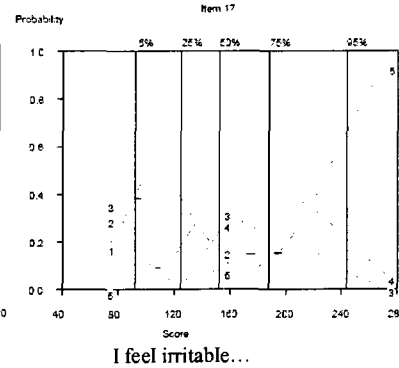
...I can't connect with people



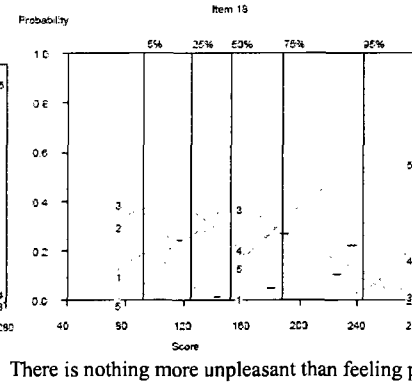
...I feel like I don't have much of a future



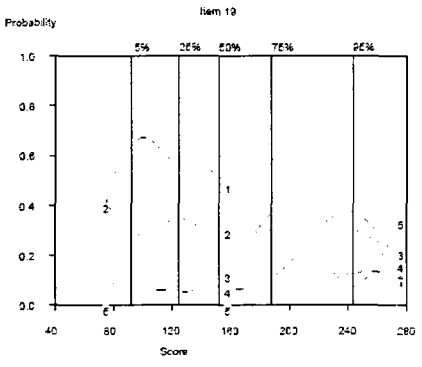
I find it difficult to breathe....



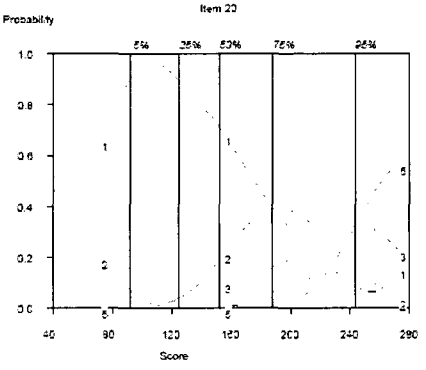
I feel irritable...



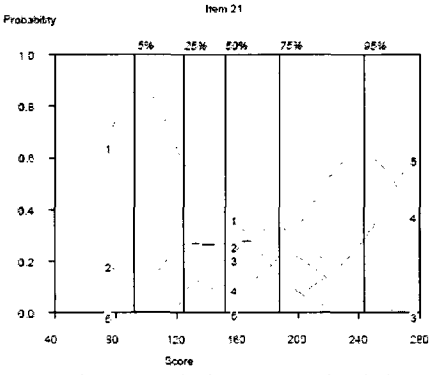
There is nothing more unpleasant than feeling pain



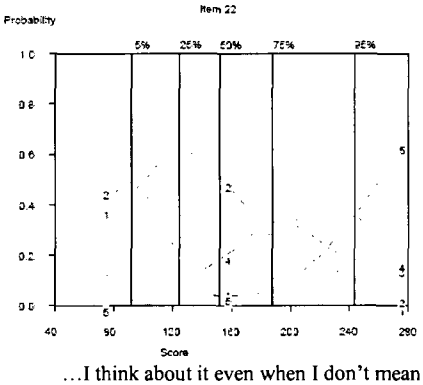
I can tolerate pain easily



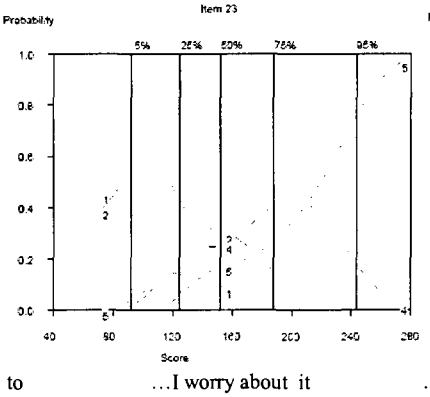
…I am scared that it is the beginning of a terrible problem



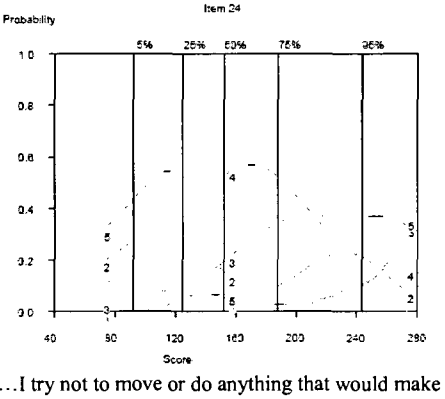
Pain seems to bother me more than it does other people



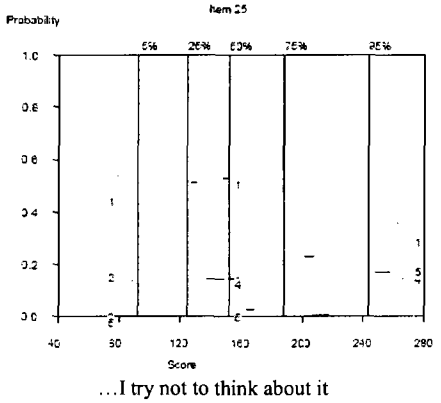
…I think about it even when I don't mean to



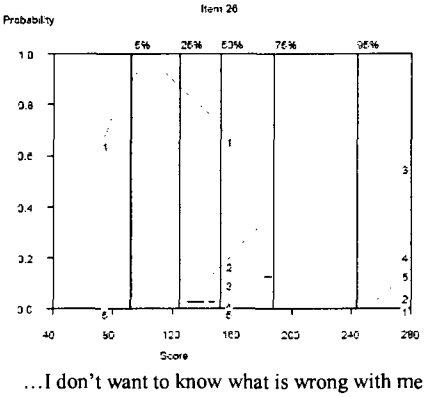
…I worry about it



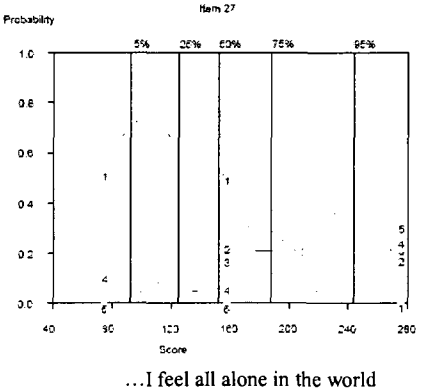
…I try not to move or do anything that would make the pain worse



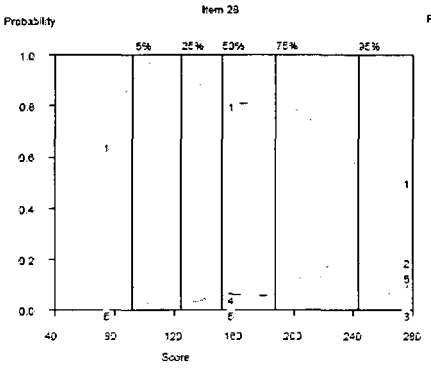
…I try not to think about it



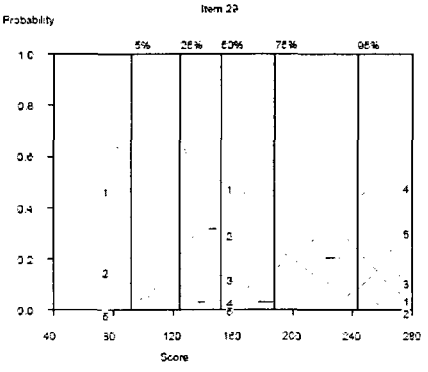
…I don't want to know what is wrong with me



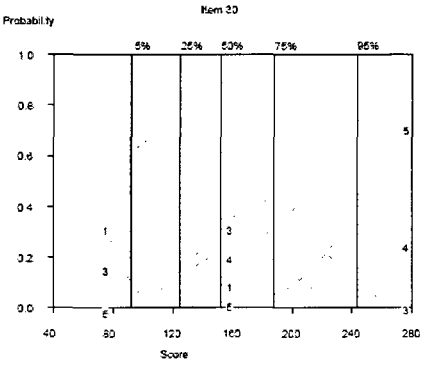
…I feel all alone in the world



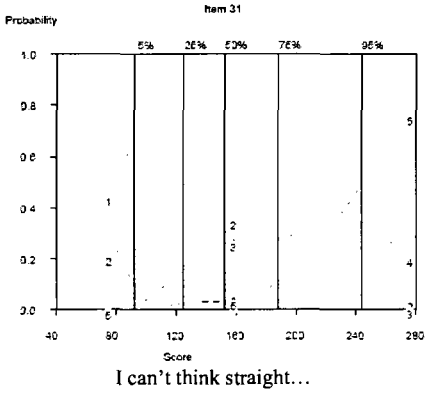
...I feel emotionally numb



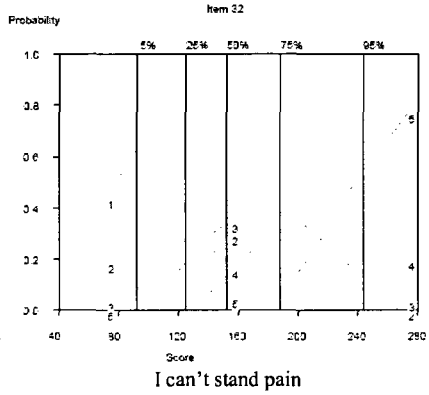
...I think I won't be able to love again



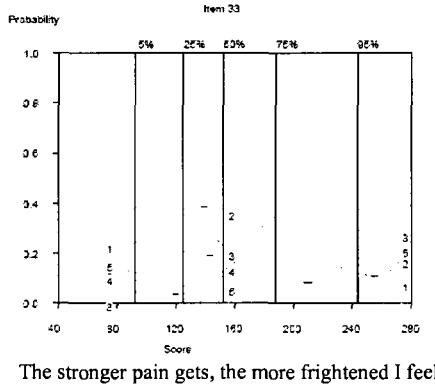
I begin trembling when engaged in an activity that increases pain



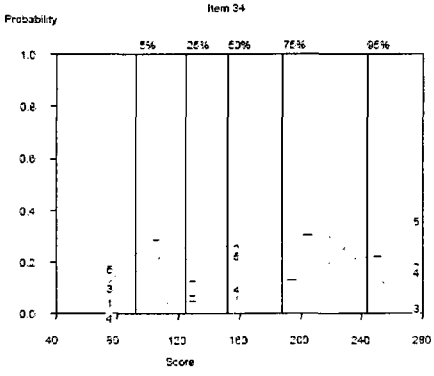
I can't think straight...



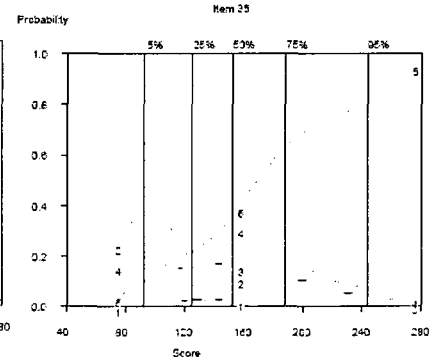
I can't stand pain



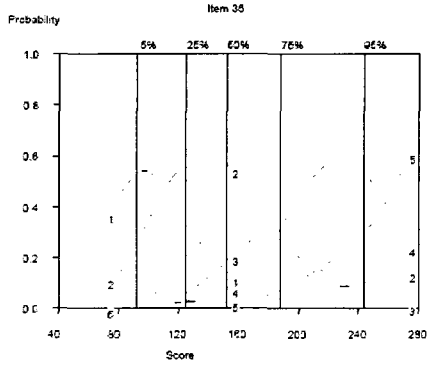
The stronger pain gets, the more frightened I feel



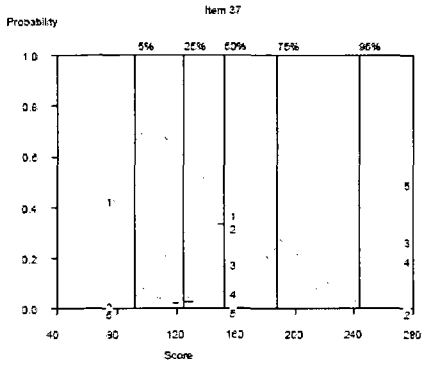
Pain is a signal that something is very wrong in my body



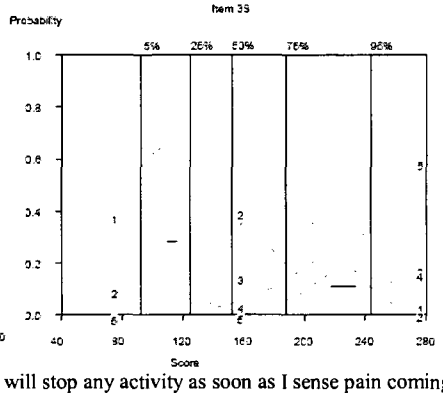
I am no more sensitive to pain than other people are



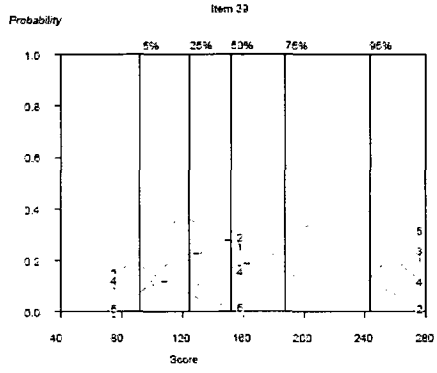
Pain does not bother me



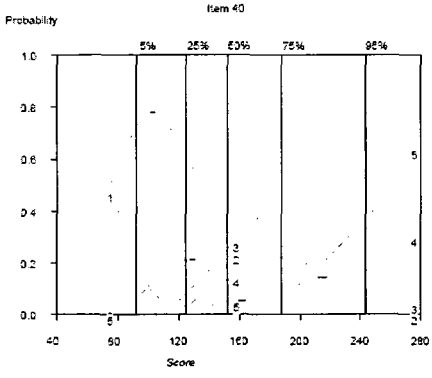
...I am scared that it will never end



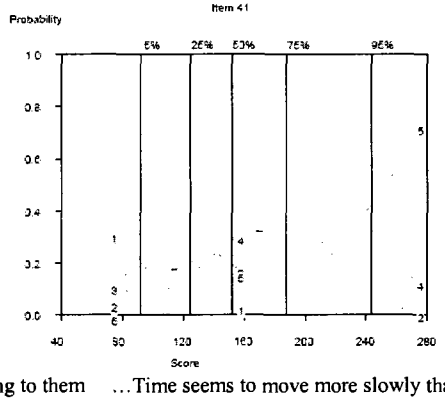
I will stop any activity as soon as I sense pain coming on



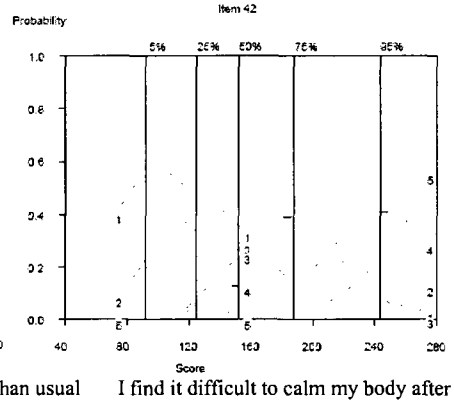
...I don't like to talk about it



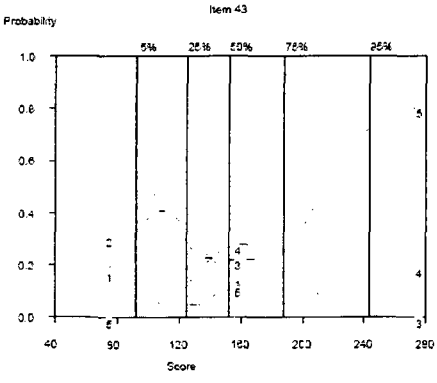
...I feel distant from people even when I am talking to them



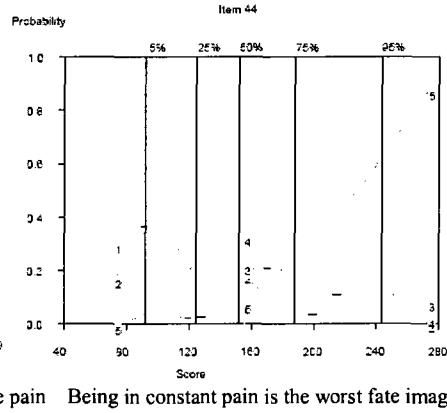
...Time seems to move more slowly than usual



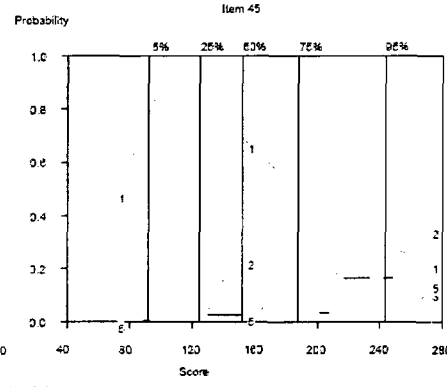
I find it difficult to calm my body after periods of pain



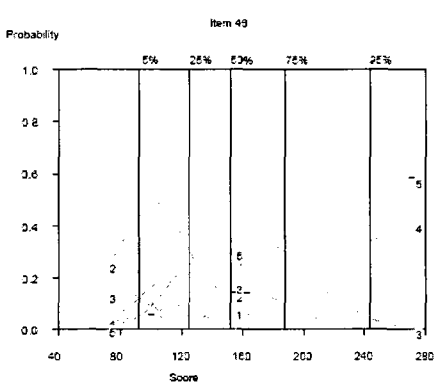
...I am ready to do almost anything just to stop the pain



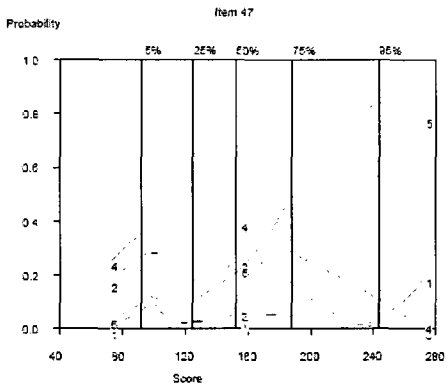
Being in constant pain is the worst fate imaginable



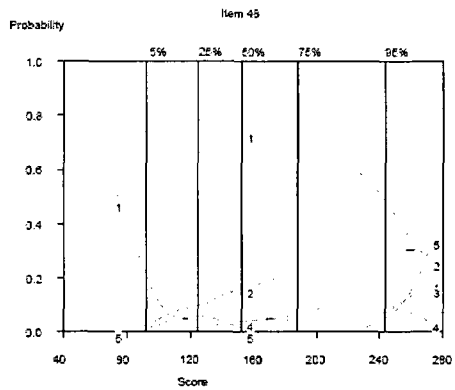
...I feel like I am going to die



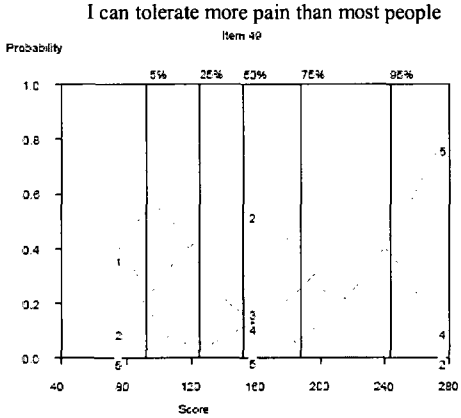
I can tolerate more pain than most people



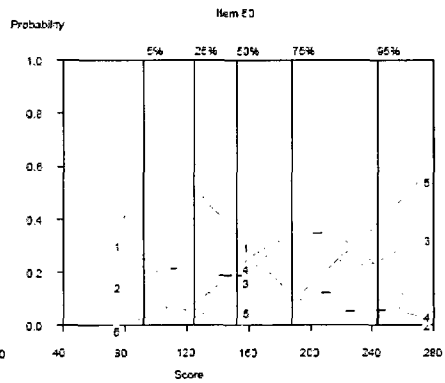
...I can ignore it easily



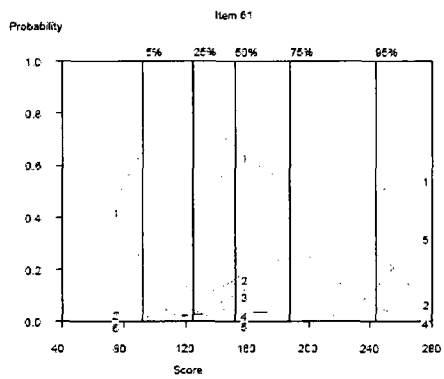
...I have unpleasant dreams or nightmares about the pain



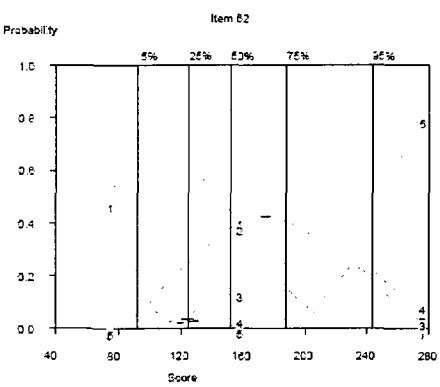
...I feel overwhelmed



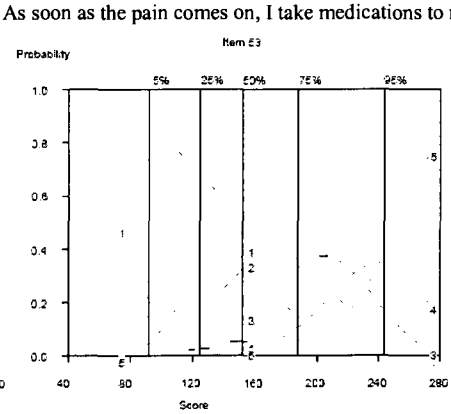
As soon as the pain comes on, I take medications to reduce it



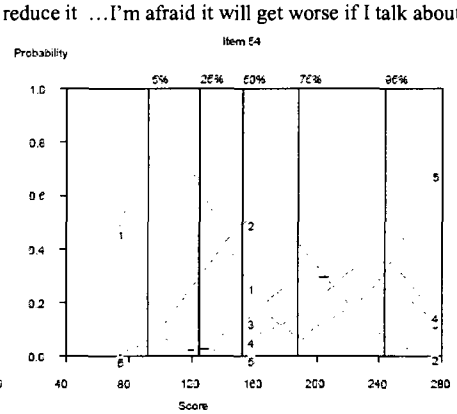
...I'm afraid it will get worse if I talk about it



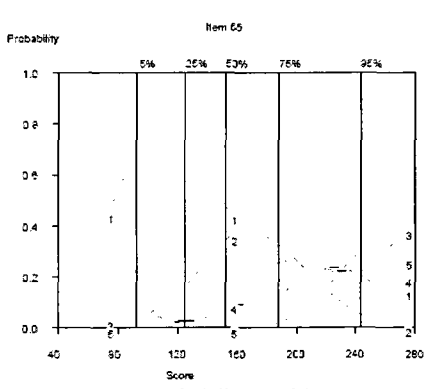
...I do not care about anything except the pain



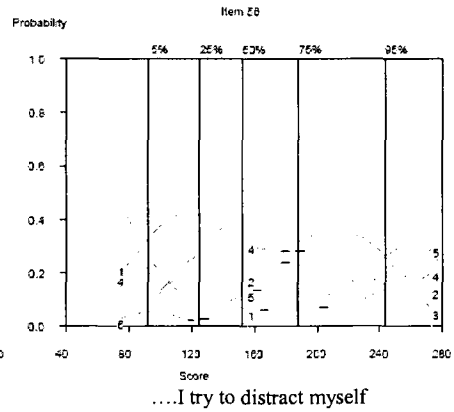
...Nothing makes me happy



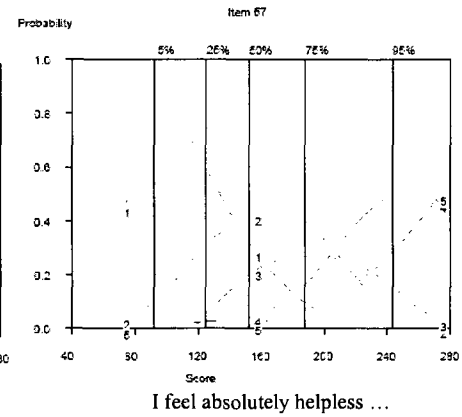
I get a feeling of dread ...



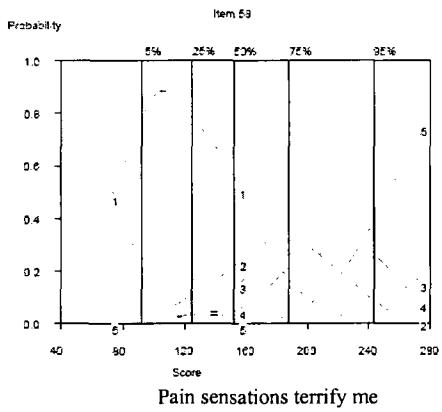
…I feel dizzy or faint



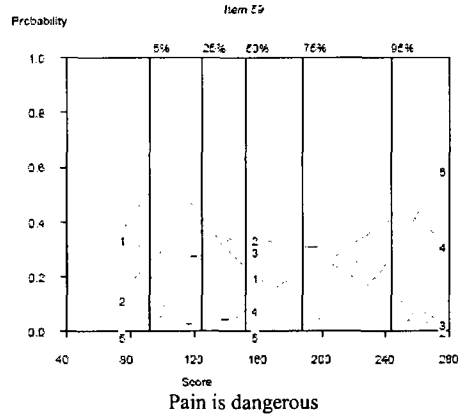
….I try to distract myself



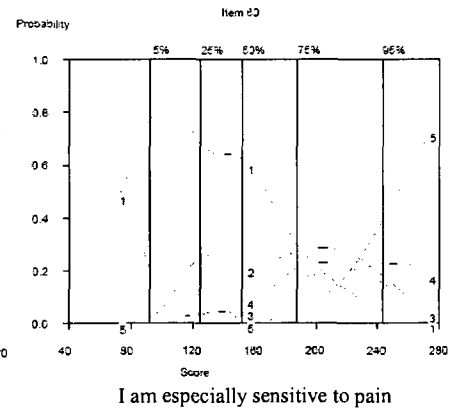
I feel absolutely helpless …



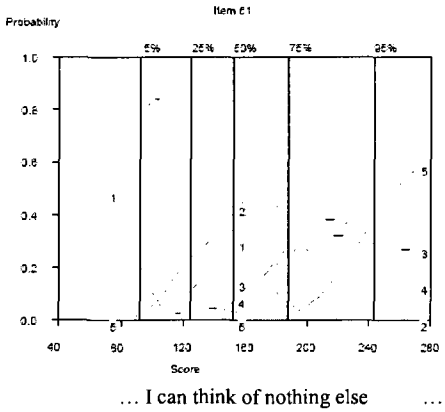
Pain sensations terrify me



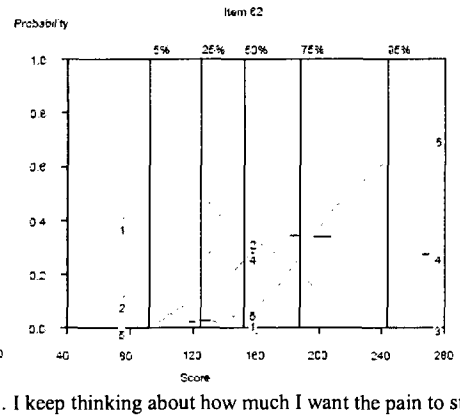
Pain is dangerous



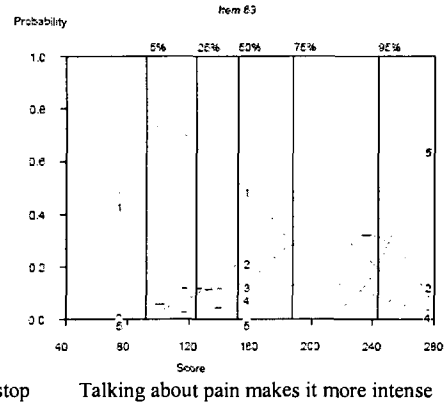
I am especially sensitive to pain



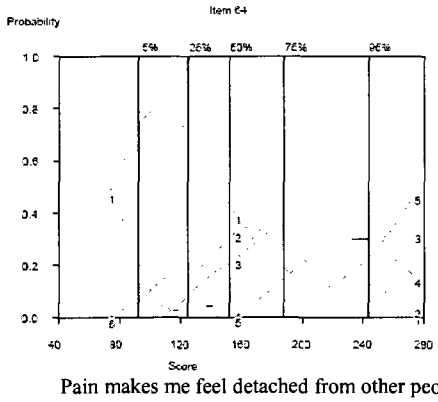
… I can think of nothing else



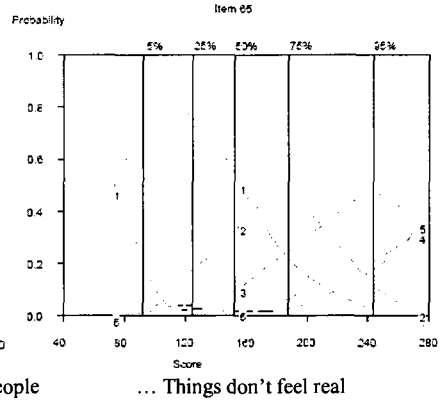
… I keep thinking about how much I want the pain to stop



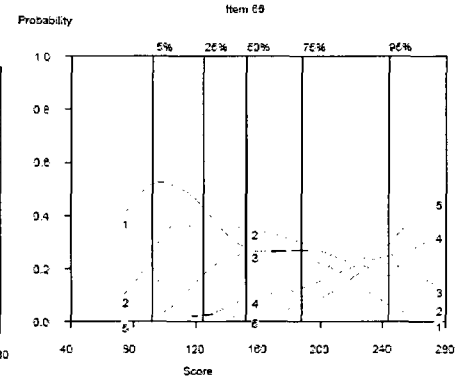
Talking about pain makes it more intense



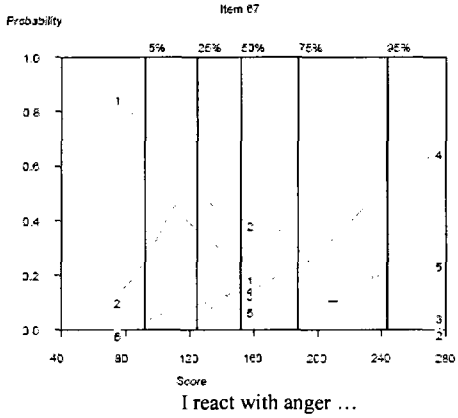
Pain makes me feel detached from other people



... Things don't feel real



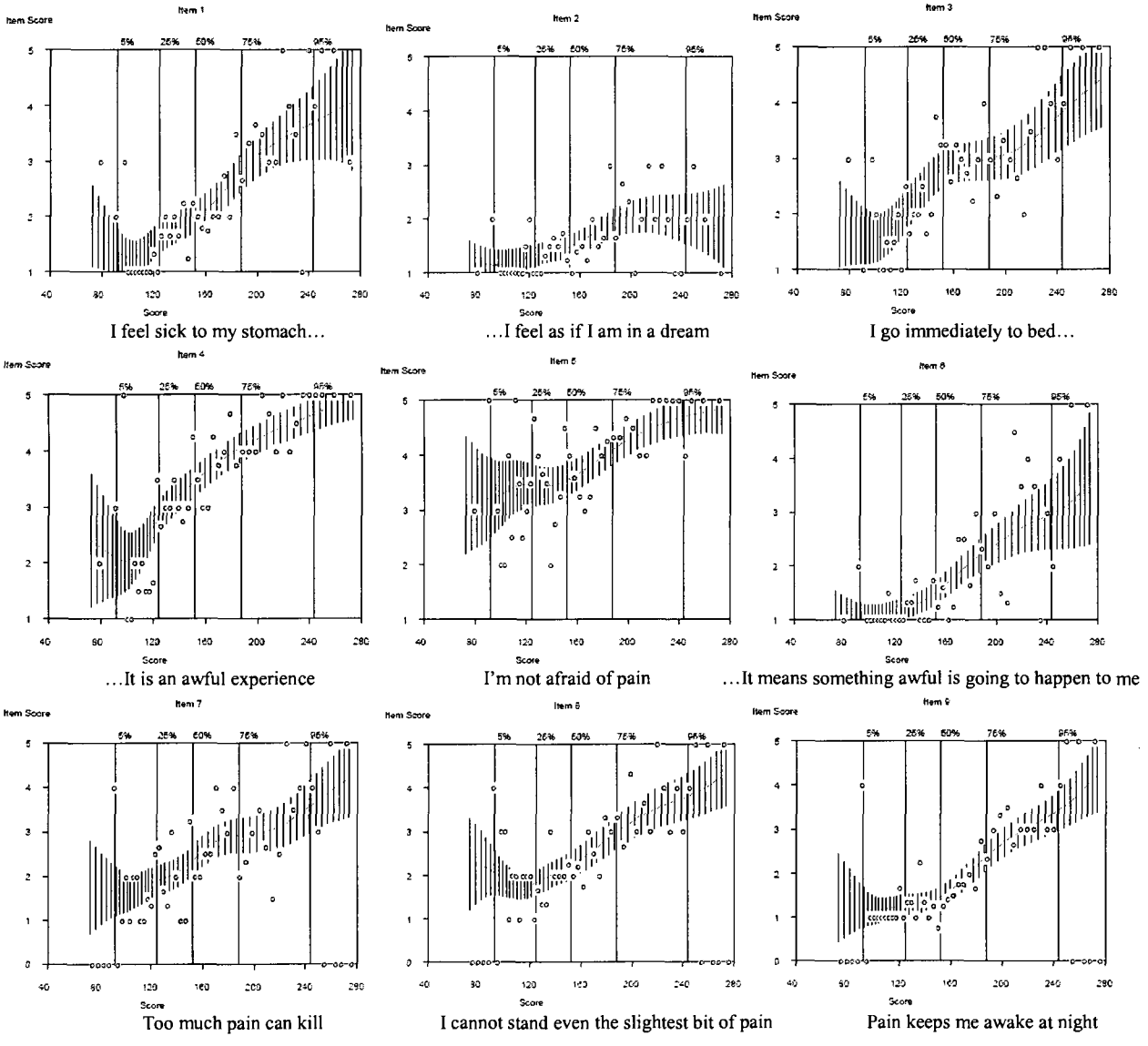
Pain seems to cause my heart to pound or race

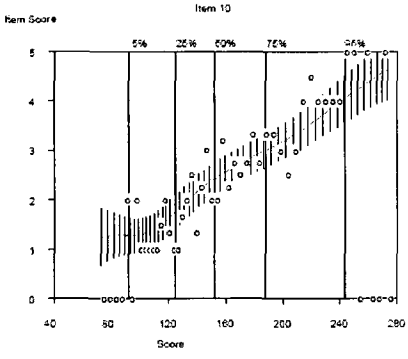


I react with anger ...

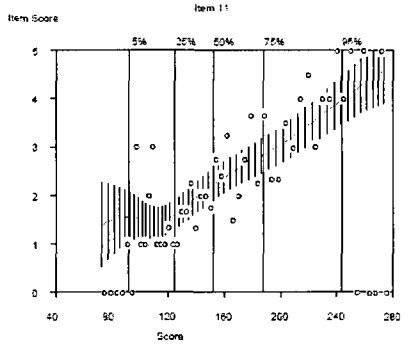
Figure D2.

Item Characteristic Curves

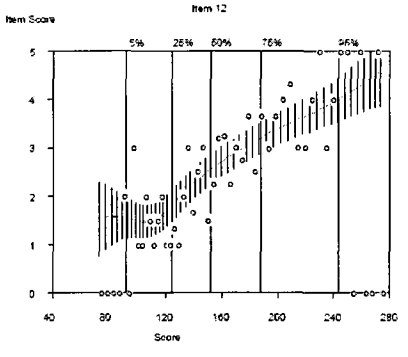




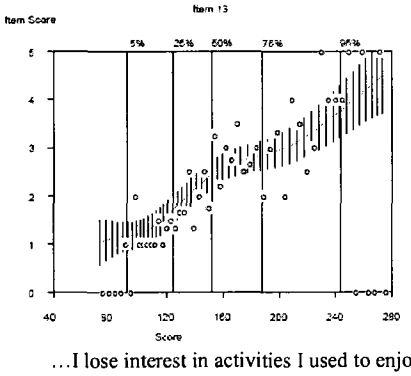
...Everything I see or do reminds me of the pain



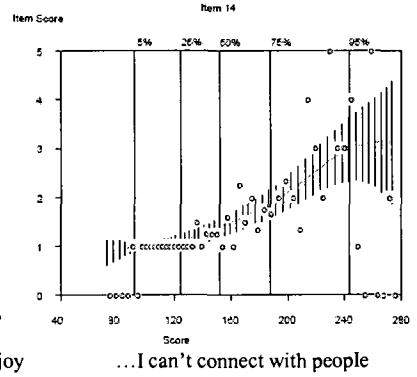
...I feel that my body is falling apart



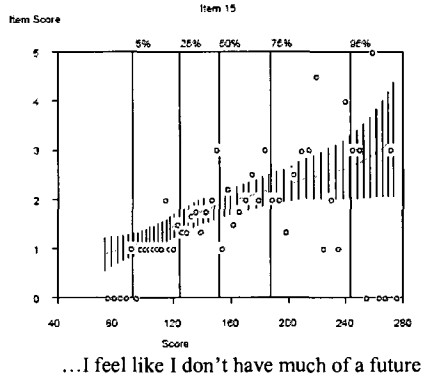
I try to avoid activities that cause pain



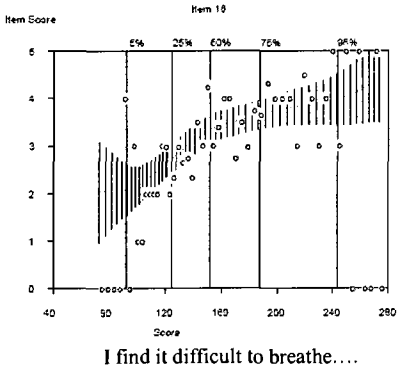
...I lose interest in activities I used to enjoy



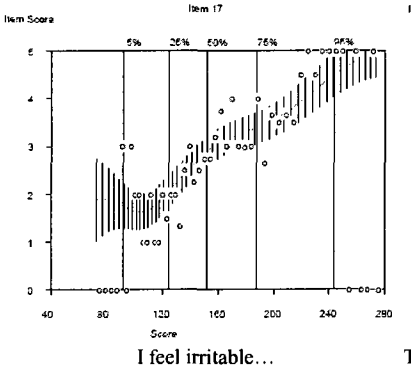
...I can't connect with people



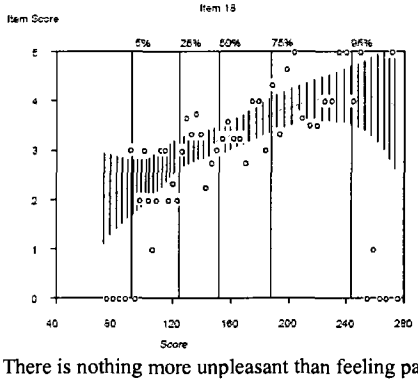
...I feel like I don't have much of a future



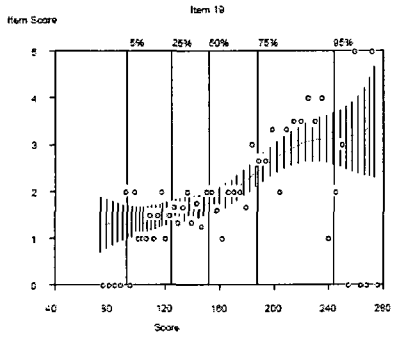
I find it difficult to breathe....



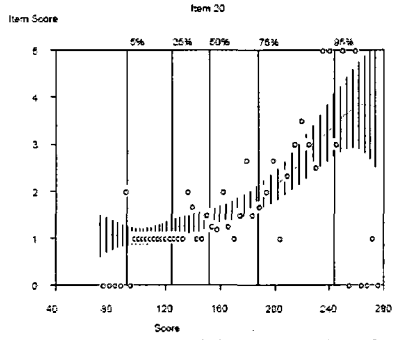
I feel irritable...



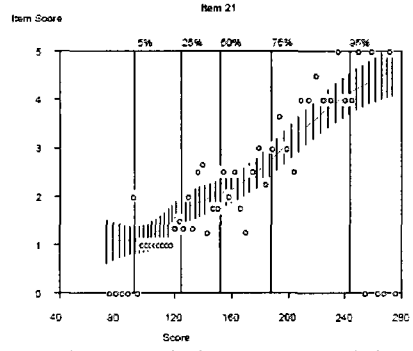
There is nothing more unpleasant than feeling pain



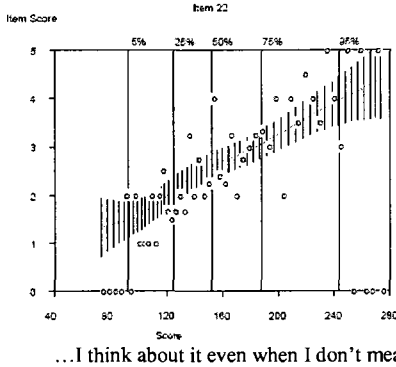
I can tolerate pain easily



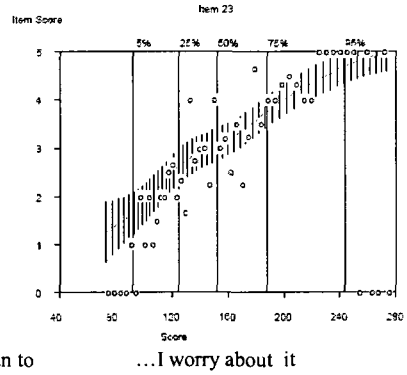
...I am scared that it is the beginning of a terrible problem



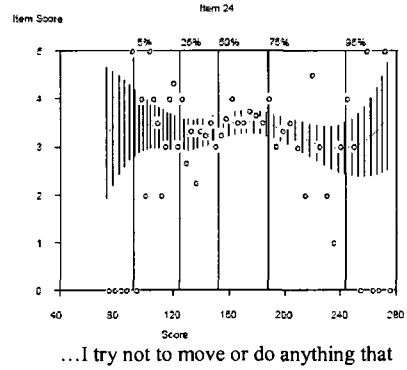
Pain seems to bother me more than it does other people



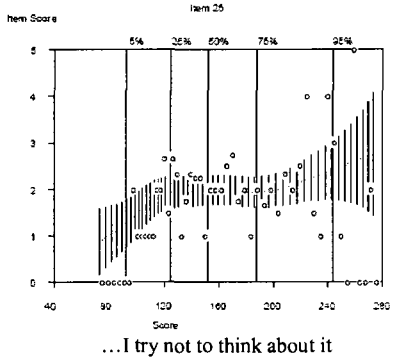
...I think about it even when I don't mean to



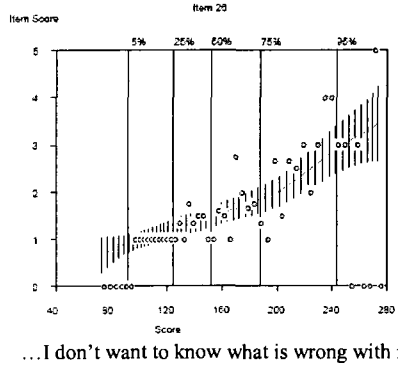
...I worry about it



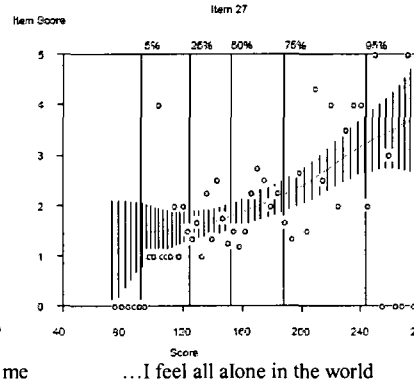
...I try not to move or do anything that would make the pain worse



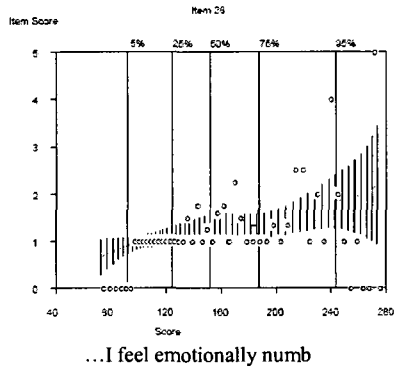
...I try not to think about it



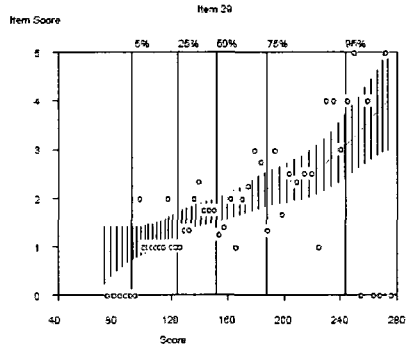
...I don't want to know what is wrong with me



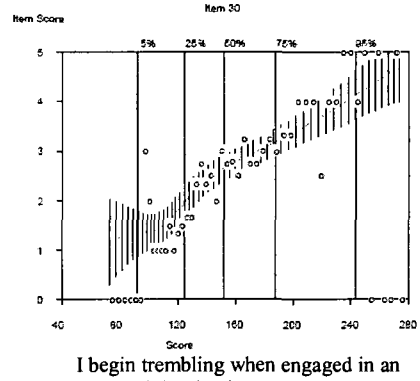
...I feel all alone in the world



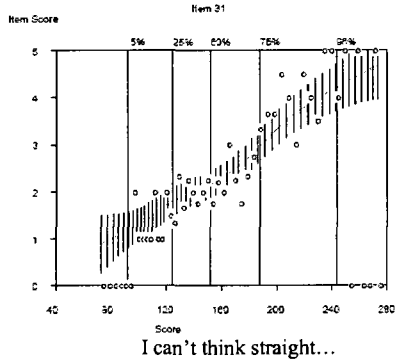
...I feel emotionally numb



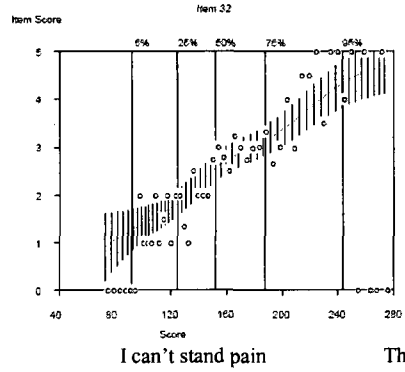
...I think I won't be able to love again



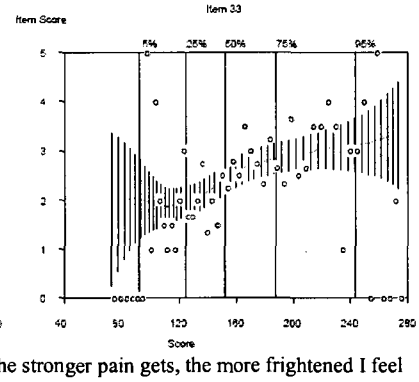
I begin trembling when engaged in an activity that increases pain



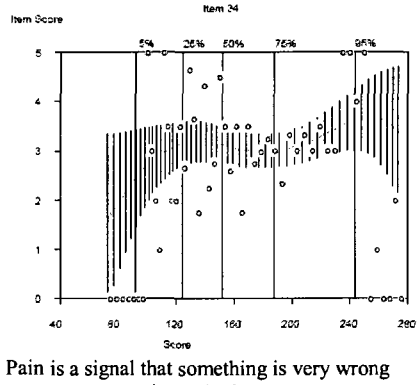
I can't think straight...



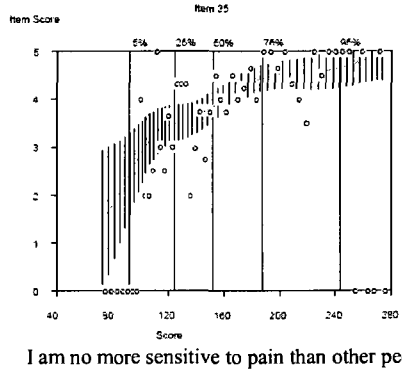
I can't stand pain



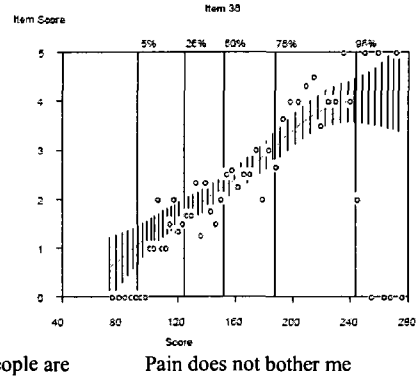
The stronger pain gets, the more frightened I feel



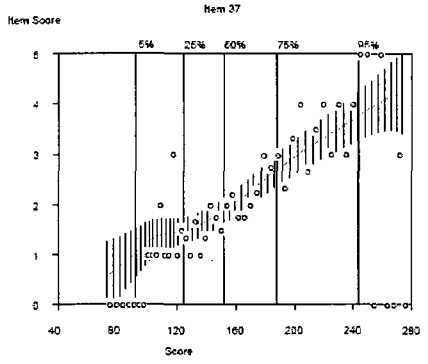
Pain is a signal that something is very wrong in my body



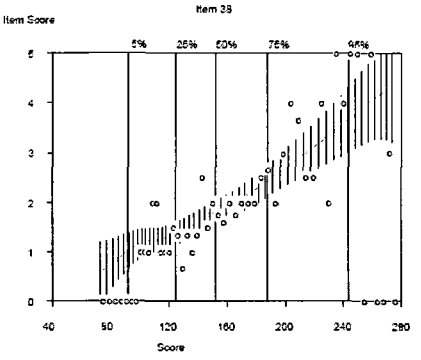
I am no more sensitive to pain than other people are



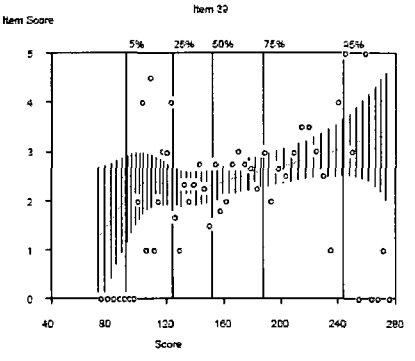
Pain does not bother me



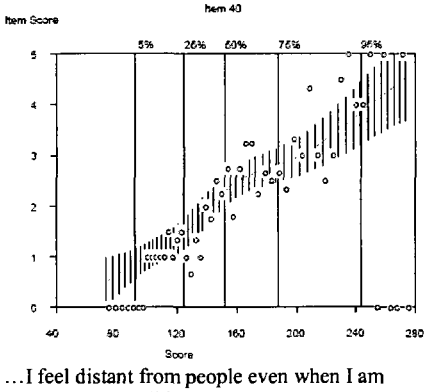
...I am scared that it will never end



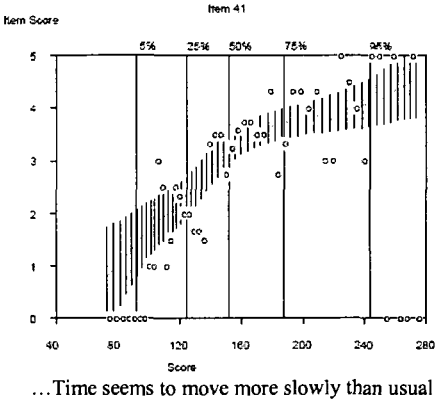
I will stop any activity as soon as I sense pain coming on



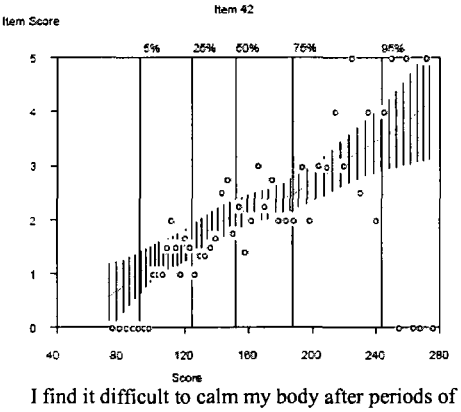
...I don't like to talk about it



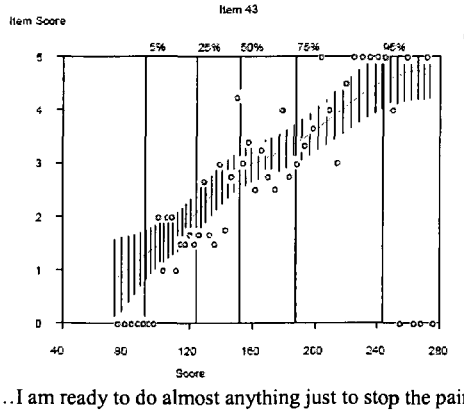
...I feel distant from people even when I am talking to them



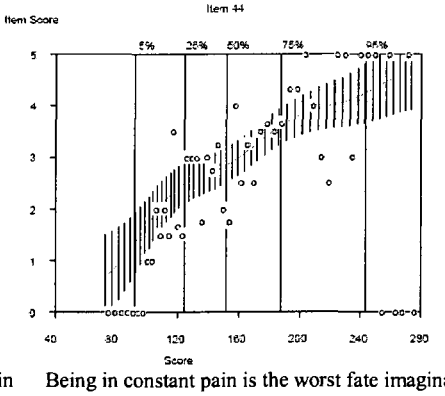
...Time seems to move more slowly than usual



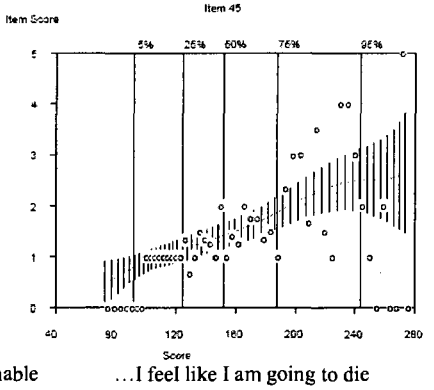
I find it difficult to calm my body after periods of pain



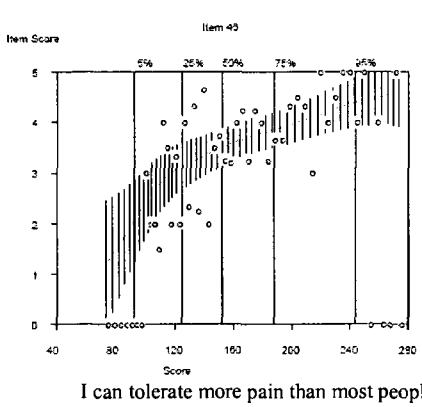
...I am ready to do almost anything just to stop the pain



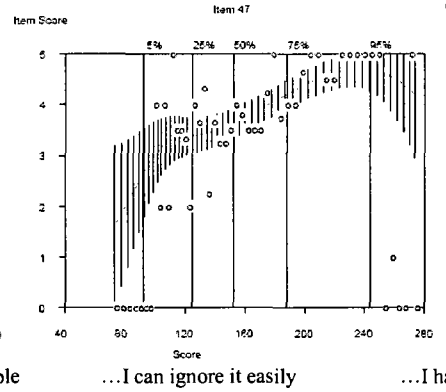
Being in constant pain is the worst fate imaginable



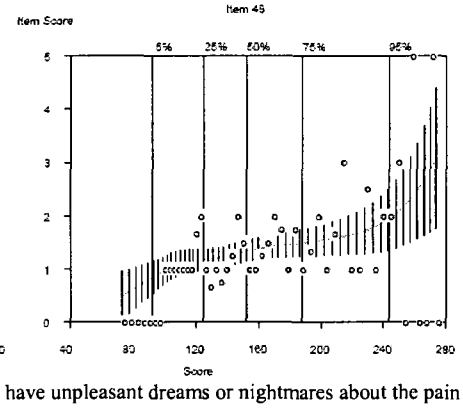
...I feel like I am going to die



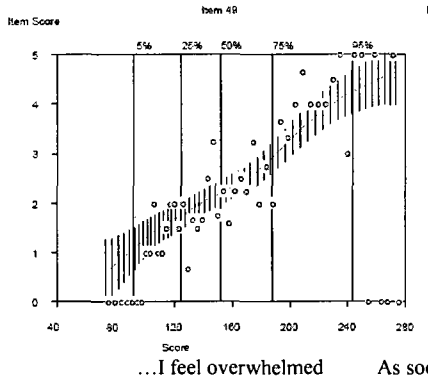
I can tolerate more pain than most people



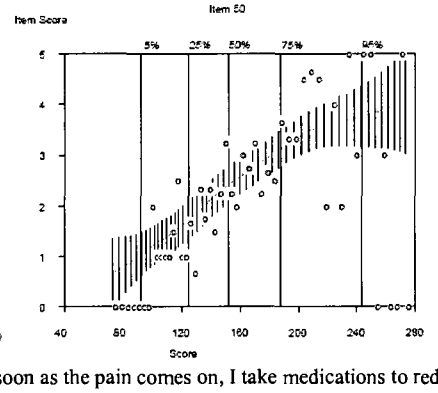
...I can ignore it easily



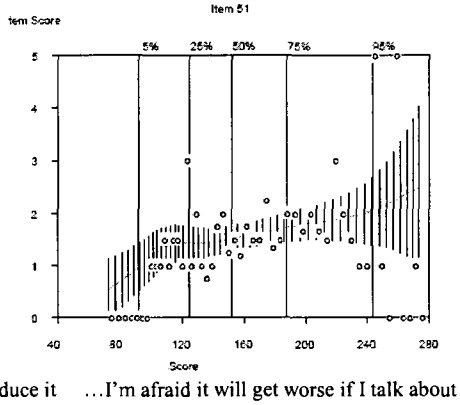
...I have unpleasant dreams or nightmares about the pain



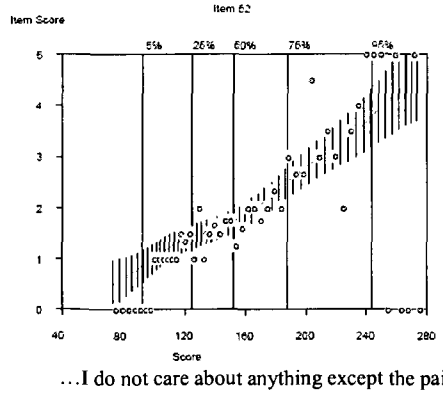
...I feel overwhelmed



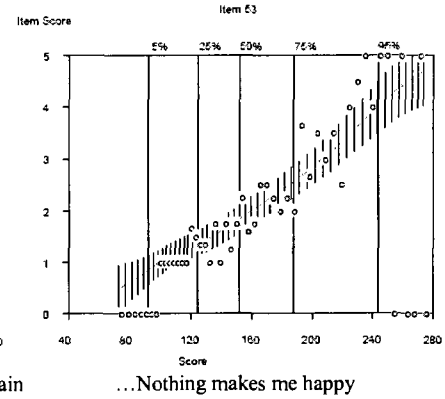
As soon as the pain comes on, I take medications to reduce it



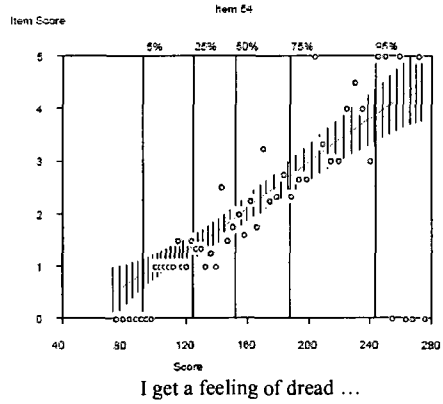
...I'm afraid it will get worse if I talk about it



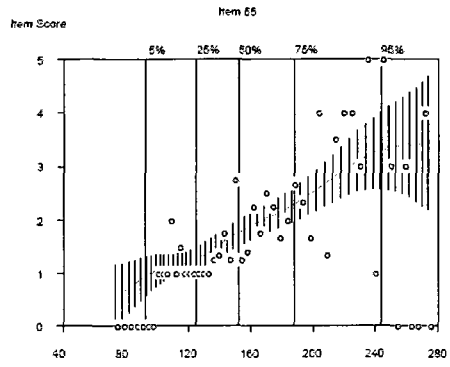
...I do not care about anything except the pain



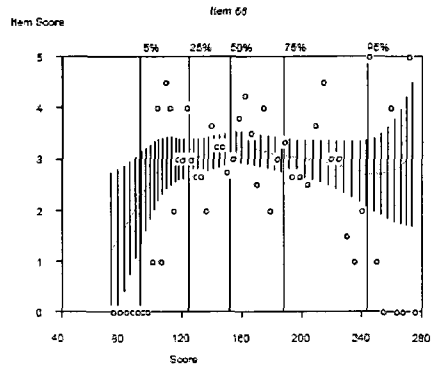
...Nothing makes me happy



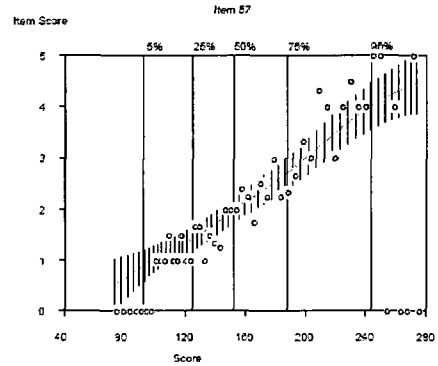
I get a feeling of dread ...



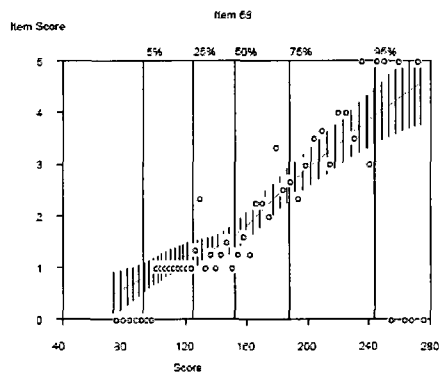
...I feel dizzy or faint



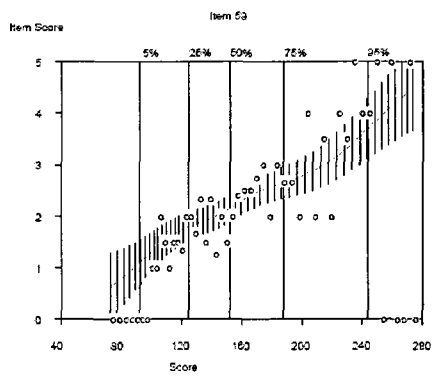
....I try to distract myself



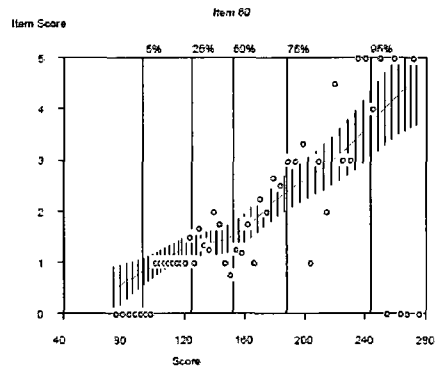
I feel absolutely helpless ...



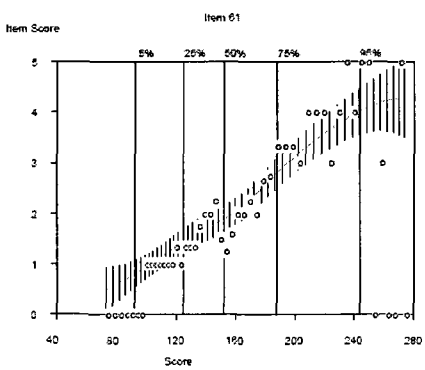
Pain sensations terrify me



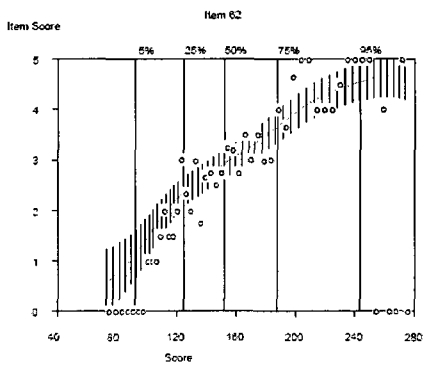
Pain is dangerous



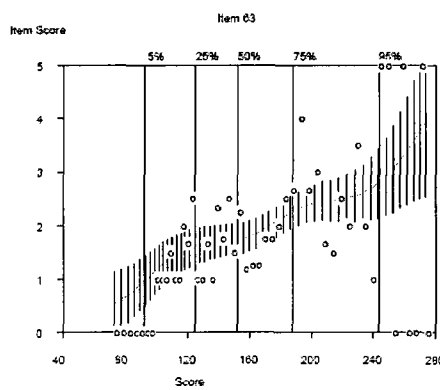
I am especially sensitive to pain



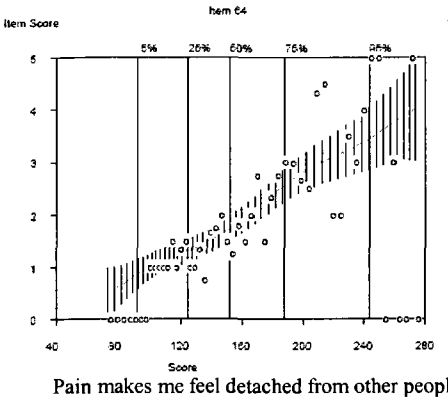
... I can think of nothing else



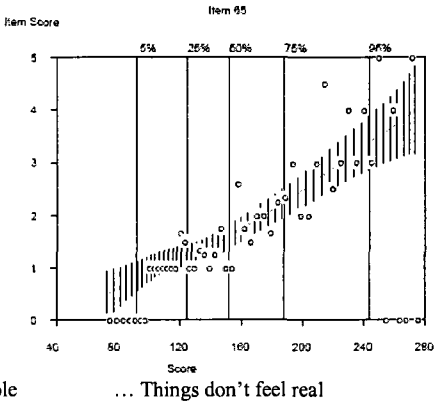
... I keep thinking about how much I want the pain to stop



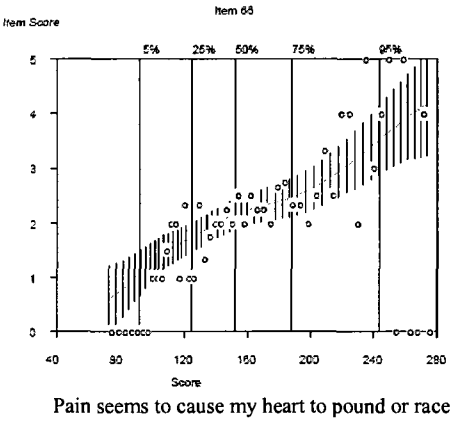
Talking about pain makes it more intense



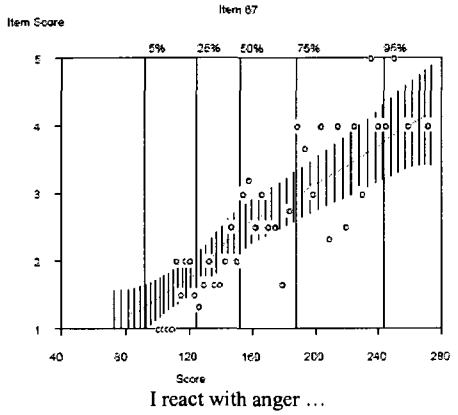
Pain makes me feel detached from other people



… Things don't feel real



Pain seems to cause my heart to pound or race



I react with anger …

Table D1.

35 Items Removed Based on Poorly Discriminating OCCs.

		Item Category
2	When I am in pain, I feel as if I am in a dream	EN
5	I'm not afraid of pain	FP
6	When I am in pain, it means something awful is going to happen to me	FP
7	Too much pain can kill	FP
8	I cannot stand even the slightest bit of pain	SP
14	When I feel pain, I can't connect with people	EN
15	When I am in pain, I feel like I don't have much of a future	EN
16	I find it difficult to breathe when I am in pain	HA
18	There is nothing more unpleasant than feeling pain	FP
19	I can tolerate pain easily	SP
24	..., I try not to move or do anything that would make the pain worse	AV
25	When I feel pain, I try not to think about it	AV
26	When I feel pain, I don't want to know what is wrong with me.	AV
27	When I am in pain, I feel all alone in the world	EN
28	When I am in pain, I feel emotionally numb	EN
29	When I feel pain, I think I won't be able to love again.	EN
33	The stronger pain gets, the more frightened I feel	FP
34	Pain is a signal that something is very wrong in my body	FP
35	I am no more sensitive to pain than other people are	SP
39	When I am in pain, I don't like to talk about it	AV
41	When I am in pain, time seems to move more slowly than usual	EN
43	When I am in pain, I am ready to do almost anything just to stop the pain	FP
44	Being in constant pain is the worst fate imaginable	FP
45	When I am in pain, I feel like I am going to die	FP
46	I can tolerate more pain than most people	SP
47	When I am in pain, I can ignore it easily	PE
48	When I am in pain, I have unpleasant dreams or nightmares about the pain	EN
51	When I feel pain, I am afraid it will get worse if I talk about it	AV
55	When I sense pain, I feel dizzy or faint	HA
56	When I feel pain, I try to distract myself	AV
59	Pain is dangerous	FP
60	I am especially sensitive to pain	SP
62	..., I keep thinking about how much I want the pain to stop	PE
63	Talking about pain makes it more intense	PE
66	Pain seems to cause my heart to pound or race	HA

Appendix E: Exploratory Nonparametric IRT 12-item SPTS

Table E1.

12 Items Chosen from Nonparametric IRT Output

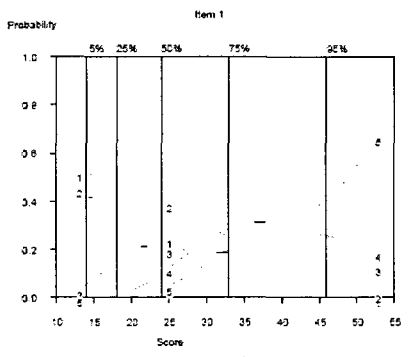
		Item Category
1.	Pain keeps me awake at night.	HA
2.	When I am in pain, everything I see or do reminds me of the pain.	PE
3.	I try to avoid activities that cause pain.	AV
4.	When I feel pain, I'm scared that it's the beginning of a terrible problem.	FP
5.	Pain seems to bother me more than it does other people.	SP
6.	When I feel pain, I think about it even when I don't mean to.	PE
7.	I can't stand pain.	SP
8.	When I'm in pain, I feel distant from people even when I'm talking to them.	EN
9.	As soon as the pain comes on, I take medications to reduce it.	AV
10.	Pain sensations terrify me.	FP
11.	When I'm in pain, things don't feel real.	EN
12.	I react with anger when I am in pain.	HA

Legend:

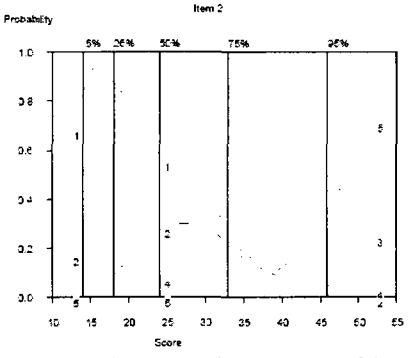
EN = Pain and Emotional Numbing Item
HA = Pain and Hyperarousal Item
AV = Pain Avoidance Item
PE = Pain Experiencing Item
SP = Sensitivity to Pain Item
FP = Fear of Pain Item

Figure E1.

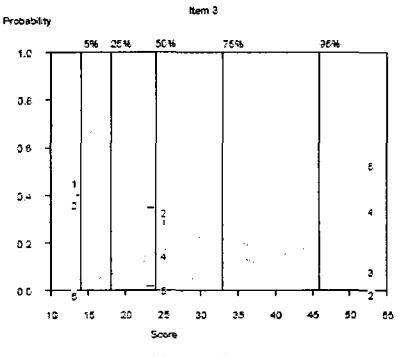
Option Characteristic Curves



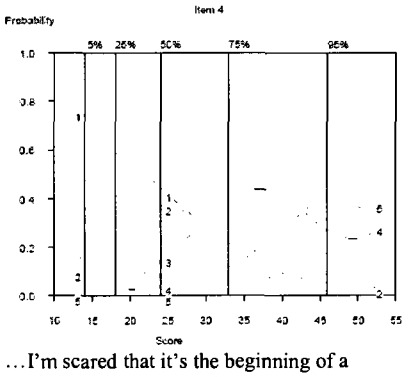
Pain keeps me awake at night



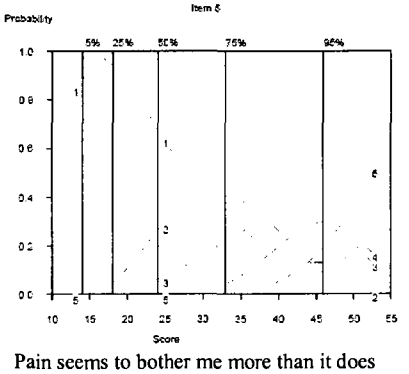
...Everything I see or do reminds me of the pain



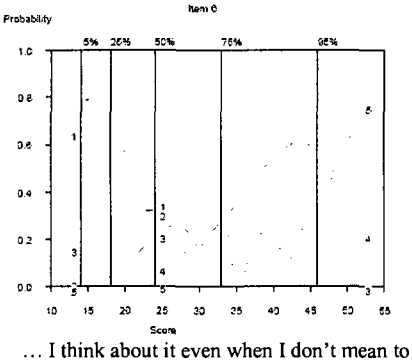
I try to avoid activities that cause pain



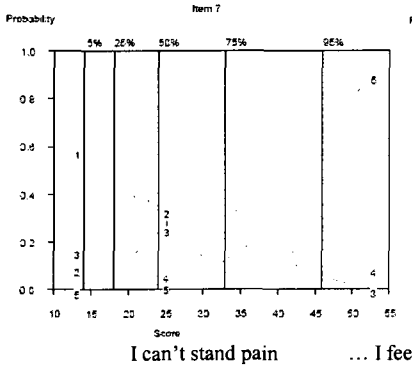
...I'm scared that it's the beginning of a terrible problem



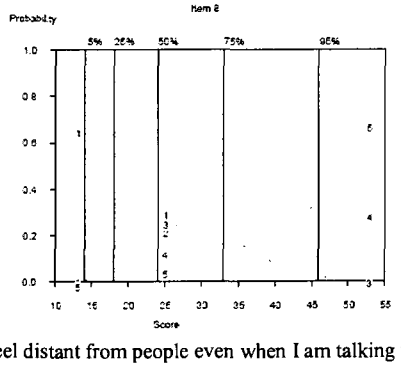
Pain seems to bother me more than it does other people



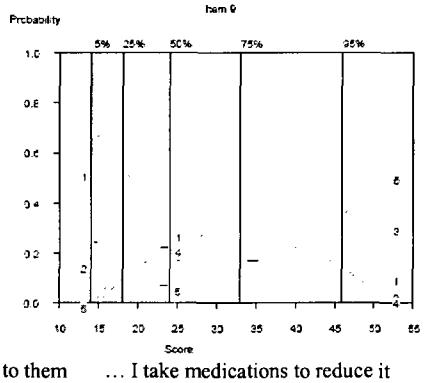
... I think about it even when I don't mean to



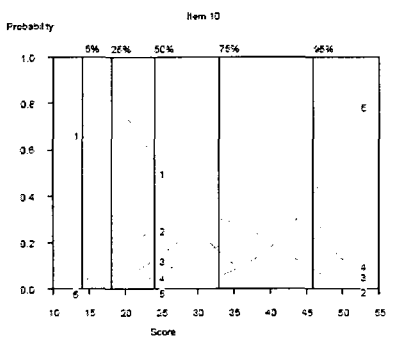
I can't stand pain



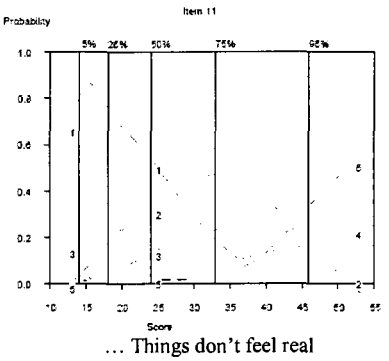
... I feel distant from people even when I am talking to them



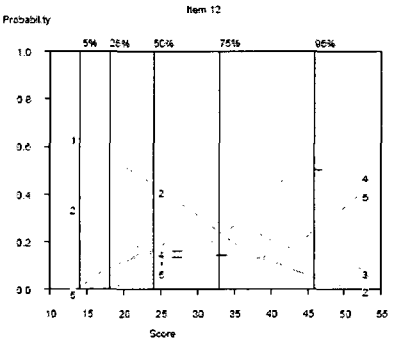
... I take medications to reduce it



Pain sensations terrify me



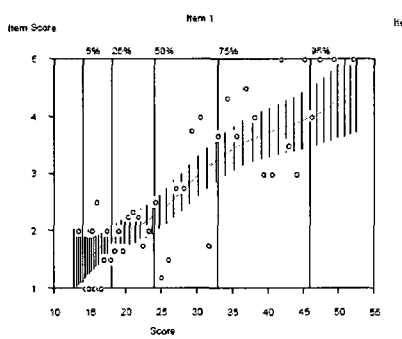
… Things don't feel real



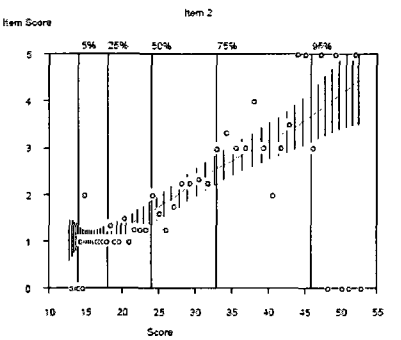
I react with anger…

Figure E2.

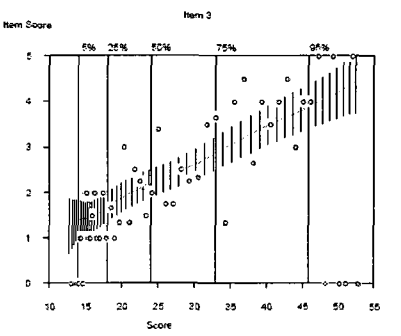
Item Characteristic Curves



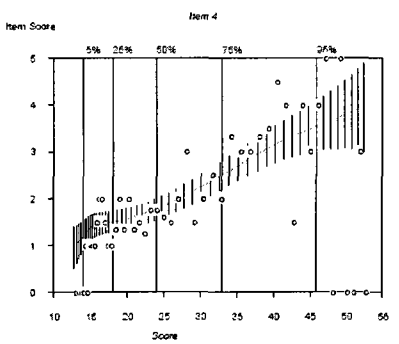
Pain keeps me awake at night



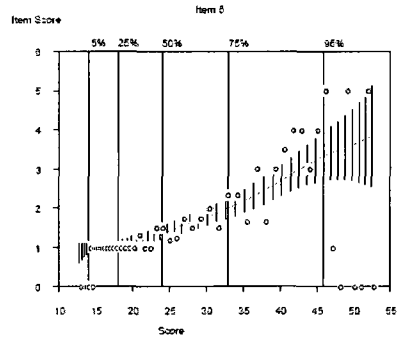
...Everything I see or do reminds me of the pain



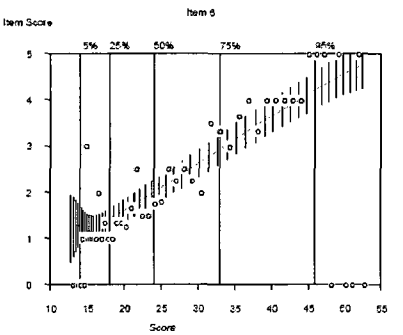
I try to avoid activities that cause pain



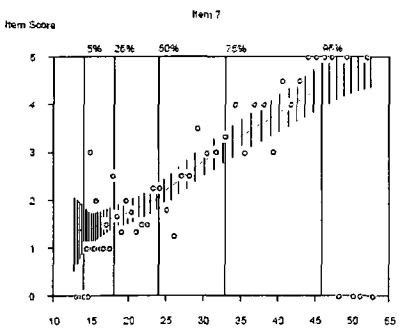
...I'm scared that it's the beginning of a terrible problem



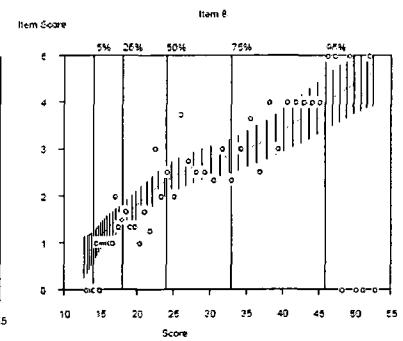
Pain seems to bother me more than it does other people



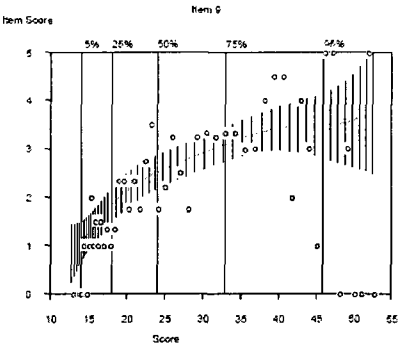
... I think about it even when I don't mean to



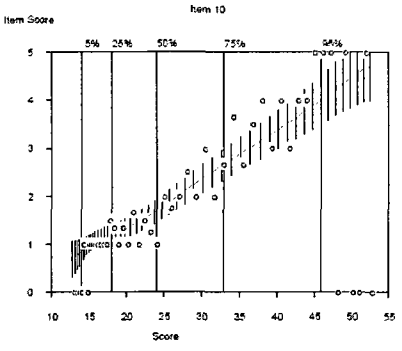
I can't stand pain



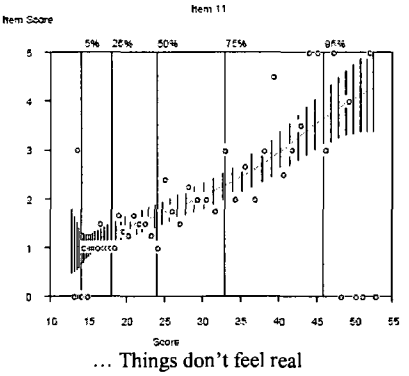
... I feel distant from people even when I am talking to them



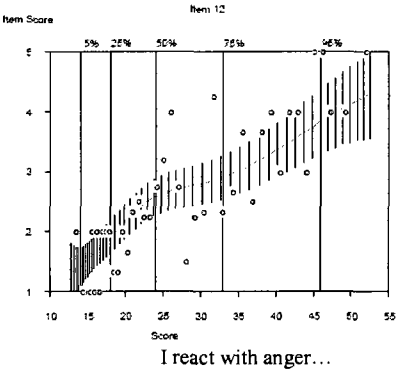
... I take medications to reduce it



Pain sensations terrify me



... Things don't feel real



I react with anger...

Appendix F: Parametric IRT 12-item SPTS

Table F1.

12-item Final SPTS

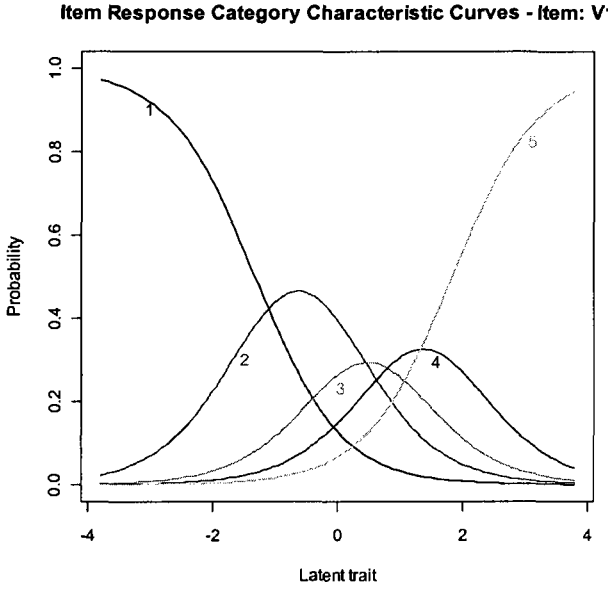
	Item Category
1. Pain keeps me awake at night.	HA
2. When I am in pain, everything I see or do reminds me of the pain.	PE
3. I try to avoid activities that cause pain.	AV
4. When I feel pain, I'm scared that it's the beginning of a terrible problem.	FP
5. Pain seems to bother me more than it does other people.	SP
6. When I feel pain, I think about it even when I don't mean to.	PE
7. I can't stand pain.	SP
8. When I'm in pain, I feel distant from people even when I'm talking to them.	EN
9. As soon as the pain comes on, I take medications to reduce it.	AV
10. Pain sensations terrify me.	FP
11. When I'm in pain, things don't feel real.	EN
12. I feel sick to my stomach when I am in pain.	HA

Legend:

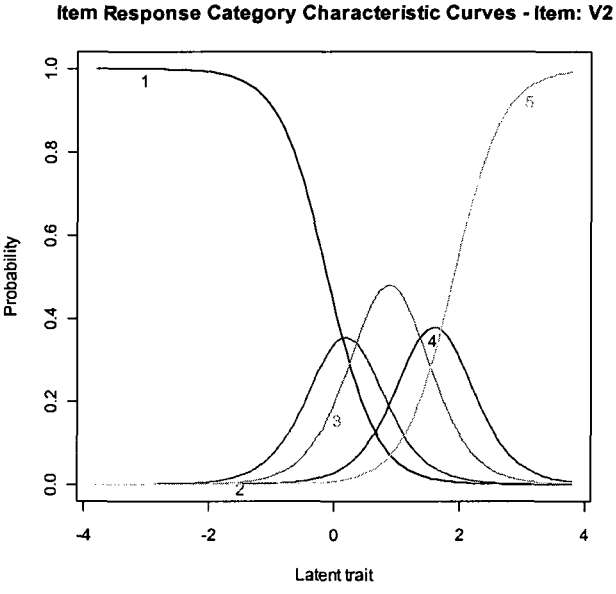
EN = Pain and Emotional Numbing Item
HA = Pain and Hyperarousal Item
AV = Pain Avoidance Item
PE = Pain Experiencing Item
SP = Sensitivity to Pain Item
FP = Fear of Pain Item

Figure F1.

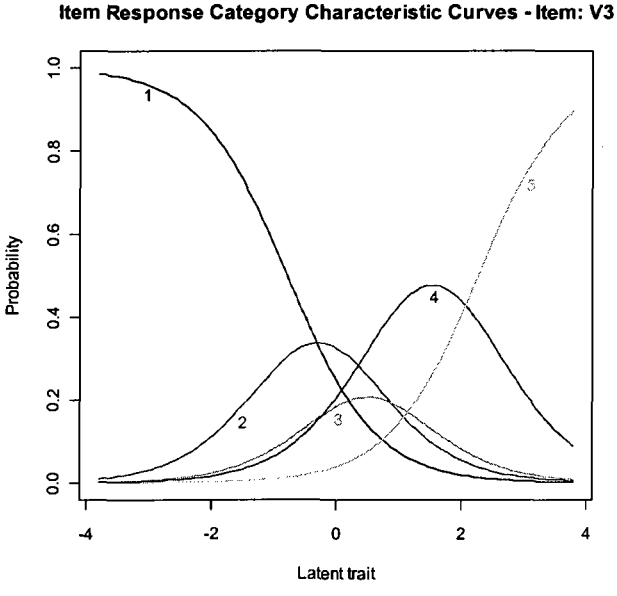
Option Characteristic Curves



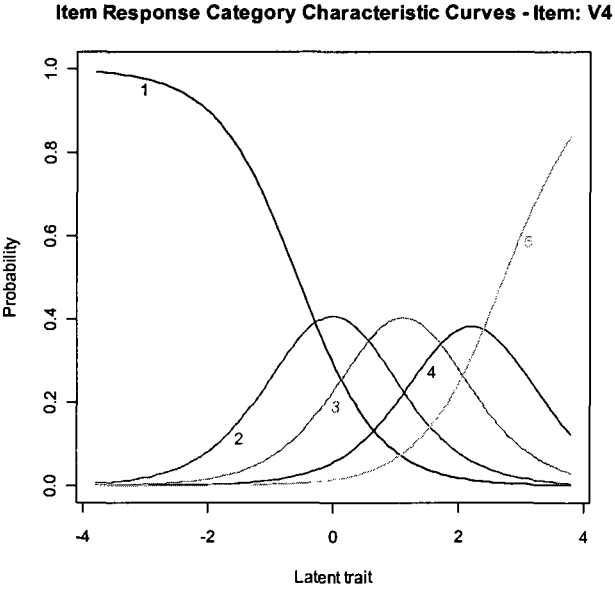
Pain keeps me awake at night



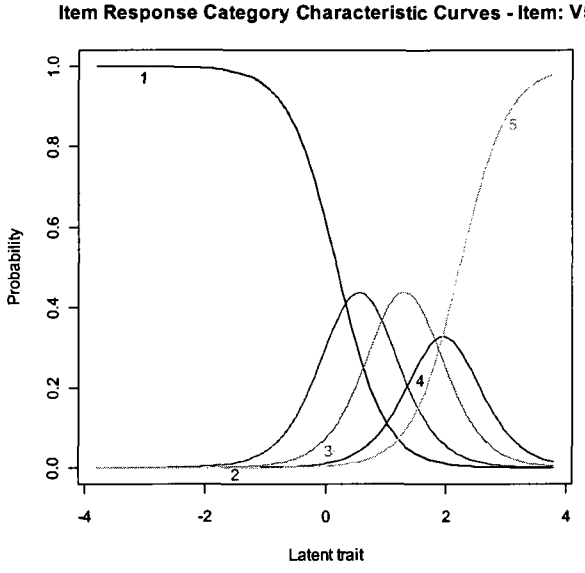
...Everything I see or do reminds me of the pain



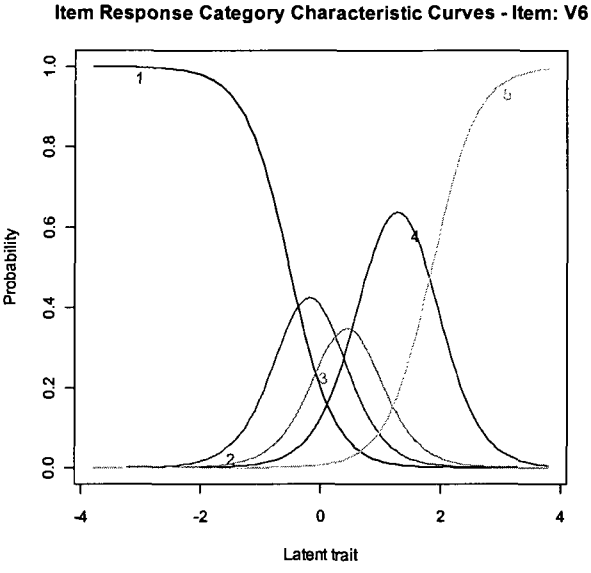
I try to avoid activities that cause pain



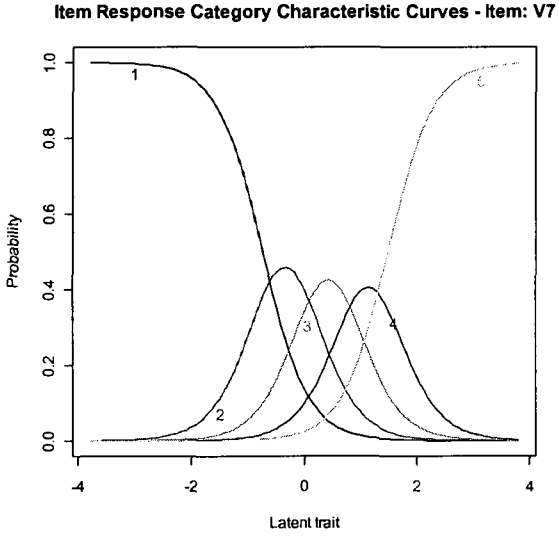
...I'm scared that it's the beginning of a terrible problem



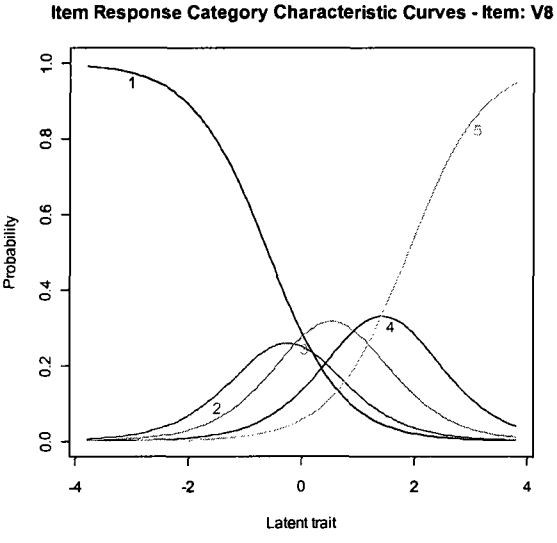
Pain seems to bother me more than it does other people



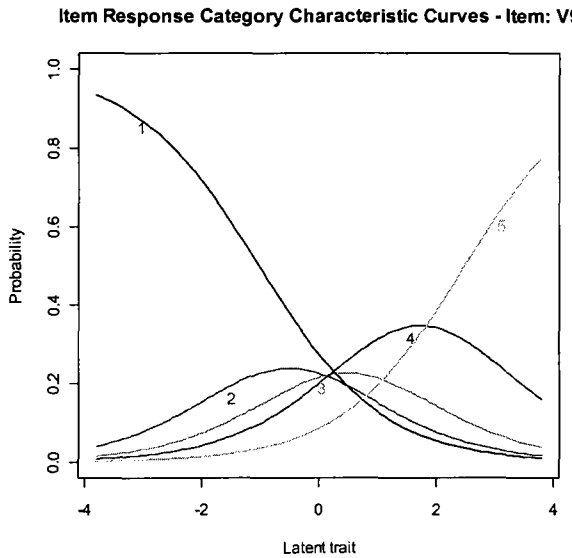
...I think about it even when I don't mean to



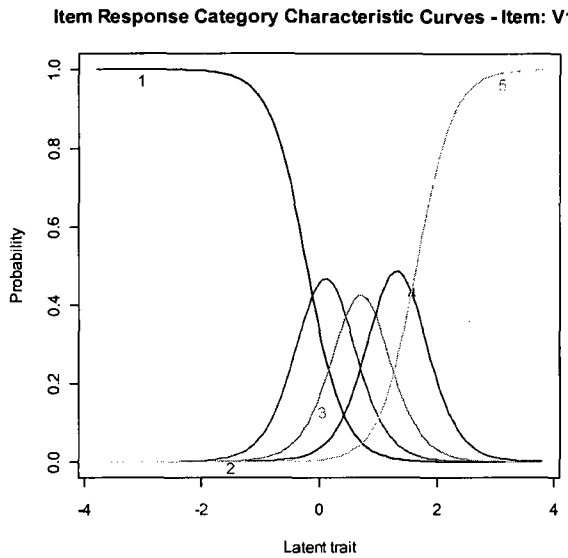
I can't stand pain



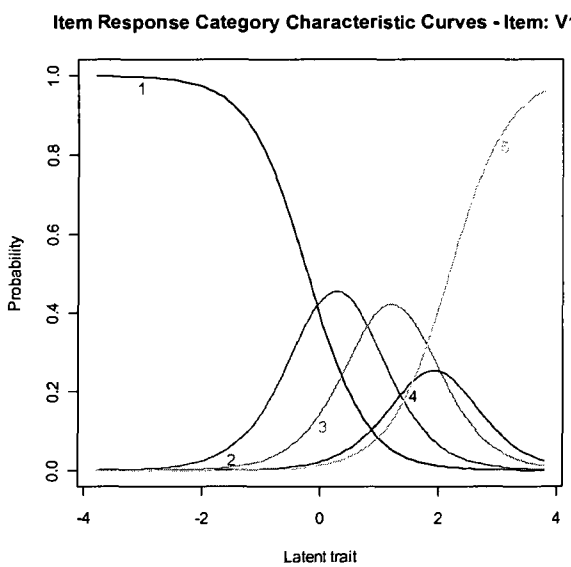
...I feel distant from people even when I'm talking to them



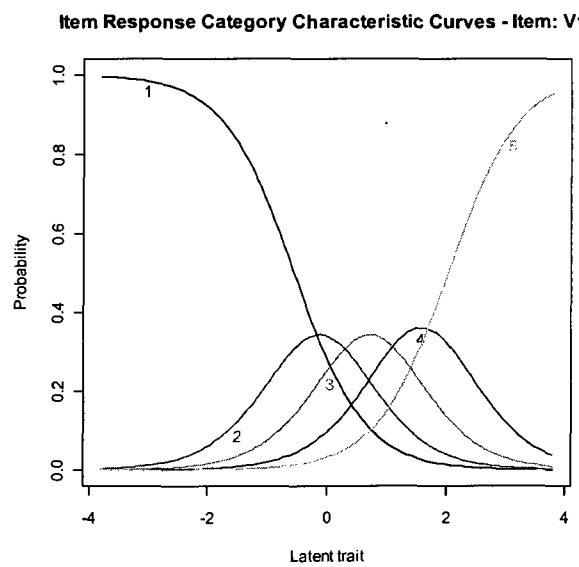
...I take medications to reduce it



Pain sensations terrify me



... Things don't feel real

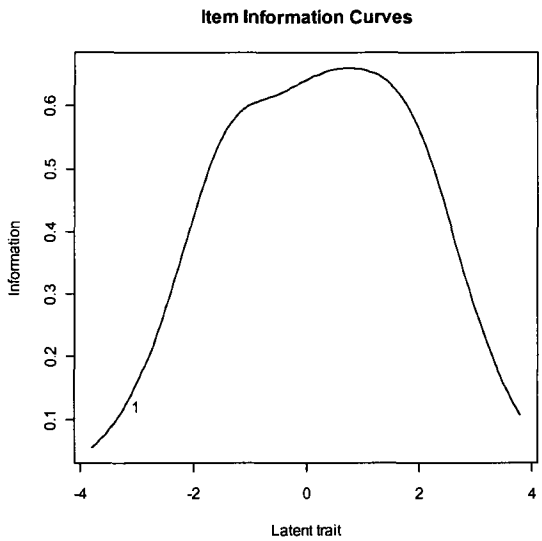


I feel sick to my stomach ...

Figure F2.

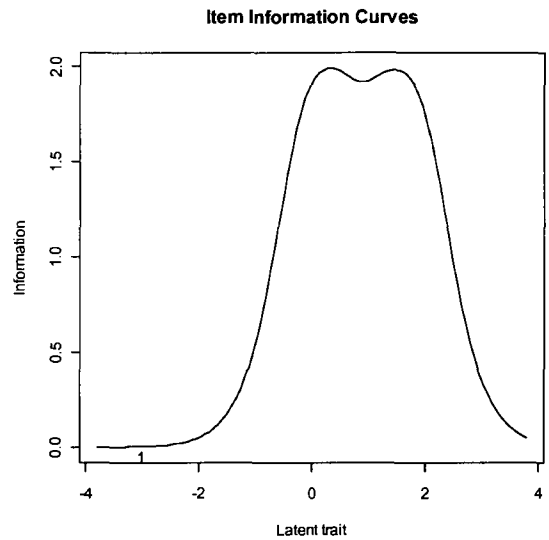
Item Information Curves

Item 1



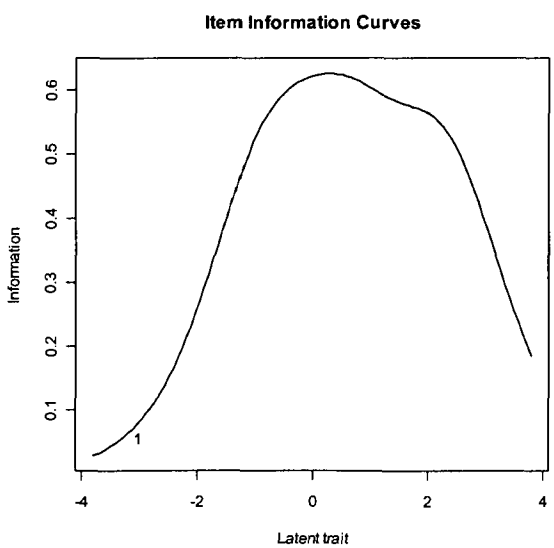
Pain keeps me awake at night

Item 2



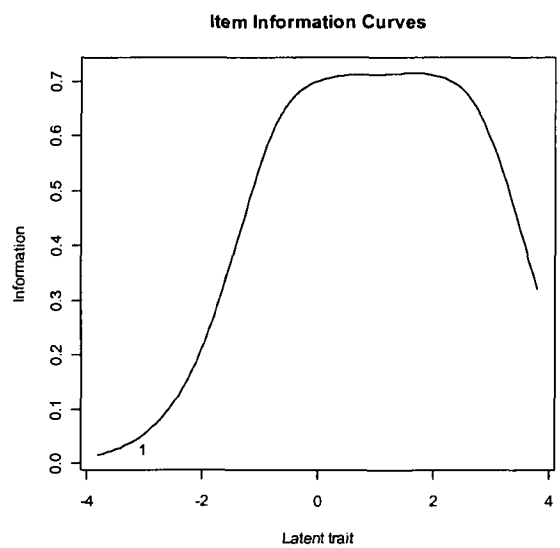
...Everything I see or do reminds me of the pain

Item 3



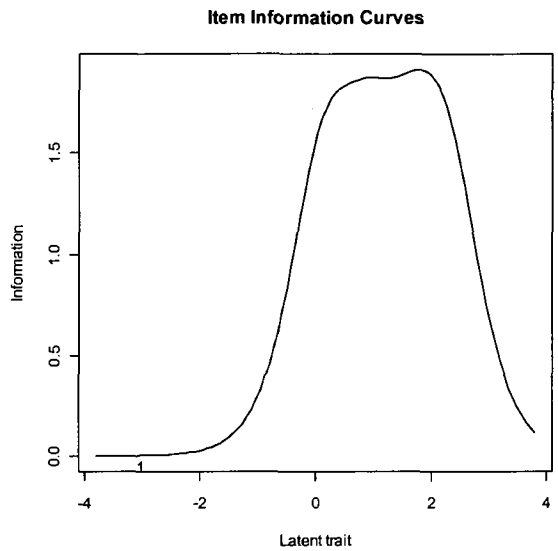
I try to avoid activities that cause pain

Item 4



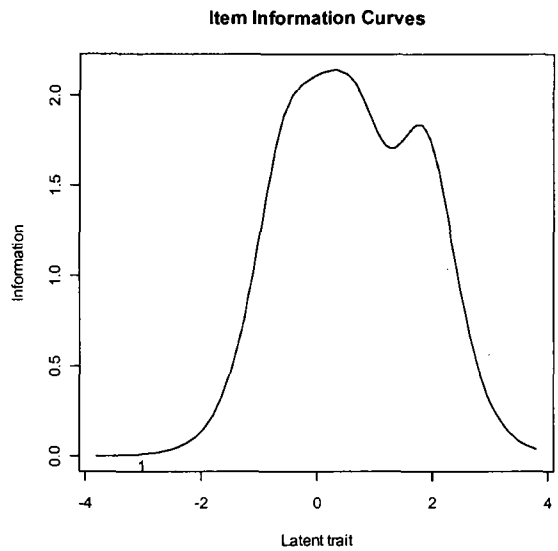
...I'm scared that it's the beginning of a terrible problem

Item 5



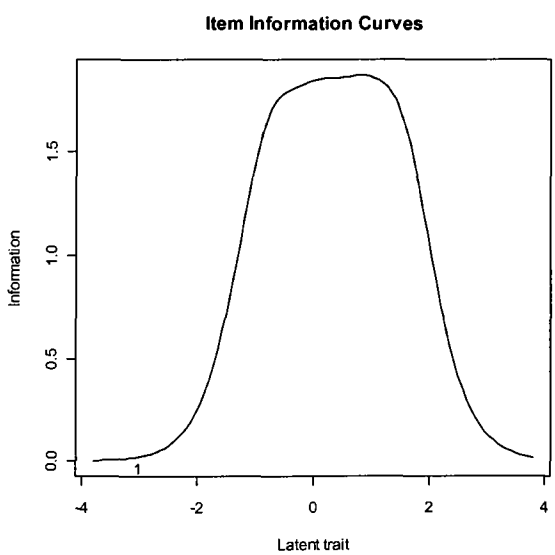
Pain seems to bother me more than it does other people

Item 6



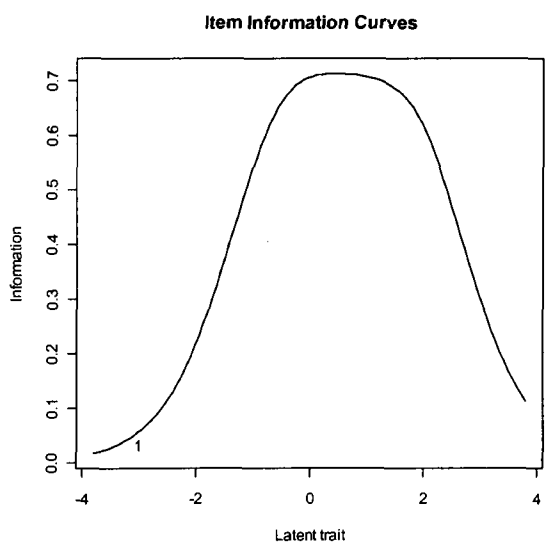
...I think about it even when I don't mean to

Item 7



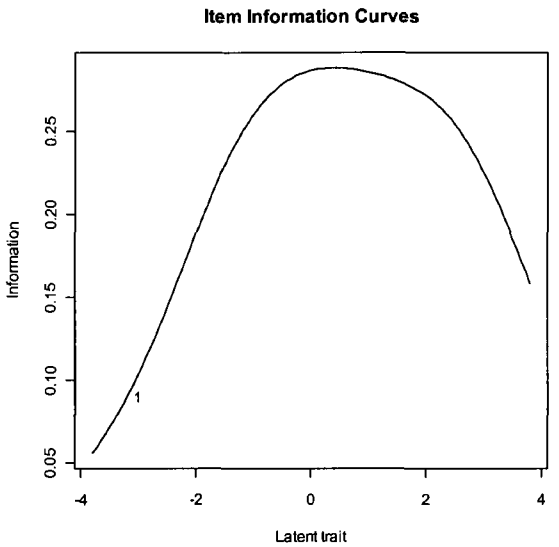
I can't stand pain

Item 8



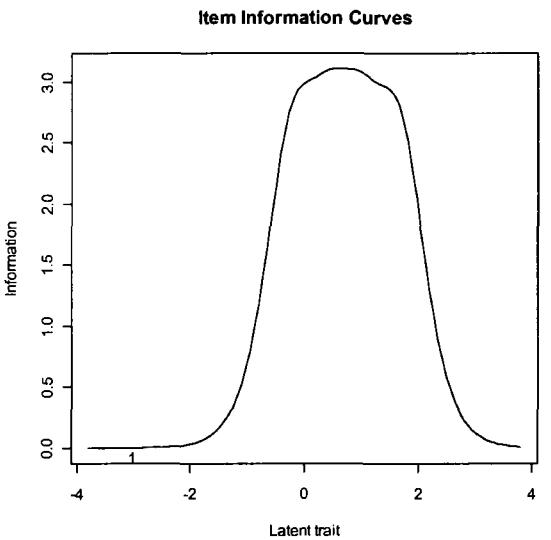
...I feel distant from people even when I'm talking to them

Item 9



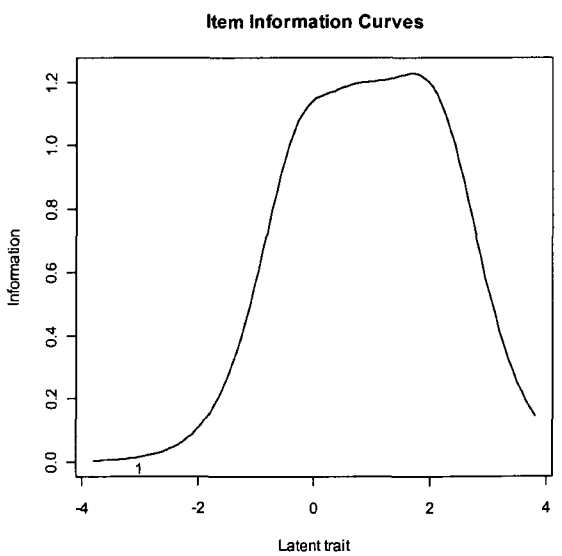
...I take medications to reduce it

Item 10



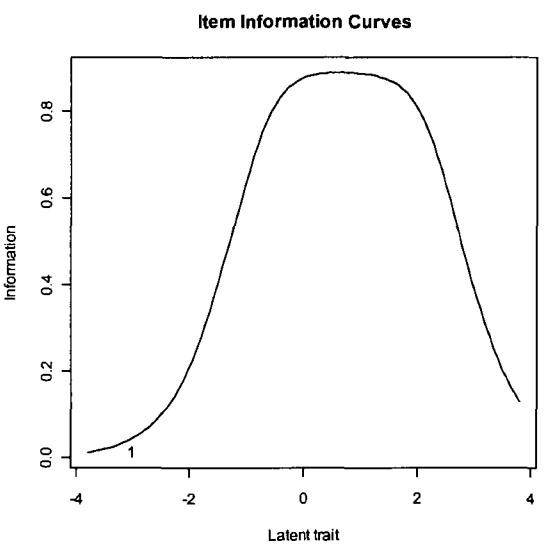
Pain sensations terrify me

Item 11



... Things don't feel real

Item 12



I feel sick to my stomach ...