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Pain-related psychological issues in hand therapy

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ABSTRACT

Study Design: Literature review.
Introduction: Pain is a subjective experience that results from the modulation of nociception conveyed to the brain via the nervous system. Perception of pain takes place when potential or actual noxious stimuli are appraised as threats of injury. This appraisal is influenced by one's cognitions and emotions based on her/his pain-related experiences, which are processed in the forebrain and limbic areas of the brain. Unarguably, patients' psychological factors such as cognitions (eg, pain catastrophizing), emotions (eg, depression), and pain-related behaviors (eg, avoidance) can influence perceived pain intensity, disability, and treatment outcomes. Therefore, hand therapists should address the patient pain experience using a biopsychosocial approach. However, in hand therapy, a biomedical perspective predominates in pain management by focusing solely on tissue healing.
Purpose of the Study: This review aims to raise awareness among hand therapists of the impact of pain-related psychological factors.
Methods and Results: This literature review allowed to describe (1) how the neurophysiological mechanisms of pain can be influenced by various psychological factors, (2) several evidence-based interventions that can be integrated into hand therapy to address these psychological issues, and (3) some approaches of psychotherapy for patients with maladaptive pain experiences.
Discussion and Conclusion: Restoration of sensory and motor functions as well as alleviating pain is at the core of hand therapy. Numerous psychological factors including patients' beliefs, cognitions, and emotions alter their pain experience and may impact on their outcomes. Decoding the biopsychosocial components of the patients' pain is thus essential for hand therapists.

Introduction

Pain in upper limb caused by a musculoskeletal disorder (MSD) is one of the main reasons why patients are referred to hand therapy. Many hand therapists rely on a purely biomedical approach to alleviate pain by focusing solely on the injured or degenerated tissues and helping to restore physical function.[1] Nevertheless, it is well established that the pain experienced by MSD patients can be influenced by psychosocial factors such as the tendency to catastrophize in the face of pain, depression, and social support.[2-8] Furthermore, on a population level, the association between pain intensity and severity of tissue lesion may vary greatly and be absent to weak.[9-13] Therefore, it appears that pain is not a simple function of anatomical insult but involves a complex interrelationship between the biological processes and psychosocial factors.[14-16] Pain is doubtlessly a highly complex phenomenon which involves multiple components and makes it a difficult experience to assess for clinicians. The biopsychosocial model of pain proposed by Gatchel (see Fig. 1)[16,17] is helpful to understand this complex phenomenon. This model differentiates the concepts of pain and nociception where pain is the subjective experience that results from the modulation of the sensory

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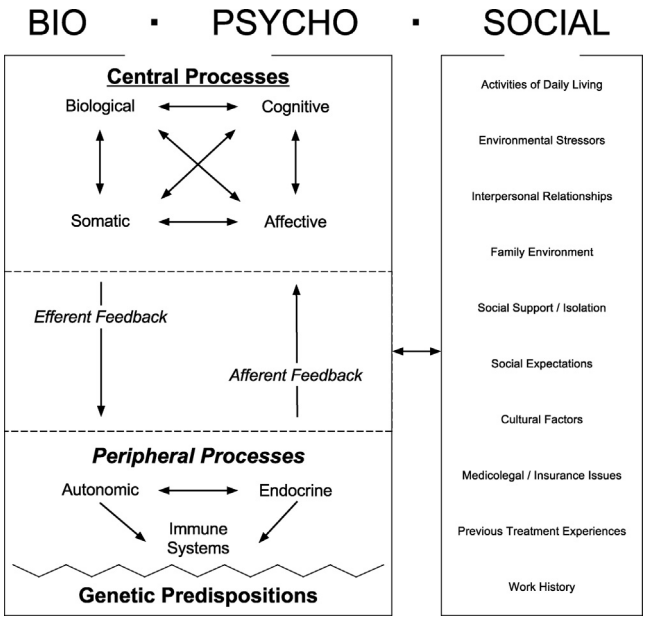

Fig. 1. A conceptual model of the biopsychosocial interactive processes involved in health and illness. From: "Comorbidity of Chronic Mental and Physical Health Conditions: The Biopsychosocial Perspective" by R.J. Gatchel, *American Psychologist*, 2004, 59, 792–805 Copyright 2004 by the American Psychological Association.

information conveyed via the neural processes to the brain, that is, nociception. According to this model, the pain experience is unique for each individual because it is modulated by the reciprocal interactions among biological (eg, genetics, neural processes across the neuraxis), psychological (eg, cognition, emotions, past learning), and social factors (eg, social support, culture).[16,17] Accordingly, understanding patients' pain is capturing how they react to nociception: (a) what the nociceptive information conveyed by the nervous systems means to patients, is it perceived as a serious threat or a manageable situation? (pain cognitions); (b) how patients feel in response to nociception, are they anxious or under control? (pain emotions); and (c) how they behave, do they avoid potentially painful gestures or continue their life as before (pain behaviors)? Thus, when hand therapists face patients' pain, they need to understand the nociceptive origin (biological), and their pain-related thoughts, emotions, and behaviors (psychological), which themselves interact with social factors.[17-20] The use of a biopsychosocial model provides both increased predictive power for the development of chronicity of symptoms.[21-23] Used as a treatment model for MSD, biopsychosocial models are associated with better outcomes than biomedically oriented interventions.[24,25] Indeed, pain management in a biopsychosocial perspective is not only acknowledged as a key feature but also widely recognized as the best treatment approach.[26,27] This can be best done by multidisciplinary teams, as recommended by various pain-expert organizations including the International Association for the Study of Pain.[27-29]

The importance of integrating pain-related psychological factors in hand therapy was highlighted in a special edition of the *Journal of Hand Therapy* (JHT) in 2011.[30] However, the tendency to focus solely on biophysical pain aspects continues to persist. For example, among more than 50 scientific articles published in the JHT between October 2016 and September 2017, only 4 included psychosocial factors as either dependent or independent variables, namely, self-efficacy,[31,32] health literacy,[33] and compliance.[34] Since pain affects hand function[35-38] and is influenced by psychosocial factors,[7] hand therapy without integrating these important dimensions is surely not optimal. There are several reasons why psychological issues are still almost absent from hand therapy. As demonstrated by a recent study investigating attitudes among American orthopedic surgeons, the main barriers for addressing these issues were lack of time, stigma associated with psychological factors, and lack of adequate training.[39] There is good reason to believe that the same is true for hand therapists. However, if the clinicians are convinced of the importance of psychological influences on patients' recovery, they will act on these issues by prioritizing their interventions despite lack of time.

This review, therefore, aims to (1) raise awareness among hand therapists of the impact of pain-related psychological risk factors by reviewing the neurophysiological mechanisms of pain and describing how they can be influenced by various psychological factors, (2) propose several evidence-based interventions that can be integrated into hand therapy to address these psychological issues, and (3) describe some approaches of psychotherapy for patients with maladaptive pain experiences.

Neurophysiological mechanisms of pain

The following section provides a brief review of the neurophysiology of pain (Fig. 2). For more details, the readers are referred to the reviews of Apkarian,[40] Baliki and Apkarian,[15] Basbaum et al,[41] and Bushnell et al.[14]

Peripheral pathways: from the nociceptors to the dorsal horn of the spinal cord

When one's body receives potential tissue-damaging stimuli such as heat or pressure, these noxious stimuli are detected by free nerve endings (nociceptors) that, once converted into nerve impulses, transmit nociceptive information along first-order Aδ- or C-fibers.[42,43] These first-order neurons synapse onto second-order neurons in the dorsal horn of the spinal cord. When tissue damage occurs, inflammatory mediators (eg, tumor necrosis factor-α, nitric

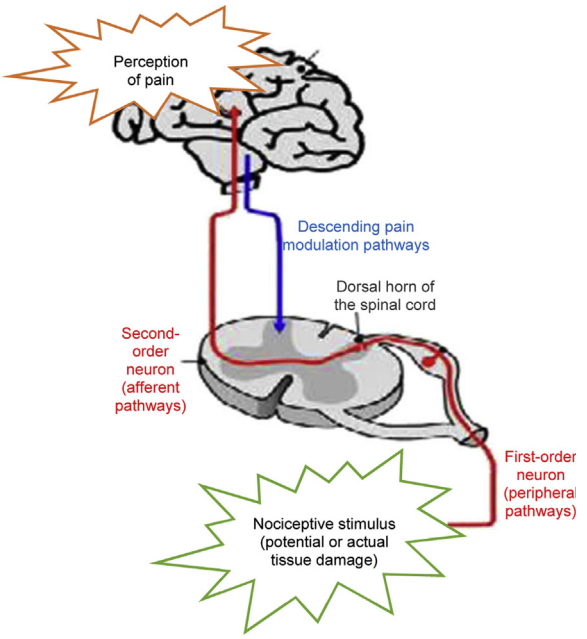

Fig. 2. Peripheral and central pain pathways. Adapted from Nijs J, Van Houdenhove B. From acute musculoskeletal pain to chronic widespread pain and fibromyalgia: application of pain neurophysiology in manual therapy practice. *Manual Therapy.* 2009; 14(1):3–12. Reprint permission obtained from RightsLink®.

oxide, bradykinin) also act directly or indirectly on nociceptors and nociceptive transmission.[44]

Ascending pain pathways: from the dorsal horn of the spinal cord to the brain

The second-order neurons convey the nociceptive information from the spinal cord to the brain stem in areas involved in arousal and attention and via the thalamus, to primary and secondary cortical somatosensory areas which are specialized in the processing of the sensory-discriminative dimensions of pain (eg, location and duration of the stimulus).[14,41] Projections from the brain stem, thalamus, and somatosensory areas also target the limbic, mesolimbic, and prefrontal areas such as the ventral tegmentum, nucleus accumbens, prefrontal cortex, cingulate cortex, amygdala, and hippocampus.[14,41] These areas are involved in the processing of the cognitive, affective, and motivational dimensions of nociception.[14,41] The pain experience is reflective of the processing of these structures which integrates the individual's past experiences, values, expectations, cultural beliefs, and salience relative to the self in response to nociception.[15,45-51] Therefore, the pain experience for the individual suffering from upper limb MSD is the result of a complex perceptual process by the peripheral and central nervous systems that involve various sensory-discriminative, cognitive, affective, and motivational aspects.

Descending pathways of pain modulation: from the brain to the spinal cord dorsal horn

Multiple descending pain pathways originating in the brain modulate ascending nociceptive signals in the dorsal horn of the spinal cord. Descending modulation of nociceptive input involves a balance between inhibitory and facilitatory processes that are dictated by behavioral priorities and altered by pathological and psychological (ie, cognitive, affective, and motivational) states.[46] Under normal circumstances, activity in the descending modulatory pathways decreases the transmission of nociceptive stimuli by impacting nociceptive transmission within the dorsal horn of the spinal cord.[46] These descending modulatory systems are influenced by limbic, mesolimbic, and prefrontal structures as described previously. These descending systems, under certain conditions, may amplify the nociceptive transmission within the dorsal horn of the spinal cord, inducing central sensitization.[47,52-54] Central sensitization is an amplification of neural signaling within the central nervous system, due to increased excitation or reduced inhibition, that elicits pain hypersensitivity.[55] The changes associated with central sensitization are multifactorial, being reflected by neuromolecular, structural, and functional changes within the nociceptive pathways as the result of central (ie, descending modulatory processes) and peripheral factors (eg, inflammation, peripheral neuropathy).[53,55-58]

Perception of pain takes place when the brain interprets the noxious signal as a threat of injury.[15] It is hypothesized that the conversion of (potential) nociception to conscious pain perception relies on the cortico-limbic threshold which appraises the noxious input,[15] and nociceptive magnitude may be modulated by psychological factors such as cognition, mood, attention, and expectation.[14,59-61] This is why perception of pain intensity is not proportionally related to the magnitude of nociception. For example, injured soldiers in the battlefield may not feel any pain, and conversely, observing significant others experiencing pain can induce pain and activates some pain-related brain regions in the observer's brain.[14,62]

From acute to chronic pain

Many factors can be involved in the transition from an acute to a chronic pain state.[56,63,64] Some authors suggest that pain chronicity occurs when there is a long-term shift in the cortico-limbic mechanisms which converts (potential) nociception to pain in genetically predisposed individuals.[15,65] This long-term shift is believed to enhance pain-related learning which will be imprinted in memory.[15] Maladaptive pain thoughts and behaviors may also be involved in the transition from acute to chronic pain.[66,67] For example, activity changes in the forebrain areas have been found in patients with chronic pain who tend to catastrophize pain[68,69] and display conditioned fear responses such as avoidance.[70] As mentioned earlier, several neuroimaging studies have demonstrated some brain activity shifting from the somatosensory areas to the cognitive-affective-motivational centers.[40,71] This shift suggests important links between pain, emotion, and memory: that is, suffering from chronic pain depends on the psychological states rather than the nociceptive stimuli[72-74] when pain can no longer be explained by tissue lesion. This link between pain and psychological issues suggests that the biomedical assumption—there has to be nociception to have pain—may not be always true. In the light of these findings, Apkarian proposes the definition of chronic pain as "a persistence of the memory of pain and/or the inability to extinguish the memory of pain evoked by an initial inciting injury."[74] Moreover, International Association for the Study of Pain has recently defined "nociplastic pain" which designates "pain that arises from altered nociception despite no clear evidence of actual or threatened tissue damage causing the activation of peripheral nociceptors or evidence for disease or lesion of the somatosensory system causing the pain."[75]

MSD pain-related psychological factors

Several psychological factors can positively or negatively influence pain and disability associated with MSD. They impact on pain perception via the central nervous system and have functional consequences on patients' responses to nociceptive input, pain experience, methods of coping with pain, and ultimately their outcomes. These psychological factors are classified into the following categories: cognitive, affective, and behavioral.[76]

Cognitive factors

Pain cognitions are how individuals appraise potential or real nociceptive stimuli based on their previous experiences and salience to the self. For example, non-noxious input may be appraised as a threat. Individuals may feel pain in the absence of an apparent noxious input. As well, actual tissue damage may not evoke any pain. The cognitive factors which influence pain perception are presented as follows.

Pain self-efficacy. Pain self-efficacy is "the sense that one will be able to manage pain."[77] This pain-related factor is protective, associated with less severe pain and better function in MSD patients[78-83] and appears to be one of the best predictors of better outcomes.[78,79,83,84] Helping patients to reinforce their self-efficacy by promoting effective coping strategies is a critical aspect of rehabilitation for patients suffering from pain (see Section Pain self-management program [PSM]).

Pain catastrophizing. Pain catastrophizing is an "exaggerated negative orientation to actual or anticipated pain comprising elements of rumination, magnification, and helplessness."[85,86] Patients with this maladaptive thinking have "a tendency to magnify the pain experience, to feel helpless when thinking about pain, and to ruminate on the pain experience."[8] Pain catastrophizing has been associated with increased pain, numbness, and/or disability in different pain conditions including upper limb MSD.[12,78,80,81,87-92] Pain catastrophizing at 1-2 months

after fracture has been shown to be a better predictor of pain and disability 8 months later than other psychological factors such as depression, anxiety, and posttraumatic stress disorder.[93] Reducing the tendency to catastrophize in the face of pain has been shown to be the best predictor for successful rehabilitation of low back pain and whiplash injury.[87,88,94] To our knowledge, no such studies have been conducted in patients with painful upper limb MSD.

Perceived injustice. Perceived injustice is "an appraisal cognition comprising elements of the severity of loss consequent to injury, blame, a sense of unfairness, and irreparability of loss."[86,95,96] This factor has been associated with increased pain intensity, and this relationship has been shown to be positively mediated by anger[97] and negatively by self-efficacy.[98] Other studies also documented the influence of perceived injustice on pain behaviors, disability, and depressive symptoms.[79,86,95] For example, this psychological factor has been shown to be a predictor of work disability 1 year after injury among individuals with back and neck injuries.[95]

Patients' feelings of injustice may be directed to their employers, colleagues, person who caused the accident (eg, driver), insurers, family, significant others, friends, and society.[99] Health care providers may also be viewed as sources of injustice due to inappropriate assessment/treatment, long wait times, and nonempathic attitudes (eg, punitive responses to patient's pain expression, ignoring pain-related psychological problems, blaming pain on psychological aspects of patients).[99] It is therefore crucial that health care providers dispense care with empathy, in open, nonjudgmental and nondefensive manners to improve the therapeutic alliance with the patient.[99]

Negative pain thoughts. Negative pain thoughts refer to "automatic, overprotective, unduly pessimistic thoughts triggered by nociception" (eg, "hurt equals harm").[20,100] These maladaptive thoughts have been shown to be associated with higher pain intensity scores, greater disability, and higher depression levels.[20,78,100] Negative pain thinking may lead to pessimistic misinterpretation of therapists' advice by the patients (eg, "You must make ergonomic adjustments to avoid pain") and exacerbates maladaptive pain thoughts (eg, "Pain during hand therapy exercises means that I am causing damage or inflammation").[20] To avoid this kind of misinterpretation, clinicians may encourage patients to be positive and active, for example, "Movers do better. You want to be a mover."

Cognitive fusion. Cognitive fusion is a "tendency for behavior to be overly regulated and influenced by cognition [such that] a person acts on thoughts as though they are literally true."[101] It has been recognized as one of the strongest predictors of psychological distress.[102] Some studies have shown this tendency may be associated with higher pain intensity scores and greater functional limitations in patients suffering from chronic pain of various origins including upper limb MSD.[102-104] Patients may be particularly maladaptive when pain catastrophizing and cognitive fusion cohabit, as they are convinced that their catastrophic thinking about pain is true (eg, "the pain will never improve").[104]

Psychological inflexibility. Psychological inflexibility consists of an "inability to take value-based actions in the presence of unwanted thoughts, feelings, or bodily symptoms" by "responding in a reflexive, habitual, or impulsive manner to internal private events (eg, thoughts, emotions, sensations) or external situations and often relying on avoidant coping strategies."[105,106] It involves 6 interrelated processes: experiential avoidance, cognitive fusion, attachment to conceptualized self, lack of contact with the present moment, lack of values clarity, and unworkable action.[107] For example, patients with psychological inflexibility may not perform daily activities, work, or do exercises despite the recognition of the benefits of these activities on their pain experience. Reducing psychological inflexibility has been shown to be directly and indirectly associated with decreasing pain intensity and disability in chronic pain patients including those suffering from upper limb MSD.[105,108-110]

Cognitive intrusion of pain. Cognitive intrusion of pain occurs in 3 steps: (1) pain distracts one's attention; (2) pain becomes the center of attention; and (3) the individual is no longer able to disengage from pain.[111,112] According to a study conducted among patients with upper limb MSD, cognitive intrusion of pain appears to mediate the relationship between pain intensity and pain interference with daily activities.[38] Based on the results of their study, the authors conclude that mindfulness meditation (see Section Mindfulness skills training) might be useful for patients who display cognitive intrusion as it may help them to be conscious of how their attention is preoccupied by pain and learn to redirect their attention toward their ongoing activity by cognitive behavioral therapy (see Section Cognitive behavioral therapy [CBT]).[38]

Emotional factors

As mentioned earlier, emotional factors can modulate pain perception. This may also be true for patients who suffer from painful upper limb MSD. The following types of emotion have been shown to influence the pain experience in this clientele of patients.

Depression. Greater symptoms of depression (eg, diminished interest, low self-esteem, hopelessness) have been associated with greater pain severity, more disability, and poor treatment outcomes for various pain conditions.[80,82,89,113-119] They have been identified as a predictor of postsurgical pain and physical functional limitation subsequent to minor hand surgery[80] as well as return to work after rehabilitation among injured workers including upper limb MSD.[114] However, the influence of depressive symptoms may also depend on the type of diagnosis: one cross-sectional study conducted among 156 patients with trigger fingers (stenosing tenosynovitis) did not show any relationship between depression levels and pain intensity.[81]

Anxiety. Anxiety (eg, restlessness, feeling tense) is another important psychological factor which can alter the pain experience. In the domain of hand therapy, an association between higher anxiety levels and increased pain intensity has been reported in patients with trigger finger, carpal tunnel syndrome, and benign tumor.[12,80] Anxiety has been identified as an important predictor of chronic pain along with depression in patients undergoing extremity trauma.[120] Interventions aimed at reducing anxiety levels may therefore help to minimize or prevent chronic pain.[64] Finally, some psychologists and psychiatrists view anxiety and depression as highly related and recommend considering both together when addressing psychological distress or emotional suffering.[121,122]

Health anxiety. Health anxiety, also termed hypochondriasis, is the "preoccupation with a belief in or fear of having a serious illness,"[123] that is, an excessive illness concern despite of the lack of medical evidence.[124] Health anxiety has been associated with more pain-related limitations among patients with hand or arm disorders.[125-127] An association has also been found between health anxiety and the presence of an idiopathic type of pain,[125-127] or pain which is vague, diffuse, nonspecific, and medically unexplained.[128] Moreover, idiopathic pain in upper limbs has been associated with

poorer physical function.[128] Therefore, patients exhibiting health anxiety and suffering from idiopathic pain may require special attention in terms of management and be best supported by a multidisciplinary team.

Anger. Anger intensity and its regulation (either suppression or expression) negatively impact pain outcomes.[97,129-132] The sources of anger may stem from treatment failures, workers' compensation or other financial claims, problems with finances, and family relationships (see also Section Perceived injustice).[76]

Fear of pain and avoidance behaviors. The fear-avoidance model of pain, introduced more than 30 years ago,[133] has been refined by Vlaeyen et al.[134] Fear of pain is an emotional response, often accompanied by anxiety and maladaptive cognitions such as negative pain thoughts or catastrophization.[134-136] It is provoked by anticipation of pain rather than a noxious stimulation and causes avoidance of pain-provoking movements.[134-136] As seen here, the aforementioned psychological factors are all intricately related concepts. Results of a meta-analysis (2016) revealed small-to-moderate associations between pain-related fear and pain intensity in different pain conditions (eg, fibromyalgia, low back pain, upper limb pain).[137] Fear of pain has been identified as a predictor of pain chronicity[138,139] and may be more disabling than pain itself.[140] Along with catastrophic thinking, fear of movement and (re)injury (kinesphobia)[141] has been demonstrated to be among the most important predictors of upper limb–specific functional limitations among patients with different upper limb conditions.[2] Avoiding exercise or activities not only results in disuse and subsequently deconditioning[84] but also reinforces the erroneous belief that exercise/activities are harmful, which in turn increase patients' disability.[76] Prescribing untailored exercise/activities to fearful patients can also enhance this vicious cycle; thus, hand therapists should be extremely careful when choosing exercise or activities for these patients.[84]

Negative affectivity. Negative affectivity is the "predisposition toward negative thoughts and feelings, including worry, self-criticism, and negative misinterpretations of self, others, and the future and associated with psychological distress (depression, anxiety)."[142,143] Negative affectivity may lead to greater pain catastrophizing, kinesiophobia, anxiety, and less-efficient coping strategies (eg, avoidance), and thereby result in limited physical function.[143,144] Patients who suffer from chronic pain (including upper limb pain) and who exhibit negative affectivity traits may certainly benefit from support to improve their skills for managing stress and distress and enhancing their resiliency.

As hand therapists, how can we address pain-related psychological issues in our clinical practices?

The fact that hand therapists have a clear understanding of the cognitive and emotional aspects of human illness behaviors is essential and imposes a switch from a biomedical to a biopsychocial approach in their clinical practice. Key elements in pain management indeed involve (1) the early recognition of the role of psychological factors in the pain experience and maladaptive pain behaviors; (2) the need of sustained support, empathic communication, and redirection of patient maladaptive emotions and thinking towards more adaptive ones; and (3) the implication of professionals from other disciplines than hand therapy when required.[8,94,145] Ways to identify pain-related psychological risk factors, assessment tools, and interventions that can be incorporated into hand therapy are presented in the following sections. Some types of psychotherapeutic interventions are also discussed.

Identification of pain-related psychological risk factors

Maladaptive cognitions, beliefs, and behaviors regarding pain should be recognized as early as possible, even in acute stages. As hand therapists, we should create nonjudgmental, comfortable environments for patients so that they can acknowledge and freely express their emotions and cognitions. Some statements or specific words that patients employ when communicating with their health care providers may help therapists to identify patients' distress and maladaptive pain experiences.[146] Bot et al [146] went through as many as 61 interviews with patients with upper limb MSD and identified that statements such as (a) "*I can't*" - interpreted as "*It's disabling*", and (b) "*Something is wrong*" - interpreted as "*It's difficult to believe that I'll be OK*" may be suggestive of the presence of maladaptive cognitions and/or pain catastrophizing, which can in turn affect the pain experience. Once patients' maladaptive cognitions or behaviors are detected, well-validated tools can be used to confirm their presence (see Table 1).

Once dysfunctional pain-related psychological factors are identified, what could and should we do as hand therapists?

When maladaptive pain-related psychological issues are identified in patients, they should be addressed promptly to avoid unnecessary suffering and minimize the risk of pain chronicity. Some clients may require help and need to be referred for psychotherapy within a multidisciplinary pain treatment facility. With limited resources within our health care system, this may however, represent quite a challenge. The following are suggested interventions addressing psychological issues that can be integrated into hand therapy. Underlying principles of some relevant psychotherapeutic modalities are also reviewed.

Pain neurophysiology education. Providing patients with education about neurophysiological mechanisms of pain (eg, the descending pain modulation mechanism) has been associated with changes in patients' pain-related beliefs, pain intensity, and physical/psychological/social

Table 1
Most commonly used instruments for assessing pain-related psychological factors

Psychological factors	Assessment tools
Cognitive factors	
Pain self-efficacy	Pain Self-Efficacy Questionnaire[147]
Pain catastrophizing	Pain Catastrophizing Scale[148]
Perceived injustice	Injustice Experience Questionnaire[95]
Negative pain thoughts	Negative Pain Thoughts Questionnaire[100]
Psychological inflexibility	Psychological Inflexibility in Pain[149]
Cognitive fusion	Cognitive Fusion Questionnaire[101]
Cognitive intrusion of pain	Experience of Cognitive Intrusion of Pain[150]
Emotional factors	
Depression	Beck Depression Inventory[151,152]
	Depression Anxiety Stress Scale (DASS)[153]
	Depression Subscale of the Profile of Mood States (POMS)[154]
	Hospital Anxiety and Depression Scale (HAD)[155]
	Patient Health Questionnaire 9 Items[156]
Anxiety	State-Trait Anxiety Inventory[157]
	Anxiety Subscale of the POMS[154]
	HAD[155]
	DASS[153]
Health anxiety	Health Anxiety Inventory[158]
Anger	Anger-Hostility Subscale of the POMS[154]
	Chronic Pain Acceptance Questionnaire[159]
Fear avoidance	Fear-Avoidance Beliefs Questionnaire[160]
	Tampa Scale of Kinesphobia[161]
Negative affectivity	Negative affectivity subscale of the Type D Scale[162]

function in different chronic conditions.[84,94,163-171] Readers are recommended to consult the practice guidelines written by Nijs et al[172] and their practical tools offered in different languages available online http://www.paininmotion.be/EN/sem-tools.html. Patients learning neurophysiological pain processing and how it is related to their pain thoughts, emotions, as well as behaviors, will help them to understand the concept of nociception and the relevance of biopsychosocial interventions.[84] When they understand that pain reflects perceived threats and not necessarily tissue damage, it is easier for them to accept that exercises can improve their condition.[84,166] They will thus be more prone to adhere to therapy and change their beliefs/cognitions regarding activities and participation.[172]

Graded activity and graded exposure. Graded activity (GA) and graded exposure (GEXP) incorporate behavioral and cognitive approaches to increase patients' participation in pain-related activities[173] by modifying maladaptive beliefs from "the activity hurts" to "the activity is safe."[94,174,175] GA consists of measuring baseline functional capacity and then establishing individual programs of suboptimal level of exercises/activities which will be gradually increased.[94,175] GA aims to achieve the next target by experiencing positive feelings of achievement and developing self-efficacy, as well as positive reinforcement given by the therapist.[94,176] GEXP encourages a confrontational response by exposing patients to feared situations that patients avoid[176-178] and graduation of exposure is based on the level of fear.[135,176] Patients' fear and anxiety can be reduced when they realize that the activities are inoffensive. Application of tolerable level of exposure produces disconfirmations between expected pain and absence of pain, as well as between expected harmful and nonharmful consequences thereby correcting the original overestimation of pain and its consequences.[94,179] A randomized controlled trial in 2016 demonstrated the efficacy of using GEXP in reducing pain and fear as well as improving physical function in patients with an upper limb complex regional pain syndrome.[180] According to a recent systematic review, GEXP seems more effective than GA in terms of function and pain catastrophizing for chronic back pain.[176] Nonetheless, GA has been shown to be more effective than a control condition for improving function.[176]

Cognition-targeted exercise therapy. Cognition-targeted exercise therapy combines the 2 interventions pain neurophysiology education (PNE) and GEXP, aiming at desensitization of the brain for pain caused by fear of movement and deconstruction of pain memories which induce avoidance.[181] Detailed instructions are given in the article written by Nijs et al.[181] Phase 1 consists of PNE to change patients' pain beliefs highlighting the relation between fear avoidance and pain. In phase 2, patients are initiated to time-contingent neuromuscular training. Motor imagery (visualization of doing the exercise) precedes increasing the level of exercise difficulty. Patients' cognitions regarding exercise-related pain are discussed, and patients are encouraged to integrate the concepts of PNE acquired in phase 1. The next step tackles feared movements and activities that are avoided by patients, by applying the GEXP principles. As the last step, cognition-targeted exercise therapy suggests exposition to controlled level of stressful situations. Efficacy of this relatively new approach is unknown for the moment, yet combining the two evidence-based interventions (PNE and GEXP) seems promising to improve clinical symptoms of patients with fear avoidance.

The Progressive Goal Attainment Program. This program was elaborated by Sullivan et al (a health psychologist) and is designed for individuals with chronic pain; it is offered by trained allied health professionals such as occupational therapists and physical therapists.[88] The 2-day training is offered worldwide, as well as online training (www.pdp-pgap.com), and is thus accessible to hand therapists. It targets modifiable pain-related psychological factors such as fear of movement/reinjury, pain catastrophizing, perceived injustice, disability beliefs, and depression.[86,182-184] Patients undergo the Progressive Goal Attainment Program for a maximum duration of 10 weeks. It aims to maximize pre-injury activity involvement within different life role domains including family, social, and occupational roles, by scheduling structured activity strategies and GA involvement to target the psychological factors.[182-184] The efficacy of the progressive goal attainment program has been demonstrated among injured workers and patients with low back pain and whiplash.[88,184,185] It represents a very interesting and relevant therapeutic avenue in hand therapy for those patients with pain-related disability.

Pain self-management program. Self-management is "the individual's ability to manage the symptoms, treatment, physical and psychological consequences, and lifestyle changes inherent in living with a chronic condition."[186] The premises of self-management are: (1) self-efficacy building; (2) self-monitoring; (3) goal setting and action planning; (4) decision-making; (5) problem solving; (6) self-tailoring; and (7) partnership between patients and health care providers.[187] Pain self-management program (PSM) may target different aspects of lifestyle such as planning, pacing activities, food/alcohol consumption, medication, exercise/physical activities, sleep, ergonomic principles, social/recreational activities, and psychological aspects (constructive thinking, focus shifting, mood improvement, relaxation/visualization).[188-190] There are different PSM modalities: face-to-face sessions, online education, interactive voice messages, telephone support, and tapes/videos.[186,187] There is a paucity of evidence on efficacy of PSM in patients with pain-related psychological factors. Nonetheless, a longitudinal randomized controlled trial has demonstrated efficacy of PSM combined with antidepressants on self-efficacy skills to manage pain and depression among depressed patients with back or lower limb MSD chronic pain.[190] Their standardized pain self-management manual is available upon request.[190]

Psychotherapeutic modalities

Although dispensing psychotherapy is reserved to trained therapists, understanding the principles of some modalities is certainly useful for hand therapists who collaborate with psychotherapists to support their patients. Several psychotherapeutic modalities that address pain-related psychological issues exist include cognitive behavioral therapy, acceptance and commitment therapy, and mindfulness skill training.

Cognitive behavioral therapy (CBT). Cognitive behavioral therapy (CBT) aims at replacing maladaptive thoughts causing maladaptive emotions and behaviors with more adaptive ones, by helping patients become aware of the interrelations between thoughts, feelings, and behaviors and of their automatic negative or inaccurate thoughts.[8] CBT entails different techniques: (1) education and socialization focus on mind-body relationships while building the therapeutic alliance and normalizing the situation; (2) cognitive restructuring aims at identification of automatic thoughts and cognitive errors (eg, catastrophizing) and their restructuration; (3) acceptance – that is, grief of the loss and shifting focus from being pain free to increasing functionality; (4) relaxation training includes diaphragmatic breathing and progressive muscle relaxation to decrease suffering associated with emotions such as anxiety and anger; (5) desensitization addresses avoidance, in conjunction with relaxation training and cognitive

restructuration, to engage in gradually more activities previously avoided; (6) attention diversion consists of distraction strategies (eg, hobbies, music, imagination); (7) behavioral activation focuses on engaging in mastery and pleasurable activities; and finally (8) activity pacing, a key skill to learn for successful energy management.[8] Hand therapists who wish more information about CBT are referred to an excellent article published in JHT in 2011.[8] According to a 2012 Cochrane review, CBT has small-to-moderate positive effects on pain severity, disability, mood, and catastrophizing thoughts when compared to treatment as usual or waiting list, and small positive effects on disability and pain catastrophizing when compared to other active treatments.[191] In hand therapy, the efficacy of a combination of CBT and relaxation strategies has been demonstrated in terms of pain intensity, pain catastrophizing, anxiety, depression, and posttraumatic stress disorder.[192] Multimodal CBT including relaxation, imagery, stress management, development of coping skills, education about disease and medication, and/or development of communication skills seems to be effective in the management of rheumatoid arthritis and osteoarthritis for pain, disability, and/or psychological status.[193,194]

Mindfulness skills training. Originating from Buddhism, mindfulness skills training (MST) includes an awareness of external and internal experiences such as sensations (eg, pain), negative feelings, or difficult thoughts and an acceptance of these experiences in a nonjudgmental way so that individuals are freed to engage in the present moment.[195-199] Pain patients who are "mindful" are aware of their pain, accept it, and utilize their cognitive and emotional resources for here-and-now activities, rather than struggling to erase all their pain through medication or lifestyle change.[200] The structure of MST entails 5 facets: (1) observing internal and external experience (eg, feelings, thoughts, sensations); (2) describing internal experiences; (3) acting with awareness, that is, being attentive to one's activities of the moment instead of acting on automatic pilot; (4) nonjudging (not criticizing) one's inner experience; and (5) nonreacting to one's inner experience.[201] There is growing evidence confirming the efficacy of MST on pain and physical function.[196,202-204]

Acceptance and commitment therapy. Acceptance and commitment therapy (ACT), developed by Hayes et al, is a behavioral therapy based on an empirical analysis of human cognition.[105,205-208] ACT's main objectives are to improve function and decrease pain interference of value-driven activities.[205] In contrast to CBT, ACT aims at accepting and being willing to experience pain rather than reducing it when the former effort is ineffective.[105,109,209] CBT focuses on changing the content of thoughts and reducing negative emotions, whereas ACT emphasizes changing awareness of and relationships to thoughts by recognizing their existence in order to resume value-driven activities that enrich life[205,208] even though these activities may induce (fear of) pain.[105] Efficacy of ACT among patients with various chronic pain conditions is well documented.[105,108,207-210]

Conclusion

Restoration of sensory and motor functions as well as alleviation of pain is at the core of hand therapy. However, pain management in this field continues to be largely guided by a biomedical approach that fails to recognize the abundance of scientific evidence supporting that pain is a multidimensional experience that involves not only a sensory component but also important affective and motivational aspects. Numerous psychological factors including patients' beliefs, cognitions, and emotions alter their pain experience and may impact on their outcomes. Acknowledging and addressing maladaptive reactions to pain and injury can help people get and stay well. How a person responds to pain has important implications on treatment choices. Decoding the biopsychosocial components of the patients' pain is thus essential for hand therapists. In other words, "Hand therapy touches not only hands, but hearts, minds, and livelihoods" (Bonnie Olivett, the *Nathalie Barr Lectureship* recipient in 1992).[211]

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