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Neuropsychological Aspects of Chronic pain

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Introduction

Many patients undergoing neuropsychological assessments have chronic pain, particularly those with work-related injuries. Many chronic pain sufferers report and demonstrate the types of problems with cognitive and behavioral performance that are of primary interest to clinical neuropsychologists. And yet the topic of this interface between pain and neuropsychology has received relatively little systematic attention. Rather the clinical management of chronic pain and neuropsychological problems seems fraught with assumptions and a distinct non-uniformity in theory and method. This is not ideal for the best quality service for patients.

The purpose of this chapter is to briefly present a review of psychological and neuropsychological aspects of chronic pain. It will begin by presenting research into the prevalence of chronic pain and its impacts on both emotional and general daily functioning. It will next review the literature on complaints of impaired cognitive functioning in chronic pain followed by a review of the literature on directly assessed neuropsychological performance. It will briefly touch on an area of current controversy, effects of opioid analgesics. A review of current treatment approaches will be done. A concluding section will attempt, once again briefly, to organize these various streams around the model of behavior underlying Acceptance and Commitment Therapy (ACT).

The Prevalence of Chronic Pain

Chronic pain is pain of three or six months duration that has persisted beyond expected healing time. It is traditionally regarded as having both unpleasant sensory and emotional qualities, to be regarded as legitimately present whether or not there is any identifiable organic pathology (International Association for the Study of Pain Subcommittee on Classification, 1986), and to be remarkably impervious medical therapies. Over the years,

many epidemiological studies have investigated the prevalence rates of both chronic and acute pain. Different researchers have assessed pain prevalence using different criteria, different methods, and in different populations. Understandably, differing research methods produce varied results. Results from this work suggest that at any one time between 25% and 49% of the population are suffering from pain (Gerdle, Bjork, Henriksson, & Bengtsson, 2004; Portenoy, Ugarte, Fuller, & Haas, 2004; Schmidt et al., 2007; Walker, Muller, & Grant, 2004; Watkins, Wollan, Melton, & Yawn, 2008) and between 19% and 22% of people are suffering from persistent or chronic pain (Breivik, Collett, Ventafridda, Cohen, & Gallacher, 2006; Eriksen, Jensen, Sjogren, Ekholm, & Rasmussen, 2003; Gureje, Von Korff, Simon, & Gater, 1998).

Persistent pain is prevalent worldwide. In 1998 the World Health Organization (WHO) assessed pain prevalence, within primary care populations, in Asia, Africa, Europe, and the Americas in 15 centers and across 14 countries (Gureje et al., 1998). This study initially screened nearly 26,000 individuals of working age and later interviewed over 5,000 adults. Investigating whether pain had been present for most of the time for at least 6 months, they found an average pain prevalence of 22% with a range from 5.5 to 33% across the different centers.

Further detail about the experience of pain is provided from a large scale computer assisted telephone survey conducted in 2003 (Breivik et al., 2006). The research sought to investigate pain prevalence in 15 European countries and Israel. This research initially screened 46,394 adults aged 18 or over and later carried out at least 300 in-depth interviews in each country. It found that 19% of those initially screened had “long lasting pain” which meant that pain had been present for at least 6 months, had also been present in the last month, and was present on more than one occasion during the last week. Pain also had to be

rated at a five or more on a numerical rating scale from 1 (no pain) to 10 (worst pain imaginable). Of those who rated their pain as 5 and above, 66% were described as having “moderate pain” (between 5 and 7 on the NRS) and 34% rated their pain between 8 and 10. Regarding pain history, the median period was 7.0 years but 21% who met the study criteria had experienced their pain for 20 years of more. As with the research described earlier, regional variations in prevalence were found from 12% (Spain, n= 3,801) to 30% (Norway, n=2,018).

Impacts of Chronic Pain on Mood & Daily Functioning

The impact of long-term pain can alter many varied aspects of individuals’ lives aside from the body sensations they experience. This can include changes to what they think, feel, and importantly what they do or do not do, both with regards to pain and to other important aspects of their life such as family, and social, recreational activities, and work.

Impact on Mood

Research consistently shows that both emotional distress and diagnosable mood disturbance occur at high rates in conjunction with chronic pain. Of course, as with pain prevalence, the results of research into the impact on mood will be influenced by factors including the population surveyed, the methods used, and the criteria applied.

Banks and Kerns (1996) suggest that patients with chronic pain are much more likely to suffer from depression than those who have other chronic medical conditions. Their review of research in this area suggested that between 30 to 54% of those seeking treatment for chronic pain would also meet diagnostic criteria for a depressive disorder. Their work considered the causality of these two problems and suggests that depression is most likely to be a result of chronic pain, not the other way around. In other research, a sample of nearly 6,000 representative individuals with chronic pain from the US suggested that 20.2% of those

surveyed had had an episode of depression in the last year (McWilliams, Cox, & Enns, 2003). The incidence of depression in those with “chronic back or neck problems” is estimated at 17.5% in the last 12 months (Von Korff et al., 2005). These data derive from the general population contacted through the National Comorbidity Study (Kessler et al., 1994) rather than treatment seeking samples reported by Banks and Kerns (1996). It is informative to compare these depression rates to that in the population generally. In this area, a large household survey conducted in Canada suggested that individuals with chronic pain were three times more likely to be depressed than individuals without chronic pain (Currie & Wang, 2004).

As for diagnoses of anxiety disorders, Dersh, Polatin and Gatchel (2002) reported prevalence rates of between 16.5% and 28.8% for co-morbid anxiety disorders (e.g., panic disorder and generalized anxiety disorder) in patients with chronic pain. McWilliams et al. (2003) suggested that 35.1% of people suffering from chronic pain also suffered from anxiety disorders. In research that has surveyed anxiety in clinical samples the prevalence of anxiety disorders has ranged from 7.0% to 62.5% (Dersh et al., 2002; Fishbain, Cutler, Rosomoff, & Rosomoff, 1998). Data from a more specific group of people with “chronic back or neck problems” revealed a co-morbidity rate with anxiety disorders of 26.5%. (Kessler et al., 1994). More recent research from Kessler allows us to compare this figure to the general population without pain. Data from a US household survey known as the national co-morbidity survey (N = 9,282) estimated that the prevalence rate for anxiety disorders within a 12 month period was of 18.1%, regardless of pain presentation (Kessler, Chiu, Demler, Merikangas, & Walters, 2005).

In other international work, a survey of over 85,088 individuals across 17 geographically diverse countries found that a number of mental health problems were more

likely to be present in individuals with chronic back or neck pain than in those without (Demyttenaere et al., 2007). The odds ratios of people with chronic pain also suffering from dysthymia were 2.8 (CI = 2.5-3.2), for generalized anxiety disorder 2.7 (CI = 2.4-3.1), for posttraumatic stress disorder 2.6 (CI = 2.3-3.0), for major depression 2.3 (CI = 2.1-2.5), for agoraphobia or panic 2.1 (CI = 1.9-2.4) and for social phobia 1.9 (CI = 1.7-2.2).

Impact on Daily Functioning

In broad terms, the intuitive conclusion that people with chronic pain might function at a lower level than those without is supported by research. In April of 2004, the American Chronic Pain Association surveyed 800 adults with chronic pain and found impacts in the following areas: sleep (78.0%), household chores (67.0%), interference with daily routines (61.0%), decreased productivity at work (51.0%), and adverse effects on relationship with partner (28%; Roper Public Affairs & Media, 2004).

As part of a wider interview in the European survey by Breivik et al. (2006), participants were also asked to rate their ability to participate in various activities (driving, exercising, household chores, maintaining an independent lifestyle, lifting, sleeping, social activities, social relationships, sexual relationships, walking, working outside of the home). Responses were given on a 3-point scale of ability (able, less able, no longer able). Many reported being “less able” to perform the above activities (percentages ranged from 22% – 56% for each activity) and many also reported being “no longer able” to do activities (range 5% – 32%). The activities that pain sufferers were most likely to be “less able” to do were: sleeping (56%), exercising (50%), and lifting (49%). The activities that pain suffers were most likely to be “no longer able” to do included working outside of the home (32%), driving (23%), lifting (23%), and exercising (23%). In this study it was found that just 31% of respondents were in full-time work, with 13% employed part time, 34% retired, and 22% unemployed. A quarter (26%) of

the sample said that pain had influenced their employment (32% of those who classified themselves as now being retired).

Results from Breivik et al. (2006) echo earlier work by other research groups. Gureje et al. (1998) used the Groningen Social Disability Schedule (SDS) to assess daily work activities, activities directed towards finding work, and the activities of those retired. Interviewers rated disability on a scale from 0-3 (0=no disability, 3=severe disability). Their results indicate that 31% of the sample with pain were rated as having either a moderate or severe disability (compared to 13% of those without pain; odds ratio 2.12). Eriksen and colleagues (2003) reported on results from national health surveys in Demark and found that activity was reported to be restricted by an average of 21% for those with pain compared with only 2% of those from a control group (odds ratio, 9.9). Similarly, quitting work for health reasons occurred in 28% of the pain group and only 5% of the control group (odds ratio, 7.3). Results from large-scale research suggest that, on average, people free from chronic spinal pain are able to function at an average of 93.5% of their full role performance; this figure drops to 76.5% for those with chronic spinal pain (Von Korff et al., 2005). Further examination of the contributing factors suggests that a third of the difference between the groups can be explained by co-morbid conditions including other chronic pain conditions, chronic physical conditions, and mental health problems (such as anxiety and depression).

Potential negative impacts of chronic pain on functioning appear to be multiplied if significant psychological difficulties are also present. A large scale European study (N = 21,425) suggested that if an individual has both pain and depression they have more than double the number of days off work per month than individuals who suffer from just pain or depression in isolation. This is more than five times as many days off work than an individual with neither pain nor depression (Demyttenaere et al., 2006).

Impact of Chronic Pain on Cognitive Functioning

As seen above, the direct impacts of chronic pain on a sufferer's daily functioning can be substantial and by themselves present significant treatment challenges. Chronic pain is a great burden and significantly taxes a patient's skills and capacity. If cognitive functioning is impaired by pain, an individual's skills and capacities may be further reduced. As a result, suffering and disability could be expected to become greater still. Therefore, any additional indirect impacts on functioning exerted through changes in cognitive functioning are important to understand. In this section we will explore three aspects of cognitive functioning in relation to chronic pain: the context of cognitive complaints, aspects of cognitive performance, and effects of opioids on cognitive functioning.

There are considerable difficulties inherent in attempting to investigate effects of chronic pain on cognitive functioning. Primarily, chronic pain status is a highly confounded variable. As the literature reviewed here demonstrates, those with chronic pain do not only suffer with pain in isolation. They also simultaneously experience symptoms such as depression, anxiety, fatigue, sleeping problems, varied histories of head trauma, comorbid medical conditions, and the effects of medications. Any of these variables may underlie complaints of cognitive impairment or measured cognitive impairment when it is identified. As these factors are non-manipulated, pre-existing at the time of assessment, and challenging to statistically isolate, it becomes difficult to unambiguously attribute cognitive impairment directly to the experience of chronic pain itself.

Other situations present complications too. Studies of chronic pain that eliminate cases of traumatic brain injury or central nervous system disease from the data are unable to appreciate how these conditions may interact with pain - that essentially an individual can have both chronic pain and a brain injury. In fact, the prevalence rate of chronic pain after

traumatic brain injury is estimated at 57.8% based on a systematic review (Nampiaparampil, 2008). In some settings the confounding factors may be even more complex. For example, a study of the medical records of 340 US military veterans seen in recently designed "polytrauma" services showed that chronic pain, posttraumatic stress disorder, and persistent postconcussive symptoms were present in 81.5%, 68.2%, and 66.8%, respectively, with 42.1% being diagnosed with all three (Lew et al., 2009). Obviously this can considerably complicate both diagnosis (Halbauer et al., 2009) and treatment (Gironda et al., 2009).

Cognitive Complaints

Difficulties with concentration, memory, and other aspects of cognitive functioning are inordinately common in persons seeking treatment for chronic pain. In one early study based on a sample of 170 adults seeking treatment for chronic pain at a university medical center (age M = 43.8 years, SD = 14.6), 42.0% of patients reported at least one problem with attention, concentration, or memory (Iverson & McCracken, 1997). In these same data, 28.8% reported frequent forgetfulness, 18.2% difficulty with attention, 16.5% difficulty with concentration, 14.7% difficulty with problem-solving and decision-making, and 10.6% difficultly with confusion. It should be noted that these patients had no reported history of head trauma. The primary purpose of this study was to examine the presence of 'postconcussive' symptoms, and it was found that 80.6% of the sample endorsed three or more symptoms from Category C of the DSM-IV research criteria for Postconcussional Disorder (Iverson & McCracken, 1997). When those Category C symptoms were combined with a complaint of impaired cognition, 39% met self-report criteria for DSM-IV postconcussional disorder. In a larger sample from the same center, a slightly larger percentage (54%) reported at least one problem with cognitive functioning (McCracken & Iverson, 2001). Another study of 222 adult patients (age M = 39.8, sd = 9.6) also seen at a

university pain center showed that 62.0% reported a moderate to severe problem in at least one of five areas of cognitive functioning (Roth, Geisser, Theisen-Goodvich, & Dixon, 2005). In that sample, 47.8% reported trouble with concentration, 41.1% trouble with remembering, and 29.3% difficulty making decisions, each at a level from moderate to extreme. The differences in percentages between these studies may derive from the way complaints were measured, as dichotomous present-absent variable in the first studies and as a five-point rating from “not at all” to “extremely” in the latter one.

In a large population-based study of community-dwelling older adults in the UK (N = 7,356), aged 50 years and older, 46.5% reported at least one of ten cognitive complaints (Westoby, Mallen, & Thomas, 2009). The research noted that reports of cognitive complaints increased with age, with 41.6% of those between 50 and 59, and 63.4% of those aged 80 or over, reporting at least one complaint. The prevalence of cognitive complaints was also higher in those reporting pain in the last four weeks compared to those who did not (52.5% versus 30.8%).

Many readers will know that fibromyalgia is a syndrome diagnosed by the presence of widespread pain and reported pain upon palpation in 11 of 18 designated tender points (Wolfe et al., 1990). Fatigue, sleep disturbance, and memory and concentration difficulties are also defined symptoms of fibromyalgia. In a study of beliefs about memory, or “metamemory,” 23 patients with fibromyalgia were compared with age- and education-matched controls and older controls (Glass, Park, Minear, & Crofford, 2005). Those with fibromyalgia reported lower memory capacity and more memory deterioration than both control groups. They also reported more use of strategies to support memory than the age-matched controls and more anxiety about memory ability than both the age-matched controls and the older controls.

Finally, there have been a number of studies that have attempted to identify predictors of cognitive complaints as a way to understand the factors that influence them. A range of factors achieve significant correlations with summary scores for cognitive complaints, including pain severity, anxiety, and depression (McCracken & Iverson, 2001; Muñoz & Esteve, 2005; Roth et al., 2005). In multivariate analyses, depression was the strongest unique predictor of cognitive complaints in the three studies reviewed here. In these analyses, combinations of variables including depression and either pain-related anxiety or "catastrophizing" accounted for 36.0% (McCracken & Iverson, 2001), 43.0% (Muñoz & Esteve, 2005), and 52.5% (Roth et al., 2005) of the variance in cognitive complaints. In the three studies selected here, pain intensity itself was only weakly associated with cognitive complaints and was not a significant predictor when other predictors were taken into account.

Cognitive Test Performance

There was a comprehensive review of cognitive performance and chronic pain, albeit ten years ago (Hart, Martelli, & Zasler, 2000). In the review the authors located 23 studies of patients with chronic pain, mostly without a history of a traumatic brain injury or neurological disease. These studies were conducted between 1987 and 1999 and the groups studied included people with non-specific chronic pain, fibromyalgia, post whiplash injury, and mixed samples. It was a narrative and not a quantitative review and the authors conclusion is summarized below.

> "Numerous studies reviewed here have demonstrated neuropsychological impairment in patients with chronic pain, particularly on measures assessing attentional capacity, processing speed, and psychomotor speed. In some studies, impairment has been related to greater pain intensity and to the involvement of head and neck areas…and

other symptoms often associated with pain such as mood change, increased somatic awareness, sleep disturbance, and fatigue." (p. 147)

A more updated survey of the literature was published just three years ago by the International Association for the Study of Pain (IASP) and authored by Krietler and Niv (2007). They divided domains of functioning into seven categories and used a simple tally system for the number of studies they identified in the published literature showing evidence for deficits in patients with chronic pain based on neuropsychological test results. A summary of the main five performance domains based on this work is presented in Table 1. Of the other two categories, one was called "other" and included research that demonstrated differences in reasoning (3 of 4 studies), construction (2 of 2 studies), and block design and similarities (no deficits were found in two studies). Another "overall" category included results from the research using the Wechsler Adult Intelligence Scale (chronic pain patients scored lower than controls in 1 of 2 studies), the Mini Mental State Exam (no significant difference in 1 study), and the Neurobehavioral Cognitive Status Examination (32% of patients with chronic pain scored in the range of impaired performance in 1 study). One limitation of this brief publication is that not all of the studies reviewed are included in the reference list and only the presence, and not the magnitude, of the results is discussed. The overwhelming suggestion from Table 1 is that those with chronic pain have wide ranging impacts on neuropsychological performance.

Insert Table 1 About Here

In a study set within a Danish pain center, both the influences of pain and pain medications on cognitive functioning were investigated (Sjogren, Christrup, Petersen, & Hojsted, 2005). It included 91 patients with chronic pain and 64 age- and sex-matched healthy controls. The patient groups were divided into those using no pain medication (n =

21), those on long-term opioid treatment (n = 19), those on antidepressant or anticonvulsant medications (n = 18), and those on combination of opioid and at least one of the other medications (n = 33). Sustained attention (continuous reaction time) and psychomotor speed (finger tapping) where impaired across the patient groups. However, information processing (paced auditory serial addition) was only impaired in the opioid group. Patient ratings of pain and sedation were significantly correlated with poor performance in sustained attention and information processing. The MMSE was also given and the authors remarked that it appeared insensitive for detecting effects on cognitive performance in their sample.

Effects of Analgesic Medications on Cognitive Functioning

Primary among the analgesic medications that raise concerns for cognitive functioning are the opioids analgesics. Current clinical guidelines from the American Pain Society and American Academy of Pain Medicine state that “chronic opioids therapy can be an effective therapy for carefully selected and monitored patients with non-cancer pain” (Chou et al., 2009). However, the authors also note that use of opioids can be associated with significant harms. For example, they later recommend that “clinicians should counsel patient on COT [chronic opioid therapy] about transient or lasting cognitive impairment that may affect driving and work safety.”

A recent review concluded that both acute and chronic opioid use appear to have effects on cognitive performance that appear to be “relatively broad spectrum,” including impairment in attention, concentration, visual and verbal recall, visual-spatial skills, psychomotor speed, and hand-eye coordination (Gruber, Silveri, & Yurgelun-Todd, 2007). Long-term opioid use appears to affect executive functions (e.g., the ability to shift mental set and inhibit inappropriate responses). The data reviewed in this paper included normal

subjects, heroin users, and patients in methadone maintenance, as well as some samples of pain sufferers, hence generalizability to patients with chronic pain is unclear.

In another review that excluded current or recovering substance abusers the conclusions were far more positive: “research reflects minimal to no significant impairments in cognitive functioning… if impairment does occur, it is most often associated with perenteral opioids administered to opioids-naïve individuals” (Ersek, Cherrier, Overman, & Irving, 2004). The authors emphasize that this particularly holds for stable chronic opioid therapy and they even suggest that successful opioid therapy can enhance cognitive functioning, presumably as a result of reduction of pain. The authors state that the literature is incomplete and leaves many questions about the effects of opioids largely unanswered. Certainly in research where cognitive performances are directly tested there are data to suggest that long term opioids are associated with decreased attention, psychomotor speed, and working memory compared with healthy volunteers (e.g., Sjogren, Thomsen, & Olsen, 2000). However other results suggest that some cognitive abilities may improve in with opioids (e.g., Rowbotham et al., 2003) or that cognitive functioning can remain unaffected (e.g., Raja et al., 2002).

Psychological Treatment for Chronic Pain

During the last 40 years the dominant psychological framework that has informed chronic pain treatment has shifted. The changes in psychological treatment have been described as forming a series of waves (Hayes, 2004). Within pain, the first wave was known as the operant approach (Fordyce, 1976), and within psychology more generally it is known as “Behavior Therapy”. Here, principles derived from laboratory-based experiments were applied to human behavior problems including chronic pain. The second wave, built on the first, and included the influence of cognitive therapy methods creating what is known as “Cognitive Behavioral Therapy” (CBT; e.g., Turk, Meichenbaum, & Genest, 1983). Today

there is a “third wave” of behavioral and cognitive therapy which includes elements of the first two waves. However, it also expands on these within a conceptual framework that is less mechanistic and more contextual. This third wave utilizes clinical technologies and a research base that advocates processes such as acceptance, mindfulness, and values. Examples of these third wave approaches include Mindfulness-based Stress Reduction, (Kabat-Zinn, 1990), Dialectical Behavior Therapy (Linehan, 1993), Mindfulness-based Cognitive Therapy (Segal, Williams, & Teasdale, 2002), Acceptance and Commitment Therapy (ACT; Hayes, Luoma, Bond, Masuda, & Lillis, 2006), and an approach to chronic pain based on ACT called Contextual Cognitive Behavioral Therapy (CCBT; McCracken, 2005).

Contemporary psychologists from different orientations would assess the merits and drawbacks of these three waves differently. An examination of the recent pain literature reveals diverse areas of competing interests including: catastrophizing (e.g., Sullivan, Lynch, & Clark, 2005; Sullivan et al., 2001), coping (e.g., Romano, Jensen, & Turner, 2003), self-efficacy (e.g., Asghari & Nicholas, 2001; Nicholas & Asghari, 2006), stages of change (e.g., Kerns, Wagner, Rosenberg, Haythornthwaite, & Caudill-Slosberg, 2005), amongst others (Keefe, Rumble, Scipio, Giordano, & Perri, 2004). Along with current contextual approaches each of these particular variables of interest carries its own assumptions of ontology, causality, and epistemology. The remainder of this chapter will highlight some current treatment approaches that appear to have particular promise.

Exposure

Integral to the first wave of psychological treatment for chronic pain was the inclusion of what are essentially exposure-based methods to reduce avoidance (Fordyce, 1976). The term “exposure-based” implies having the patient move toward and make contact with situations that are likely to include both fear and avoidance. This could include situations

involving contact with movement and pain, or contacting situations that are assumed to involve the experience of pain. The key to the success of these methods is to assure that the exposure takes place without subtle forms of avoidance blocking that contact, such as bracing, distracting, or other covert means of trying to suppress experiences. Typically, treatments of this nature proceed through a series of “exposure trials”. Here patients begin in situations that elicit low levels of threat or fear and proceed through repeated exposure trials to situations that are associated with higher levels of challenging private experiences. The progression of treatment in this way is often known as a “graded hierarchy”.

An aspect of the second wave of psychological treatment which is sometimes added to this methodological foundation is known as the “behavioral experiment”. This involves teaching the patient methods by which they can identify and challenge irrational expectations concerning particular exposure situations (e.g., Vlaeyen, de Jong, Geilen, Heuts, & van Breukelen, 2001). In this case, repeated trials are thought to reduce the feelings of fear and correct mistaken or irrational thoughts or expectations.

In an early demonstration of these methods, Vlaeyen et al. (2001) conducted a replicated, single-case, cross-over experimental design comparing exposure (repeated explicit contact with feared experiences) with techniques designed to gradually increase activity regardless of fear. The research included 4 participants from the Netherlands who were selected because of their high levels of fear of movement. Results utilizing graphical and time series analyses recorded patient ratings of pain-related thoughts and feelings on a daily basis. These demonstrated that improvements only took place during the exposure condition and not the activity condition. Similar research was conducted in Sweden (Boersma et al., 2004) which replicated the results above. Later research in this area suggested that it was the exposure component itself, not associated educational sessions, that appeared to be

responsible for increases in participant daily activity. This research also demonstrated that treatment gains were maintained at follow up six months later (de Jong et al., 2005b). Similar treatments have also been carried out for patients with complex regional pain syndrome (CRPS; de Jong et al., 2005a).

Acceptance & Commitment Therapy (ACT)

Over the past 15 years or so there has been a series of studies into applications of ACT to chronic pain (McCracken, 2005). ACT includes exposure-based methods but greatly expands on these. ACT is based on the notion that a significant proportion of human suffering emerges from “psychological inflexibility,” a process based in interactions between verbally-based learning and direct experience that reduces the capacity for behavior to persist or change as required in the pursuit of values and the achievement of goals. Psychological inflexibility lends behavior an unworkable quality resulting from avoidance, a loss of contact with direct environmental contingencies, a stuckness in verbally constructed versions of events and the self, and failure of committed and values-based action (Hayes et al., 2006). According to the therapeutic model underlying ACT, “psychological flexibility” is the contrasting process which stems from acceptance, mindfulness, contact with present experiences outside of processes of language and thinking, and behavior change based in goals and values.

ACT points to problems that can arise when people come to verbally analyze, apply problem solving strategies, and seek to control relatively uncontrollable events, such as thoughts, memories, physical sensations, and emotional experiences that are based in one’s own history (Hayes, Strosahl, & Wilson, 1999). As this applies to unwanted to psychological experiences, this process is referred to as experiential avoidance and is assumed to be at the root of many forms of behavior problems (Hayes, Wilson, Gifford, Follette, & Strosahl, 1996).

ACT also points to what is called the “illusion of language,” the sense that we are dealing with the actual world with our thoughts when in fact we are constructing the world within our thoughts. From these processes behavior is coordinated by experiences that we attempt to control without success and by verbally constructed versions of reality that may be misleading and can block contact with other sources of healthy and flexible behavior influence.

In practice ACT includes looking with the patient, with great care, at their behavior patterns and the influences being exerted on them. It includes looking for clinically relevant behavior patterns in treatment sessions, patterns of avoidance or behaviors that show other qualities of psychological inflexibility. When encountered these are met with methods to enhance psychological flexibility such as acceptance, mindfulness, and values.

Numerous studies support the model underlying ACT particularly for chronic pain. These include studies that illustrate the potentially adverse impacts of avoidance (Fordyce, Shelton, & Dundore, 1982; McCracken & Samuel, 2007; Vlaeyen & Linton, 2000) and the potential benefits of acceptance (McCracken 1998; McCracken & Eccleston, 2005; McCracken, Spertus, Janeck, Sinclair, & Wetzel, 1999) and mindfulness (Kabat-Zinn, 1990; Kabat-Zinn, Lipworth, & Burney, 1985; McCracken, 2007; McCracken, Gauntlett-Gilbert, & Vowles, 2007) for patients’ emotional, physical, social, and work-related functioning.

Treatment Outcome

In recent years, at least seven treatment outcome studies have been published in the field of chronic pain that have focused on processes involved in psychological flexibility and inflexibility. In these studies both mindfulness-based methods alone (Morone, Greco, & Weiner, 2008; Pradhan et al., 2007; Sephton et al., 2007) and broader packages of treatment (McCracken, MacKichan, & Eccleston, 2007; McCracken, Vowles, & Eccleston, 2005) have yielded significant results across a range of domains. These include average effect sizes in

the area of pain-related anxiety and depression of 1.2 immediately post treatment (N = 171) and above .90 at a three-month follow-up (N = 114) (Vowles & McCracken, 2008). Research in this area still awaits a large scale, high quality, fully randomized, controlled trial - but promising results have come from a small randomized trial of participants “at risk” for work loss due to pain or stress (Dahl, Wilson, & Nilsson, 2004), a non-randomized trial with a waiting phase comparison (McCracken et al., 2005), and a small scale randomized trial in patients with whiplash-associated disorders (Wicksell, Ahlqvist, Bring, Melin, & Olsson, 2008).

Relevance of ACT & Related Processes to Neuropsychology

Many patients involved in work-related accidents are referred for neuropsychological services. They may have musculoskeletal and well as neurological problems. As reviewed here, they may have pain, anger, fear, depression, poor sleep, fatigue, and postconcussive symptoms, and they may demonstrate difficulties in cognitive performance. They may be in a process of resolving blame, wage replacement, or damage awards. As humans will do, they are likely to have many thoughts, beliefs, and judgements about the nature of their injuries and what they mean. And their behavior is likely to fall prey to these many experiences and the person’s thoughts about them. The influences of potential financial settlements sometimes complicate the process of treatment, even in the most honest patients.

The methods and processes of ACT appear particularly well suited to this patient group. A complete analysis within this area is beyond the scope of this chapter; however, a few particular aspects of fit are easily identified. First, many of the experiences encountered during the aftermath of work-related injuries are ultimately uncontrollable or at least uncontrollable on a timeline dictated by the patient – some may subside over a longer term. Traumatic accidents along with the confusion, ambiguity, and adversarial situations they engender can create a context of needing to analyze, understand, know, or prove what is

wrong. ACT includes specific therapeutic techniques for promoting acceptance and “letting go” of the struggles with these experiences - when to do so serves the purpose of functional improvement. It is assumed that once efforts are freed from analyzing and struggling with experiences, the person is more likely to be effective and engaged in assessment and treatment services. Second, patients’ injuries and the experiences engendered are likely to distract, disrupt, or disintegrate behavior patterns that require sustained attention (e.g., Eccleston & Crombez, 1999). Again, acceptance-based methods and mindfulness-based methods for promoting more skillful attention and awareness are likely to provide benefits. Third, patients thoughts and beliefs post injury may have a worried, ruminative, or catastrophizing quality (e.g., Sullivan et al., 2001). ACT has specific methods for what is called cognitive defusion for reducing the impact of overwhelming emotionally-laden thoughts. Finally, as acceptance, mindfulness, and defusion methods loosen the influences on endless analysis, struggling, rumination, and distress, work on values-based methods can help patients to connect or reconnect with directions in their lives even if these directions include barriers or challenges that they did not encounter before.

Summary & Conclusions

In this chapter there are many findings that can be expressed with certainty and some that cannot. Certainly, chronic pain is a very prevalent problem and a source of a great deal of suffering and disability. About 20% of the general population suffers with persistent pain. Those with persistent pain are two to three times more likely than those without pain to suffer with depression or an anxiety disorders. Rates of both depression and anxiety disorders are significantly higher in those who seek treatment for chronic pain, possibly rougly twice as likely as in those who do not seek treatment. Approximately 30% of chronic pain sufferers report that they are no longer working or consider themselves retired as a result of their pain.

Certainly, whether it is in a chronic pain service, a neuropsychology service, or in the general community, chronic pain and neuropsychological problems frequently co-occur. For example, somewhere between from 40% to just over 60% of patients seeking treatment for chronic pain also complain of some kind of difficulty with cognitive functioning, and similarly about 60% of those with traumatic brain injuries also present with chronic pain. Studies of cognitive complaints in persons with chronic pain find that they are particularly correlated with measures of emotional distress, especially depression. There have been a number of neuropsychological impairments documented in the literature on those with chronic pain. There is, however, some lack of uniformity in the literature and it is far less certain what processes are involved in impairments observed, whether these arise directly from collateral problems such as low mood, sleep disturbance, or other influences, from the pain experience itself, or some combination. The role of analgesic medications provides another area of relative uncertainty. For instance, opioids are increasingly prescribed for chronic pain and even encouraged in current practice guidelines. Although opioid use certainly carries some risk of cognitive and behavioral disturbance, it is by no means clear from the literature for whom, to what extent, in what areas of functioning, and under what circumstances these problems will occur. There is some degree of acrimony in the debate surrounding opioid use for chronic non-malignant pain, and there is a great deal of emotion behind both the push for free access to reduce suffering and the push to block access to prevent harms. This emotion can cloud the evidence.

This chapter summarized recent developments in treatment for chronic pain. These developments seem particularly effective and may be an improvement in some ways over previous treatments, although definitive trials are still needed. It is suggested that the methods and processes within these treatments may be particularly well suited to the

problems experienced by persons with traumatic work-related accidents, including those with verified or suspected brain injury. It is easy to conceive a treatment service based on ACT particularly designed for the most complex of the patients within this area of clinical work, for these so-called “polytrauma” cases with chronic pain and brain injury.

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Table 1

Summary of study results in relation to cognitive test performance in patients with chronic pain based on Kreitler and Viv (2007).

Performance Domain	Studies Testing This Domain	Studies Showing Deficits in Chronic Pain	Percent Positive Results	Comments
Memory	34	30	88.2	Authors concluded that most affected aspects include delayed memory, verbal tasks, and new learning
Attention	13	9	69.2	Notable in failing to show deficits were the stroop interference task and attention task from the WMS
Verbal	9	8	88.9	Tests here included vocabulary and word or category fluency
Speed	17	14	82.3	Tests here included verbal, processing, and psychomotor speed
Mental Flexibility	11	8	72.7	Included mostly task or instruction switching challenges