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The Role of Acceptance and Mindfulness in Pediatric Chronic Pain Outcomes

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The Role of Acceptance and Mindfulness in Pediatric Chronic Pain Outcomes

Abstract
Pediatric chronic pain prevalence rates are now reported between 20-40% (Abu-Afareh et al., 2010; Goodman & McGrath, 1991; Huguet & Miro, 2008; Perquin et al., 2000; Stanford, Chambers, Biesanz, & Chen, 2008). Researchers have found that children with chronic pain report significant functional disability, including significant disruptions at school and work, and psychological difficulties including depression (Kashikar-Zuck, Goldschneider, Powers, Vaught, & Hershey, 2001; Palermo, 2009). The primary objectives of the current dissertation were to describe acceptance of pain along with psychological and pain correlates in a clinical sample of youth with chronic pain and to examine acceptance of pain a moderator of pain-related disability. Fifty-five participants between the ages of 8-17 years ($M = 14.36, SD = 2.47$) and their parents were recruited from pediatric pain management, neurology, and gastrointestinal clinics at a children's hospital housed within a university medical center in the Pacific Northwest. The total child sample consisted of 41 females (74.5%) and 14 males (25.5%), who reported mean pain duration as 2.28 years ($SD = 2.44$). The most commonly reported ethnic groups were Caucasian ($n = 36, 65.5\%$) and Mixed Ethnicity ($n = 8, 14.5\%$). Participants completed online surveys, which included demographic information, pain characteristic information (i.e., pain intensity and frequency), the Pain Catastrophizing Scale – Child Version (PCS-C-C), the Child and Adolescent Mindfulness Measure (CAMM), the Chronic Pain Acceptance Questionnaire – Adolescent Version (CPAQ-A), the Child Activity Limitations Interview (CALI-21), and the Children's Depression Inventory (CDI). Results indicated that participants reported moderate to high levels of pain and 69% of participants reported daily pain. Correlational findings indicated a significant positive correlation between pain intensity and functional disability. Chronic pain acceptance ratings were positively correlated with general mindfulness ratings, but negatively correlated with depressive symptoms and pain catastrophizing. General mindfulness ratings were also negatively correlated with depressive symptoms and pain catastrophizing. Participants' depressive symptoms and pain catastrophizing were also positively correlated. Results of hierarchical regression models indicated that participants' typical pain intensity ratings were the strongest predictor of functional disability scores. It was hypothesized that chronic pain acceptance would uniquely and significantly predict functional disability. However, results indicated that while an overall model including pain intensity, child age, gender, and pain-specific acceptance was highly associated with functional disability scores, neither pain-specific acceptance nor general mindfulness scores uniquely predicted functional disability scores. Pain-specific acceptance did not moderate the relationship between depression and functional disability or between pain catastrophizing and functional disability. Although these results suggest that pain-specific acceptance and general mindfulness are not associated with functional disability within a pediatric chronic pain population, methodological issues within the current study suggest results should be interpreted with caution. Moreover, extant literature suggests that acceptance-based approaches are indeed effective in decreasing functional disability related to pediatric chronic pain.

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The Role of Acceptance and Mindfulness in Pediatric Chronic Pain Outcomes

by

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A dissertation submitted to the faculty of

Pacific University School of Professional Psychology

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Dissertation Chair: Susan T. Li, Ph.D.

Dissertation Reader: Anna C. Wilson, Ph.D.

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Abstract

Pediatric chronic pain prevalence rates are now reported between 20-40% (Abu-Afareh et al., 2010; Goodman & McGrath, 1991; Huguet & Miro, 2008; Perquin et al., 2000; Stanford, Chambers, Biesanz, & Chen, 2008). Researchers have found that children with chronic pain report significant functional disability, including significant disruptions at school and work, and psychological difficulties including depression (Kashikar-Zuck, Goldschneider, Powers, Vaught, & Hershey, 2001; Palermo, 2009). The primary objectives of the current dissertation were to describe acceptance of pain along with psychological and pain correlates in a clinical sample of youth with chronic pain and to examine acceptance of pain a moderator of pain-related disability. Fifty-five participants between the ages of 8-17 years ($M = 14.36, SD = 2.47$) and their parents were recruited from pediatric pain management, neurology, and gastrointestinal clinics at a children’s hospital housed within a university medical center in the Pacific Northwest. The total child sample consisted of 41 females (74.5%) and 14 males (25.5%), who reported mean pain duration as 2.28 years ($SD = 2.44$). The most commonly reported ethnic groups were Caucasian ($n = 36, 65.5\%)$ and Mixed Ethnicity ($n = 8, 14.5\%)$. Participants completed online surveys, which included demographic information, pain characteristic information (i.e., pain intensity and frequency), the Pain Catastrophizing Scale – Child Version (PCS-C-C), the Child and Adolescent Mindfulness Measure (CAMM), the Chronic Pain Acceptance Questionnaire – Adolescent Version (CPAQ-A), the Child Activity Limitations Interview (CALI-21), and the Children’s Depression Inventory (CDI). Results indicated that participants reported moderate to high levels of pain and 69% of participants reported daily pain. Correlational findings indicated a significant positive correlation between pain intensity and functional disability. Chronic pain acceptance ratings were positively correlated with general mindfulness ratings, but negatively
correlated with depressive symptoms and pain catastrophizing. General mindfulness ratings were also negatively correlated with depressive symptoms and pain catastrophizing. Participants’ depressive symptoms and pain catastrophizing were also positively correlated. Results of hierarchical regression models indicated that participants’ typical pain intensity ratings were the strongest predictor of functional disability scores. It was hypothesized that chronic pain acceptance would uniquely and significantly predict functional disability. However, results indicated that while an overall model including pain intensity, child age, gender, and pain-specific acceptance was highly associated with functional disability scores, neither pain-specific acceptance nor general mindfulness scores uniquely predicted functional disability scores. Pain-specific acceptance did not moderate the relationship between depression and functional disability or between pain catastrophizing and functional disability. Although these results suggest that pain-specific acceptance and general mindfulness are not associated with functional disability within a pediatric chronic pain population, methodological issues within the current study suggest results should be interpreted with caution. Moreover, extant literature suggests that acceptance-based approaches are indeed effective in decreasing functional disability related to pediatric chronic pain.

**Keywords:** pediatric chronic pain, acceptance, mindfulness, disability
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Chapter 1: Introduction

Pediatric chronic pain has been established as a common chronic condition in children, with estimated prevalence rates ranging from 20-40% (Abu-Arafeh, Razak, Sivaraman, & Graham, 2010; Goodman & McGrath, 1991; Huguet & Miro, 2008; Perquin et al., 2000; Stanford, Chambers, Biesanz, & Chen, 2008). With increased awareness of this condition, research in the area of pediatric chronic pain has correspondingly increased over the past few decades. Perhaps following trends in adult literature, there has also been a recent increase in literature related to the development and utilization of mindfulness- and acceptance-based therapies with children and adolescents suffering from chronic pain syndromes (Burke, 2010; Feinstein et al., 2011; Thompson & Gauntlett-Gilbert, 2008; Wicksell et al., 2009). While sharing some commonalities with traditional cognitive behavioral approaches to chronic pain treatment, acceptance- and mindfulness-based treatments set themselves apart from cognitive behavioral therapies (CBT) through their emphasis on exposure to internal experiences that are typically avoided by chronic pain patients. Cognitive behavioral therapies tend to use techniques such as distraction, cognitive-restructuring, progressive muscle relaxation, guided imagery, psychoeducation, and positive reinforcement of healthy behaviors in order to provide alleviation of suffering associated with pain (Chambers, Holly, & Eakins, 2004; Eccelston, 2001). Acceptance-based approaches, however, focus less on pain reduction and more on exposure to internal experiences, even when these experiences are aversive (e.g., pain), and attempt to encourage pain patients to approach their pain and other experiences in a nonjudgmental and accepting way (Bishop et al., 2004; Hayes et al., 1999). Although CBT approaches have been established as well-supported treatments for pediatric chronic pain (Chambers, Holly & Eakins, 2004), research on acceptance- and mindfulness-based therapies with this population is still in its
infancy. Thus, it is important to consider how skills taught in such therapies (i.e., those that promote the increase of acceptance and mindfulness levels) might be associated with children’s psychological and overall functioning. It is also important to examine acceptance and mindfulness both within the context of treatment and in general (i.e., how they influence treatment outcomes and general functioning).

The current study will explore the role of pain acceptance and general mindfulness in the experience of children and adolescents with chronic pain, as well as their relationship to known covariates of pain and various pain characteristics. This information will add to the current literature by clarifying the relationships between these variables and addressing how they potentially interact with one another and how they may ultimately impact the experience of children with chronic pain. Further, this study attempts to provide a rationale for the use of acceptance- and mindfulness-based therapies with pediatric chronic pain patients. The current study provides information relevant to a variety of pediatric chronic pain populations (i.e., headache, recurrent stomachache, musculoskeletal pain), and not just to one subgroup of pain patients. This information will be valuable to researchers, clinicians, and those who develop treatment protocols for this population.

**Literature Review**

The International Association for the Study of Pain (IASP) has defined the term *pain* as “an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage” (Merskey & Bogduk, 1994, p.210). Because there are different subtypes of pain experiences, it is important to distinguish between these subtypes in order to better understand the phenomenon of chronic pain. The first pain subtype that will be discussed is acute pain. Acute pain is “produced by a well-defined noxious or tissue-
damaging stimulus” (McGrath, 1990, p.12). Acute pain has a fairly short duration and can act as a warning signal to individuals that something is wrong. Children experience different episodes of acute pain on a daily basis in the form of everyday bumps and scrapes (Fearon, McGrath, & Achat, 1996). Children also experience acute pain caused by invasive medical or dental procedures (McGrath, 1990). Children may also experience acute pain episodes during more severe injuries (e.g., broken bones) and illnesses that induce pain (e.g., stomach flu). These categories of acute pain experiences vary significantly, not only in the way in which they are produced, but also in the emotional and situational variables attached to their production. For example, children may perceive pain associated with everyday bumps and bruises as the inevitable result of play (McGrath, 1990), and therefore view it as less threatening or anxiety-provoking. However, pain associated with medical or dental treatments may invoke feelings of fear due to perceived lack of control or uncertainty regarding the procedures themselves (McGrath, 1990). This fear and anxiety can, in turn, result in increased levels of pain and increased fear and anxiety during subsequent procedures. Professionals see acute pain in a variety of clinical situations, but the most common form is postoperative pain (Schug & Watson, 2002).

In addition to acute pain, children can also experience recurrent or chronic pain. Because the definition of chronic pain often varies depending on the theoretical orientation from which one operates, there is no universally accepted definition (Novy, Nelson, Francis, & Turk, 1995). The IASP defines chronic pain as pain without apparent biological value that has persisted beyond the normal tissue healing time, which is typically taken to be 3 months (Merskey & Bogduk, 1994). Other researchers have defined chronic pain as pain that “has persisted for a month beyond the usual course of an acute illness or a reasonable duration for an injury to heal,
pain that is related to a chronic pathological process, and pain that recurs at intervals for an extended time” (Cheville, Caraceni, & Portenoy, 2000, p.3). Researchers and professionals often operationalize this recurrence to be at least once per week. Importantly, chronic pain is distinguishable from acute pain not only in terms of duration, but also because of the body’s inability to “restore its physiological functions to normal homeostatic levels” (Loeser & Melzack, 1999, p.1609, as cited in Cheville, Caraceni, & Portenoy, 2000), meaning that chronic pain may have long-lasting effects on a child’s physiological functions, despite the lack of an observable source of painful stimuli.

Some researchers argue that while acute pain is legitimately classified as a symptom of injury or disease, chronic pain should be viewed as a disease in its own right (Niv & Devor, 2004). Patients who suffer an initial episode of tissue damage or disease tend to experience continued or chronic pain due to secondary changes within the pain detection system and within one’s psychosocial functioning. Thus, chronic pain is the result of different physiological mechanisms than acute pain and it often triggers the development of a complex array of physical and psychosocial changes that significantly impact an individual’s functioning (Niv & Devor, 2004). Niv and Devor (2004) provide further support for the conceptualization of chronic pain as a disease by focusing on the definition of the word “disease” itself: “Oxford English dictionary defines ‘disease’ as a bodily condition in which functions are disturbed or deranged…surely an apt description of chronic pain” (p.179). Thus it appears that chronic pain differs from acute pain in several domains including, duration, homeostatic processes, and physiological impact. These differences are also highlighted in how we currently understand pain experiences and perception. Similar to debates regarding the definition of chronic pain, the mechanisms underlying pain sensation and perception have also been debated for centuries. The following section briefly
outlines the evolution of pain theories over time and outlines current views on pain sensation and perception.

**Pain Theories**

Historically, pain was viewed as either a purely physiological/sensory phenomenon or a purely psychological one (Turk & Rudy, 1986). For example, while the early philosopher Aristotle conceptualized pain as an emotional experience, Rene Descartes viewed pain as a strictly sensory experience that was directly proportional to the amount of physical damage (as cited in Turk & Rudy, 1986). This Cartesian view is represented through a theory of pain that persisted throughout many centuries: the specificity theory. The *specificity theory* proposes that a specific pain system transmits messages from pain receptors in the skin to a pain center housed within the brain (as cited in Melzack & Wall, 1983). Maximillian von Frey further developed this theory by proposing the existence of four major cutaneous modalities: touch, warmth, cold, and pain. Von Frey postulated that each modality has its own corresponding projection system to a brain center specifically responsible for that sensation. There is a psychological assumption inherent in von Frey’s theory that suggests a direct connection from pain receptors in the skin to a brain center where only pain is perceived. However, empirical evidence has failed to support a direct relationship between intensity of a stimulus and pain perception (Melzack & Wall, 1983). Later, pattern theory was developed as a reaction against the direct connection assumption in specificity theory. *Pattern theory* holds that the most important determinants of pain are stimulus intensity and central summation (Melzack & Wall, 1983). According to this theory, pain is a result of the summation of skin sensory input at the dorsal horn cells. Persistent pain, as found in pathological pain states, is the result of abnormally long summation time periods.
The inability of surgical and pharmacological treatments to completely ameliorate pain, and individual differences in pain experience, has lead to a reexamination of both specificity theory and pattern theory (Turk & Rudy, 1986). Cartesian dualism dominated thought on pain experience for centuries; however, in the 1960’s, Melzack and colleagues developed Gate Control Theory to account for many of the psychological factors that the dualistic theories could not explain (Poole, Matheson, & Cox, 2005). Melzack and Wall (1965) developed this new model of pain based on clinical observations and pain-related research (as cited in Poole, Matheson, & Cox, 2005). Gate Control Theory emphasized the vital role of both the central and peripheral nervous systems in reports of pain (Turk & Rudy, 1986). Melzack and colleagues suggested that pain sensation occurs when sensory stimuli interact with both cognitive and affective factors. This interaction determines how an individual experiences pain. Gate Control Theory proposes that the flow of nerve impulses from peripheral fibers to the central nervous system can be increased or decreased through a neural mechanism in the dorsal horns of the spinal cord (i.e., the “gate”; Melzack & Wall, 1983). The degree to which this gate influences pain experience is largely influenced by the brain. When the amount of information passing through the gate exceeds a critical threshold, neural areas responsible for pain perception are activated. Although physiological aspects of Gate Control Theory have subsequently been challenged, its emphasis on pain experience as a perceptual, and not just sensory phenomenon has received considerable support within the healthcare field (Turk et al., 1983, as cited in Turk & Rudy, 1986). Although Gate Control Theory improved upon the dualistic pain theories of the time, a number of complex variables were not addressed by this model. Today, pain is viewed as a multidimensional construct that is influenced by affective, sensory, and cognitive variables, and is often conceptualized within a biopsychosocial model (Bush & DeLuca, 2001).
Biopsychosocial Model of Pain

Merskey and Bogduk’s (1994) definition of pain as an unpleasant sensory and emotional experience associated with actual or potential tissue damage highlights the subjective nature of pain through its emphasis on the dual nature of pain as both a physiological event and a psychological experience (Cheville, Caraceni, & Portenoy, 2000). A number of variables, including personality, learning experiences, expectations, and previous pain experiences, impact the way children and adults experience and respond to pain from the same stimulus (McGrath, 1990). Children’s understanding and descriptions of pain also vary significantly based on their age and cognitive level. Therefore, children tend to judge the intensity of their pain in relation to other painful experiences they have had in the past (McGrath, 1990). Based on this information, researchers and clinicians now emphasize the importance of considering a biopsychosocial model of pain assessment and treatment (e.g., Bush & DeLuca, 2001). A biopsychosocial approach acknowledges and emphasizes the “mutually influencing relationships among biological, psychological, individual, family, and community factors in the onset, maintenance, and experience of illness and its impact” (Zeltzer, Tsao, Bursch, & Myers, 2006, p.662), thus emphasizing the sensory, affective, and cognitive components of pain. Pain sensation is thought to depend largely on the meaning attributed to pain, as well as any expectations held by an individual regarding its controllability and likelihood of being able to cope with it (Bush & DeLuca, 2001). Lipani and Walker (2006) examined pain appraisal in children with chronic or recurrent abdominal pain and found that family disruption significantly influenced the extent to which child participants perceived their abdominal pain as threatening, and the extent to which they perceived themselves as unable to cope with the pain (as cited in Zeltzer et al., 2006). Furthermore, Vervoort and colleagues determined that pain catastrophizing, a tendency to focus
on and magnify threat value of pain, significantly accounted for pain characteristics beyond the effects of age, sex, and negative affect (Vervoort, Goubert, Eccleston, Bijttebier, & Crombez, 2006). These findings, among many others in recent research studies, support the use of a biopsychosocial approach to the conceptualization, assessment, and treatment of pain syndromes in children and adolescents.

**Biobehavioral Model of Pediatric Pain.** Varni et al. (1996) created a conceptual framework specific to pediatric pain based on the aforementioned biopsychosocial approach (see Figure 1). This model, the Biobehavioral Model of Pediatric Pain, hypothesizes that a number of factors influence the perception of pain and functional status outcomes in children with chronic pain. The model includes precipitants, intervening variables, functional status, and pain behaviors. These factors all interact with, and mutually influence one another. Precipitants include organic disease, physical injury, psychological stress, and invasive medical procedures. Intervening variables can include biological predispositions, family characteristics, cognitive appraisals, and coping strategies. Functional status outcomes include activities of daily living, school attendance, and depressive symptoms, among other variables. This biobehavioral view implies that various trait and state characteristics of a child can impact his or her experience of pain, thus supporting the exploration of various child characteristics and how they can impact pediatric pain syndromes. This multidimensional model also provides the framework from which this study is conducted. Specifically, I will attempt to clarify the relationship between various intervening variables (e.g., pain catastrophizing, pain acceptance, and overall mindfulness and acceptance), and examine how these intervening variables are associated with functional status outcomes (e.g., functional disability and depression).
Epidemiology of Chronic Pain in Children.

Although the etiology of chronic pain syndromes varies individually and is often unexplained, epidemiological studies suggest that pain is a common childhood problem. Although extensive literature exists regarding the prevalence of pain experiences in adults, there is far less information on the epidemiology of pain in children and adolescents (Perquin et al., 2000). Chronic pain among children and adolescents appears to be a much more common phenomenon than originally presumed by health care professionals; recent studies have indicated that pediatric chronic pain affects approximately 25% of all children (Stanford et al., 2008), with higher rates found in some geographical areas. For example, in a study of pain prevalence in
Dutch children ages 0-18, researchers found that 53.7% of participants reported a pain experience (either acute or chronic) in the previous 3 months (Perquin et al., 2000). A similar study in Spain revealed that 37.3% of 561 school-aged children reported having chronic pain (Huguet & Miro, 2008). Among these youth, one third reported pain in multiple areas, with lower limb pain, headache, and abdominal pain as the most commonly reported areas of pain experienced. However, it is important to note that these differences in reported rates may be the result of methodological differences between studies (such as variation in age), rather than actual differences in prevalence rates. Most pediatric pain research has focused on specific pain conditions (e.g., headache, recurrent abdominal pain) and many studies thus far have used restricted age groups with limited information on pain characteristics other than the presence of pain (e.g., frequency, duration, intensity; Perquin et al., 2000).

**Intervening Psychological Variables**

Research has found that the impact of pain on a child is not simply a function of pain frequency or intensity, but is dependent on a number of intervening variables that directly impact how a child perceives and reacts to pain (Varni et al., 1996). Although a number of intervening variables exist (i.e., psychosocial variables at the individual, parent, or family level) the following section focuses on intervening child psychological variables that influence the perception of pain, such as pain catastrophizing, acceptance, and mindfulness, as these are the intervening variables that will be the focus of this study.

**Pain Catastrophizing.** Pain catastrophizing has been conceptualized as an excessively negative “mental set” that is activated during actual or anticipated pain experiences (Sullivan et al., 2001). It has also been more specifically defined as “an exaggerated negative orientation toward actual and anticipated painful stimuli” (Vervoort et al., 2010, p.90). Development of the
Pain Catastrophizing Scale (PCS-C; Sullivan Bishop, & Pivik, 1995) yielded three factors that appear to make up the construct of pain catastrophizing: magnification, rumination, and helplessness. These factors have been subsequently replicated in further research as well (Sullvian, Bishop, & Puvik, 1995). As a result of growing research on this topic, pain catastrophizing has been described by some as one of the most important psychological predictors of pain experience, as increased catastrophizing is consistently found to be associated with heightened pain experience (Sullivan et al., 2001). Researchers have discovered these associations within various patient groups, including those experiencing chronic lower back pain, rheumatoid arthritis, and dental procedures (Sullivan et al., 2001).

Research has also indicated that pain catastrophizing is associated with illness behaviors (behaviors that reflect help-seeking or heightened preoccupation with symptom management; Sullivan et al., 2001). Some of these behaviors include increased frequency and duration of hospital stays, increased use of analgesics and over-the-counter medication, and more frequent visits to health care professionals (Gil et al., 1993). Even upon first glance, is it evident that such excessive help-seeking behaviors would not only decrease an individual’s ability to function normally, but would also place an increased burden on one’s family and the entire healthcare system.

Moreover, in a study of school-aged children, Vervoort and colleagues (2010) found that when pain level was low at the initial evaluation, children’s baseline level of pain catastrophizing had a significant and unique contribution to the prediction of pain and disability level at 6-month follow-up. These researchers also found that variability in pain and disability complaints could not be explained by trait anxiety, suggesting that catastrophic thinking may arise as a function of trait anxiety, but is in fact a distinct construct beyond that of overall predispositional anxiety.
These researchers hypothesized that pain catastrophizing may impact perceptions of pain intensity and subsequent disability through processes related to threat vigilance. More specifically, pain catastrophizing leads to hypervigilance to pain stimuli, and individuals who catastrophize may be attentionally biased towards pain or pain-related information (Crombez, Van Damme, & Eccleston, 2005). Previous researchers have found that the threat of pain alone is enough to decrease pain coping efficacy and to interfere with daily functioning by eliciting pain-avoidance behaviors (Crombez et al., 1999).

It is well established in the pain literature that the function of pain is to “demand attention, interrupt current activity, and generally interfere with a range of cognitive processes” (Van Damme, Crombez, & Eccleston, 2004, p.70). Thus, pain is an adaptive function that interrupts what we are currently doing or thinking and provides us with a signal that something is wrong. However, researchers have found that catastrophic thinking about pain increases the attentional demand of pain, perhaps to a level that is more damaging than helpful. This increased attentional demand of pain causes difficulty in disengagement from pain-related thoughts and behaviors, and decreased likelihood of engagement in everyday activities and positive functioning (Van Damme, Crombez, & Eccleston, 2004). Compas and Boyer (2001) suggest in their cognitive-affective model of pain, that children who focus their attention on pain not only experience heightened perceptions of pain, but also possess fewer attentional resources to engage in other, more adaptive coping strategies. Pain-related “negative sets” may be more quickly activated and may contain excessively pessimistic and negative thoughts in individuals who catastrophize. This may result in a pattern of increased avoidant behaviors, worry, and anxiety related to pain (Van Damme et al., 2004), which may, in turn, increase the focus on pain, and lead to a self-perpetuating cycle of chronic pain and disability (Boyer et al., 2006). Therefore these
researchers, amongst others in the chronic pain field, suggest that using exposure techniques that disconfirm highly pessimistic or negative beliefs regarding pain may be most effective with pain catastrophizers. Moreover, they also endorse treatment techniques that teach chronic pain patients to regulate their attention and reengage with positive and changeable aspects of themselves and their environment. These recommendations lead us to a fairly new, yet increasingly supported treatment modality in the area of pediatric chronic pain: acceptance and mindfulness-based interventions. These interventions are designed to address the intervening variables of pain catastrophizing by focusing on a competing response (i.e., exposure rather than avoidance). Acceptance and mindfulness may be viewed as intervening variables that teach children an alternative way to view their pain experiences and perhaps enhance their adaptive functioning. The next section reviews the constructs of both acceptance and mindfulness and how these variables are viewed within the context of psychological treatment.

**Acceptance and Mindfulness.** Over the past few decades, with increased research in the field of pediatric pain, there has also been an upsurge in interest and research related to the development and utilization of acceptance and mindfulness-based interventions for the treatment of chronic pain in pediatric populations (Burke, 2010; Feinstein et al., 2011; Masuda, et al., 2011; Thompson & Gauntlett-Gilbert, 2008; Wicksell et al., 2009). Thus it is imperative that the scientific and clinical community gains a full understanding of how the constructs of mindfulness and acceptance work in the context of pain, and how they are associated with pain experiences.

Mindfulness, although well-studied over the past few decades, does not appear to have a universal definition. At its most basic level, it is defined as “moment-by-moment awareness” (Germer, 2005). Other definitions include a focus on attentional control, as well as a cognitive
process during which one creates new categories, is open to new information, and develops awareness of more than one perspective (Langer, 1989, as cited in Germer, 2005). Jon Kabat-Zinn, who has been credited by many with bringing mindfulness practice to the Western world, defines mindfulness as, “…paying attention in a particular way: on purpose, in the present moment, and nonjudgmentally” (Kabat-Zinn, 1994. p.4). Kabat-Zinn’s program, Mindfulness-Based Stress Reduction, teaches clients to foster a decentered relationship to cognitive contents by taking a wider perspective. When considered within a therapeutic context, its definition often highlights nonjudgment as a critical aspect; by refraining from judging our experiences, we are more likely to view those experiences as they truly are (Germer, 2005). Mindfulness-based treatments have been found be effective and efficacious for a variety of psychological and medical disorders, including depression, generalized anxiety disorder, chronic pain, borderline personality disorder, and psychotic symptoms (Roemer & Orsillo, 2009). However, the majority of mindfulness research to date has been conducted with adults, and is therefore difficult to generalize to children and adolescents. In a randomized control trial of Mindfulness-Based Cognitive Therapy (MBCT) for children with academic, behavioral, and attentional difficulties, Semple and colleagues found that children ages 9-13 who participated in their MBCT group therapy protocol demonstrated fewer attention problems, behavior problems, and anxiety symptoms at the end of treatment and at a 3-month follow-up (Semple, Lee, Rosa, & Miller, 2010). This study suggests that mindfulness is not only helpful in treating these difficulties, but is also a feasible treatment option for children as young as 9 years old. Additionally, a review of literature related to the use of mindfulness practices with children found 44 studies with preschool age children, further supporting the feasibility of this type of training with even very young children (Burke, 2010). Though continued replication of results is required, preliminary
results in mindfulness-based treatments for children are indeed promising (see Burke, 2010; Flook et al., 2010).

Perhaps the most integral part of mindfulness training is its emphasis on nonjudgment. An extension of the nonjudgment aspect of mindfulness is referred to as acceptance, or “a willingness to let things be just as they are the moment we become aware of them – accepting pleasurable and painful experiences as they arise” (Germer, 2005, p.7). Acceptance-based therapies help patients identify personal values and encourage them to engage in activities that are in accordance with these values. They emphasize exposure to private experiences they typically avoid (e.g., pain, distress), in the service of engaging in activities they value, even when their private internal experiences cannot be controlled or alleviated. They encourage clients to feel all emotions and bodily sensations fully and without avoidance (e.g., Hayes et al., 1999; Wicksell, Melin, Lekander, & Olsson, 2009). These interventions also teach defusion techniques (distancing oneself from one’s thoughts) and mindfulness strategies as methods for enhancing acceptance of experiences that cannot be changed and eliciting valued action (see Hayes, Strosahl, & Wilson, 1999). In other words, acceptance-based approaches attempt to change the function of private thoughts and events, rather than change their form or frequency (Hayes et al., 1999). They emphasize exposure to previously avoided private experiences (i.e., pain), and teach patients to be more mindful of their experiences in a nonjudgmental and open way (Wicksell, 2007). Furthermore, they promote the acceptance of negative reactions, such as bodily sensations and emotions that cannot be directly changed (Wicksell et al., 2009).

More specifically, pain acceptance (i.e., pain-specific acceptance) is defined by researchers as an openness or willingness to experience pain and to pursue valued goals and activities despite having pain (Kratz, Davis, & Zautra, 2007). Thus, in the context of pain,
defusion techniques help one distance oneself from thoughts related to pain or painful experiences when the patient has become overly enmeshed with his or her thoughts. Instead of trying to restructure the thoughts or eliminate them, as is common in more traditional CBT approaches (e.g., Beck, 2011), acceptance-based approaches attempt to decrease the validity of one’s thoughts. Some researchers argue that because chronic pain is largely perceived as uncontrollable, using treatment methods that attempt to control pain symptoms may result in persistent and unsuccessful attempts to manage one’s pain. For example, researchers suggest that if patients are continually motivated to escape or avoid their pain, they may remain preoccupied with pain-related information and subsequently pay more attention to pain (Viane, Crombez, Eccleston, Devulder, & De Corte, 2004). Research studies in recent years appear to support these claims. For example, a study conducted with Swedish children with a long-standing history of idiopathic pain, found that Acceptance and Commitment Therapy (ACT; Hayes, 1999), an acceptance-based treatment protocol, was significantly more effective than a comparison multidisciplinary treatment approach at reducing perceived functional disability in relation to pain, fear of re-injury, pain intensity, and general pain-related discomfort (Wicksell et al., 2009). Preliminary research has also found that exposure and acceptance-based treatments resulted in significant and stable decreases in disability, pain interference, intensity, and pain catastrophizing (Wicksell, Melin, & Olsson, 2007). Furthermore, acceptance strategies have also been found to increase pain tolerance in acute experimental pain studies (Masedo & Esteve, 2007), further suggesting that acceptance plays a crucial role in how pain is experienced by individuals. Interestingly, pain acceptance has also been found to moderate the relationship between pain and negative affect in adult female osteoarthritis and fibromyalgia patients (Kratz et al., 2007). Similarly, regression analyses in a study with adolescents suffering from cystic
fibrosis found that acceptance had a significant and unique contribution in explaining anxiety, disability, and depression, beyond the effects of disease severity or demographic information (Casier et al., 2008). However, it is currently unclear whether these results would generalize to other pediatric chronic pain populations.

Research conducted on mindfulness and acceptance within pediatric populations thus far has offered promising results; however, the relationship between the constructs of acceptance and mindfulness and other intervening variables (e.g., pain catastrophizing) is still unclear. While researchers have begun to examine the impact of chronic pain on everyday functioning, it also has become important to consider how various intervening variables can impact a child’s functional status outcomes. The following section provides information related to the impact that pediatric chronic pain has on a child’s social, emotional, academic, and family functioning.

**Functional Status Outcomes**

**Functional Disability.** Given the high prevalence rates of children and adolescents who suffer from chronic pain, it is important to consider how chronic pain impacts physical, social, emotional, and academic functioning. The World Health Organization’s International Classification of Impairments, Disabilities, and Handicaps (1980) holds that there are four levels of disease experience: (a) the underlying disease or disorder; (b) impairment (e.g., pain symptoms); (c) disability (e.g., inability to perform activities because of the disorder); and (d) handicap (e.g., restrictions in social roles). This model emphasizes the multiple factors that impact disability in any particular group and the importance of understanding the various ways in which a disorder can impact a person’s everyday life. This framework can also be used to understand and elucidate the effects of pain on functioning for youth with chronic pain.
Functional impairment, or functional disability, has been defined by previous researchers as “difficulty in performing age-appropriate activities in daily life” (Palermo, Lewandowski, Long, & Burant, 2008, p. 645). For school-aged children and teenagers, this may include an inability to attend school, participate in extracurricular activities, spend time with friends and family members, and even perform day-to-day self-care activities. Functional disability in children with chronic pain is typically measured through both parent-report and self-report measures; these measures, such as the Child Activity Limitations Inventory (CALI-21; Palermo et al., 2008) often list a number of daily activities that are then rated by parents and children in degree of frequency of problems and/or difficulty. Factor analyses of the CALI-21 revealed a two-factor model that can be used to evaluate limitations in both Active and Routine domains (Palermo et al., 2008). Although level of functional impairment varies considerably amongst children with chronic pain syndromes, a number of research studies have found that pediatric chronic pain often results in reduced ability to perform daily activities, disruptions in work-, and school-related activities, and difficulties in psychological functioning (e.g., Kashikar-Zuck, Goldschneider, Powers, Vaught, & Hershey, 2001; Lewandowski et al., 2010; Palermo, 2009). Researchers interested in the effects of pain states and their impact on daily living found that more than two-thirds of children and adolescents living with chronic pain perceived their pain to cause the following functional difficulties: sleep problems, inability to pursue hobbies, eating difficulties, school absences, and inability to meet their friends (Cohen, Vowles, & Eccleston, 2010; Roth-Isigkeit, Thyen, Stöven, Schwarzenberger, & Schmucker, 2005). Although common themes regarding functional disability emerged in this study, prevalence of daily activity restriction also varied amongst children and adolescents with different pain locations; 51.1% of children and adolescents with abdominal pain, 43% of those with headache, and 19.4% of those
with back pain reported being absent from school because of their pain. Functional restrictions were also more common among girls than boys of the same age, with the exception of children between the ages of 4 and 9 years, where restrictions were generally equal between genders.

Qualitative analyses of semi-structured interviews with children between the ages of 10 and 17 years, who suffer from chronic pain also revealed similar functional disability themes (Meldrum, Tsao, & Zeltzer, 2009). Analyses revealed that children often described hiding their pain from parents and friends, perceiving pain as an obstacle to personal activities and goals, experiencing a sense of isolation from peers, and having growing fears regarding how pain will affect their future. When participants were asked how their pain made them feel, a number of emotions were described; however, the authors of this study note that the most commonly expressed emotion was frustration because their pain prevented them from engaging in activities they loved and from achieving goals that were important to them (Meldrum et al., 2009).

An examination of social development and disability in adolescents with at least a 4-year history of chronic pain revealed high levels of disability in 90% of the sample (Eccleston, Wastell, Cromcez, & Jordan, 2008). More than half of these adolescents judged themselves as behind their peers in four or more domains of adolescent social development, with the most common developmental lag in school progress and development. These authors argue that chronic pain appears to have a direct role in reducing opportunities for social exposure and normative developmental experiences (e.g., school and peer-group involvement), while simultaneously increasing a child’s dependence on parents and others within the home. These circumstances seemingly contribute to an adolescent’s perceptions of lower social development and may cause an adolescent with chronic pain to feel unable to undertake potentially daunting
tasks of higher education study, employment, or moving away from their family home
(Eccleston et al., 2008).

Further, absenteeism from school not only results in decreased academic performance, but can also have long-lasting effects regarding a child’s social and personal development. This is especially concerning given the high rate of school absences amongst children and adolescents with chronic pain. One study found that in a sample of 220 of children with a history of pain symptoms in the absence of a clear organic etiology, nearly half of the participants missed at least 25% of school days, with some missing significantly more (Logan, Simons, Stein, & Chastain, 2008). This study also found that school absence differed as a function of pain location; adolescents with functional abdominal pain missed more school days compared to those with other pain complaints, such as neuropathic pain.

Psychological Functioning

When considering the many ways in which chronic pain can adversely affect a child’s family, school, and social functioning, it is no wonder that children who suffer from chronic pain often report significant difficulties with psychological functioning as well. These psychological difficulties often take the form of depression, anxiety, and low self-esteem among other difficulties. Perhaps the most studied psychological outcome in this population, as well as the one of interest for this study, is depression. In addition to overall functional disability, depression has been shown to be a common outcome for children with pediatric chronic pain. Research has demonstrated that children with chronic pain syndromes consistently report that they experience more stress and feel more depressive symptoms than do children who do not have chronic pain (Palermo, 2009). For example, after controlling for patient demographic and medical variables, researchers found that in a sample of 160 pediatric pain patients, higher pain intensity ratings
were significantly associated with higher depressive symptoms, as well as higher anxiety, internalizing and externalizing behavior problems, and lower self-esteem (Varni et al., 1996). However, Bennett (1994) notes that children with chronic illnesses appear to be more vulnerable to internalizing problems than externalizing problems. Furthermore, Kashikar-Zuck and colleagues found that while most patients in their sample of 73 adolescents with chronic pain endorsed mild to moderate levels of depression, 15% of the patients in their sample reported severe levels of depression (Kashikar-Zuck et al., 2001). Furthermore, in the aforementioned study by Eccleston et al. (2008), 62% of children in their sample reported clinically elevated symptoms of depression. Bennett (1994) hypothesized that depressive symptoms may be commonly seen with chronic pediatric medical problems because of physical limitations as a result of the illness, high rates of school absence, decreased opportunities for socialization, increased dependence on others, and feelings of helplessness.

The high rates of depressive symptoms in pediatric chronic pain patients is especially alarming considering the exacerbating effect that depression can have on a child's functional disability. For example, Walters and Williamson (1999) found that symptoms of depression were directly related to the amount of activity restriction in children with various chronic and recurrent pain syndromes. Similarly, children with other chronic illnesses, such as cancer, have been found to have more depressive symptoms when they also have significant restrictions in their daily activity (Bennett, 1994). Researchers have also determined that other child variables, such as coping style and internal versus external locus of control, impact level of depressive symptoms. Previous research has determined that children who have pain difficulties tend to have better psychological adjustment to their pain when they have an active coping style and an internal locus of control (Thompson et al., 1994). Alternatively, a maladaptive coping style that includes
catastrophizing about pain and behavioral disengagement, coupled with social isolation from peers, is positively correlated with depressive symptoms (Varni et al., 1996). It is important to note that these correlational studies do not provide a causal explanation, nor do they explore potential moderators of depression and functional disability. However, when considered within the framework of the biopsychosocial model discussed earlier, the relationship between these variables can be conceptualized as bidirectional and mutually influential (Bush & DeLuca, 2001).

The Current Study

As stated throughout this literature review, further research examining the association of various intervening psychological variables with the functional outcomes of pediatric chronic pain patients is needed in order to gain a fuller understanding of the impact of chronic pain on this population. This information has direct implications for how pediatric chronic pain is treated and for whom various treatment modalities are most appropriate. This study will also inform whether treatments focused on the development of pain-specific acceptance and general mindfulness skills are a worthwhile endeavor for healthcare professionals who work with these youth. Because previous research on pediatric chronic pain is often focused on specific pain populations, the current study was conducted through a general pain management clinic, in an attempt to gain information from children with a variety of chronic pain complaints (e.g., headache, stomachache, musculoskeletal pain). Participants were also recruited through Gastrointestinal and Neurology specialty clinics in order to obtain a larger sample size. Therefore it is hoped that this information will be generalizable to a range of pediatric chronic pain patients. The study focuses on youth between the ages of 8 and 17. This age range was chosen in order to capture the largest sample of children and adolescents suffering from chronic pain. The
following aims and hypotheses were used to guide the development of the protocol for the current study.

**Aims and Hypotheses**

**Aim 1:** Examine predictors of functional disability in youth ages 8-17 with chronic pain.

*Hypothesis 1:* Individual child demographic and pain characteristics (i.e., older age, female gender, and higher pain intensity) will predict higher levels of functional disability, as measured by the Child Activity Limitations Interview (CALI-21; Palermo et al., 2008).

*Hypothesis 2:* Pain-specific acceptance, as measured by the Chronic Pain Acceptance Questionnaire – Adolescent version (CPAQ-A; McCracken, Gauntlett-Gilbert, & Eccleston, 2010) will have a unique and significant contribution in predicting functional disability, beyond the effects of known covariates, such that higher pain-specific acceptance will be associated with lower functional disability.

**Aim 2:** Explore correlates of pain-specific acceptance and general mindfulness in youth with chronic pain.

*Hypothesis 3:* Pain-specific acceptance will be more highly associated with functional disability scores than general mindfulness, as measured by the Child and Adolescent Mindfulness Measure (CAMM; Greco, Baer, & Smith, 2011), such that higher pain-specific acceptance will be more highly correlated with lower functional disability than general mindfulness.

**Aim 3:** Test a model in which pain-specific acceptance moderates associations between psychological factors and functional disability in adolescents with chronic pain.
Hypothesis 4: Depressive symptoms, as measured by the Children’s Depression Inventory (CDI; Kovacs & Beck, 1977), and Pain Catastrophizing, as measured by the Pain Catastrophizing Scale (PCS-C; Sullivan, Bishop, & Pivik, 1995) will both be positive correlated with level of functional disability, as measured by the Child Activity Limitations Interview (CALI-21).

Hypothesis 5: The relationship between depressive symptoms and functional disability will be moderated by level of pain-specific acceptance, such that children who are high in depressive symptoms and low in pain-specific acceptance will have the highest functional disability.

Hypothesis 6: The relationship between pain catastrophizing and functional disability will be moderated by level of pain-specific acceptance, such that children who are high in pain catastrophizing and low in pain-specific acceptance will have the highest functional disability.

Method

The following methods were employed to address the hypotheses above.

Participants

Participants in this study were recruited from the Pediatric Pain Management, Neurology, and Gastrointestinal Clinics at a children’s hospital in the Pacific Northwest. Inclusion criteria were as follows: participants were between the ages of 8-17 years, currently suffering from a chronic pain syndrome, and fluent enough in English to comprehend and sign the informed consent forms, as well as complete study measures that were solicited for participation. Participants were also required to have a parent or other legal guardian, who was also fluent enough in English to understand and sign the informed consent form, and complete a set of
questionnaires in order to be eligible to participate. Participants were not excluded based on comorbid diagnoses, etiology of pain syndrome, or level of treatment participation.

**Design and Procedure**

This study was reviewed and approved by the Institutional Review Boards (IRB) at Oregon Health and Science University (OHSU) and Pacific University. Research participants were recruited through a Pediatric Pain Management clinic during initial intake appointments for new patients and regular therapy sessions with returning patients. Potential participants from all three clinics were also contacted via telephone and US mail to inform them about the study and to invite them to participate. A HIPAA waiver form was also approved by the host site IRB, in order to allow for patient telephone contact. Those individuals who fit the inclusion criteria and who were interested in participating in the study were provided with a hard copy of both parent and child questionnaires, or provided with an electronic link to a secured, online version of both questionnaires. Participants were provided with participant identification numbers in an effort to maintain confidentiality when completing surveys. The parent survey took approximately 10 minutes to complete and the child survey took approximately 30-45 minutes to complete. Hard copies were available to participants; although, only online surveys were completed by participants in the current study. Online surveys were submitted online via a secure website hosted by the institution. Upon completion of the survey, youth received a $10 giftcard. The following section outlines measures used to gather information through the child and parent surveys.

**Measures**

**Pain Characteristics.** Both parents and youth reported basic demographics (i.e., age, gender) and various pain characteristics. Participants reported the location of their pain and rated
usual pain intensity and pain intensity when at its worst on a visual analog scale (VAS) that ranged from 0-100. Parents also rated their perception of their child’s pain intensity on a VAS from 0-100. The VAS is a reliable, valid, and very widely-used measure of pain intensity in children (Varni, Walco, & Katz, 1989).

**Catastrophizing.** Level of pain catastrophizing was measured using the Pain Catastrophizing Scale – Child Version (PCS-C; Crombez et al., 2003). The PCS-C was originally adapted from the Pain Catastrophizing Scale, an adult self-report measure of pain catastrophizing. The PCS-C is a 13-item questionnaire designed to assess catastrophic thinking about pain, including dimensions of rumination, magnification, and helplessness. Sample items include, “When I am in pain, I worry all the time about whether the pain will end” and “When I am in pain, I keep thinking about how much I want the pain to stop”. The initial validation study found that pain catastrophizing, as measured by the PCS-C in a clinical sample of children with chronic or recurrent pain (age range 8-16 years), had a unique and significant contribution in predicting pain intensity and disability (Crombez et al., 2003).

**General Mindfulness.** General mindfulness was measured with the Child and Adolescent Mindfulness Measure (CAMM; Greco et al., 2011). The CAMM was designed to assess level of general mindfulness skills in children and adolescents, including the ability to observe moment-to-moment experiences, awareness of current actions (rather than automatic or absentminded actions), and adoption of a nonjudgmental view towards internal experiences (i.e., emotions, cognitions, and bodily sensations). The CAMM is a 10-item self-report questionnaire. Sample items include, “I notice my thoughts as they come and go” and “I get upset with myself for having certain thoughts”. A recent validity study with 319 children in grades 5-10 indicated that it has adequate internal consistency (α = .80). The study also revealed that CAMM scores
were positively correlated with quality of life, academic competence, and social skills, and negatively correlated with both internalizing and externalizing behaviors, as well as somatic complaints (Greco et al., 2011).

**Pain-Specific Acceptance.** Pain-specific acceptance was assessed using the Chronic Pain Acceptance Questionnaire – Adolescent Version (CPAQ-A; McCracken et al., 2010). The CPAQ-A is a 20-item questionnaire and includes items such as, “I can do activities well even if I do not control my pain” and “It’s O.K. to experience pain”. A validity study of the CPAQ-A conducted with a sample of 122 highly disabled adolescents with chronic pain revealed good internal consistency for the total acceptance scale ($\alpha = 0.87$). A correlational analysis also demonstrated that higher levels of acceptance were associated with lower levels of distress and disability, but was unrelated to pain intensity (McCracken et al., 2010).

**Functional Disability.** Information regarding participants’ level of functional disability was gathered through the Child Activity Limitations Interview (CALI-21), a 21-item self-report questionnaire designed to assess functional impairment due to chronic pain in school-age children (Palermo et al., 2008). Children rate how difficult or bothersome doing functional activities are on a likert scale from 0 (Not Very Difficult) to 4 (Extremely Difficult). Some sample activities include, going to school, playing with friends, and eating regular meals. The CALI-21 interview version was originally normed on 189 children with recurrent pain, including headaches, juvenile idiopathic arthritis, and sickle cell disease (Palermo, Witherspoon, Valenzuela, & Drotar, 2004). The CALI-21 demonstrated excellent internal consistency ($\alpha = .88$), and moderate test-retest reliability and cross-informant reliability ($\alpha = .33$ and $\alpha = .43$, respectively; Palermo et al., 2004). A follow-up validation study of the self-report questionnaire version, with 155 children and adolescents, also demonstrated good internal consistency ($\alpha = $
0.95), high cross-informant reliability \((r = .73)\), and construct validity, providing further support for the reliability and validity of the CALI-21 (Palermo et al., 2008). Total scores on the CALI-21 were positively correlated with measures of pain intensity and depressive symptoms.

**Depression.** Child depressive symptoms were measured using the Children’s Depression Inventory (CDI; Kovacs & Beck, 1977). The CDI is a 27-item self-report screening assessment used to assess the presence and severity of depressive symptomatology in children between the ages of 7 and 17 years and was normed on 1,266 students from public schools in Florida. The CDI reports good internal consistency reliability \((\alpha = .86)\) and there have been numerous validity studies in which the CDI has effectively differentiated between depressed and non-depressed children (Carlson, 2007). The CDI is the most commonly utilized self-report measure of depressive symptomatology in children (Kaminsky, Robertson, & Dewey, 2006).

**Results**

All data were analyzed using SPSS 21.0. Prior to statistical analyses, the data were examined for accuracy of entry and scoring of measures. All scores were also checked for normality through visual inspection and the Shapiro–Wilk test of normality. Bivariate correlations were used to examine associations between variables of interest within the entire sample. Statistical significance was set at \(p < .05\) for all analyses. Hierarchical linear regressions were used to examine the multivariate associations of pain intensity, pain-specific acceptance, general mindfulness, depressive symptoms, pain catastrophizing, and functional disability.

**Missing Values**

Although most participants completed the questionnaires in their entirety, there were a number of missing values that needed to be addressed. First, visual examination revealed that a few participants randomly skipped some items, particularly on hard copy intake forms for the
Pediatric Pain Management Clinic. Moreover, participants who were recruited from other specialty clinics at the children’s hospital, through Pediatric Neurology and Pediatric Gastroenterology, were not administered certain items. Participants from other departments did not complete the intake forms designed specifically for the Pediatric Pain Management Clinic; and therefore, had missing values for information gathered from these intake forms; in particular, they did not complete the child self-report CALI-21 during intake. Given the high correlation between parent and child CALI-21 scores, both in this sample and in the CALI-21 standardization sample (Palermo et al., 2004), parent-report CALI-21 scores were used to substitute for the child scores when child self-report scores were unavailable. It should be noted that the use of parent proxy reports to measure quality of life ratings in children has typically been considered acceptable within the pediatric pain literature (e.g., Gold, Mahrer, Yee, & Palermo, 2009; Palermo et al., 2004). Scores for all measures were only included in analyses if participants completed at least two-thirds of the measure.

**Descriptive Data**

Table 1 summarizes the sample characteristics and pain characteristics. Online questionnaires were completed by 55 youth between the ages of 8-17 years ($M = 14.36$, $SD = 2.47$) and their parents. The total child sample consisted of 41 females (74.5%) and 14 males (25.5%), who reported mean pain duration (i.e., how long they have been experiencing pain) as 2.28 years ($SD = 2.44$). The most commonly reported ethnic groups were Caucasian ($n = 36$, 65.5%) and Mixed Ethnicity ($n = 8$, 14.5%). Ethnic background information was unavailable for 7 of the 55 participants. The most common pain locations reported by respondents were headache ($n = 15$, 27.3.8%), stomach/abdominal pain ($n = 10$, 18.2%), back pain ($n = 9$, 16.4%), and legs/limb pain ($n = 6$, 10.9). Eight participants reported pain in more than one location.
(14.5%). The remaining participants endorsed joint pain, facial pain, and neck/shoulder pain ($n = 7$, 12.7%). When asked to rate their typical or usual pain levels on a visual analog scale, mean pain levels were 61.05 on a scale from 1-100 ($SD = 19.83$). When asked to rate their worst pain, participants’ mean pain levels were 86.59 on a scale from 1-100 ($SD = 18.35$). These results indicate moderate levels of pain on a regular basis but very high levels of pain when at its worst.

Table 1

Sample Demographic and Pain Characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>$n$ (%) / $M$ ($SD$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>14.36 (2.47)</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>14 (25.5%)</td>
</tr>
<tr>
<td>Female</td>
<td>41 (75.4%)</td>
</tr>
<tr>
<td>Child Ethnicity</td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>36 (65.5%)</td>
</tr>
<tr>
<td>African American</td>
<td>1 (1.8%)</td>
</tr>
<tr>
<td>Amer. Indian/Alaskan Native</td>
<td>2 (3.6%)</td>
</tr>
<tr>
<td>Other</td>
<td>1 (1.8%)</td>
</tr>
<tr>
<td>Mixed Ethnicity</td>
<td>8 (14.4%)</td>
</tr>
<tr>
<td>Unknown</td>
<td>7 (12.7%)</td>
</tr>
<tr>
<td>Pain Locations</td>
<td></td>
</tr>
<tr>
<td>Headache</td>
<td>15 (27.3.8%)</td>
</tr>
<tr>
<td>Stomach/Abdominal Pain</td>
<td>10 (18.2%)</td>
</tr>
<tr>
<td>Back Pain</td>
<td>9 (16.4%)</td>
</tr>
<tr>
<td>Legs/Limb Pain</td>
<td>6 (10.9%)</td>
</tr>
<tr>
<td>Multiple Location</td>
<td>8 (14.5%)</td>
</tr>
<tr>
<td>Joint Pain</td>
<td>3 (5.5%)</td>
</tr>
<tr>
<td>Facial Pain</td>
<td>2 (3.6%)</td>
</tr>
<tr>
<td>Neck/Shoulder Pain</td>
<td>2 (3.6%)</td>
</tr>
</tbody>
</table>
Pain Ratings

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>Typical Pain (0-100)</td>
<td>61.05 (19.83)</td>
</tr>
<tr>
<td>Worst Pain (0-100)</td>
<td>86.59 (18.35)</td>
</tr>
</tbody>
</table>

Pain Duration (years) 2.28 (2.44)

Pain Frequency

<table>
<thead>
<tr>
<th>Frequency</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 time/week</td>
<td>1 (1.8%)</td>
</tr>
<tr>
<td>2-3 times/week</td>
<td>1 (1.8%)</td>
</tr>
<tr>
<td>4-6 times/week</td>
<td>9 (16.4%)</td>
</tr>
<tr>
<td>Daily</td>
<td>38 (69.1%)</td>
</tr>
<tr>
<td>Unknown</td>
<td>6 (10.9%)</td>
</tr>
</tbody>
</table>

The Shapiro–Wilk test of normality indicated that CALI-21, CAMM, CPAQ-A, CDI, and PCS-C scores were all normally distributed. Pain ratings, including ratings of typical pain and worst pain, and child age were not normally distributed. The sample also consisted of far more female participants than male participants, and more adolescents than younger children. However, these results were expected given the nature of the clinical population surveyed. The sample consisted of children who were part of a clinical pain population and were being seen through a pain management clinic; thus, they were expected to report higher pain ratings than the general public. Therefore, the non-normality of their pain ratings can be conceptualized as an inherent characteristic of this population. Further, literature in this area suggests that chronic pain syndromes are more commonly found in females and in older adolescents (Perquin et al., 2000), which is also reflected in the current sample’s characteristics.

**Preliminary Analyses: Correlational Findings**

Please see Table 2 for a correlation table including all variables of interest. Neither participant age nor sex was significantly correlated with any of the other variables of interest. Typical pain ratings and worst pain ratings were highly and significantly correlated ($r = .50$, $p < .01$), suggesting that children who report experiencing higher pain on a regular basis are more
likely to report higher pain ratings when it is at its worst. Pain frequency was not significantly
correlated with any other variables.

When looking at CALI-21 scores, the mean level of functional disability in this sample
was 33.63 (SD = 16.48), indicating a moderate level of functional disability, overall. Both typical
pain intensity ratings ($r = .30, p = < .05$) and worst pain ratings ($r = .27, p = < .05$) were
positively correlated with CALI-21 scores, suggesting that children who reported higher pain
ratings tended to report higher functional disability ratings as well. Correlations between
functional disability and pain catastrophizing (PCS-C; $r = .27, p = .05$), and between functional
disability and depressive symptoms (CDI; $r = .26, p = .06$) were both approaching significance,
indicating that children who reported higher pain catastrophizing or depressive symptoms also
tended to report higher functional disability.

Chronic pain acceptance ratings (CPAQ-A) were significantly negatively correlated with
ratings of depressive symptoms (CDI; $r = -.48, p < .05$), pain catastrophizing ($r = -.59, p < .05$),
and general mindfulness ($r = .53, p < .01$). These results suggest that higher chronic pain
acceptance ratings were associated with lower depressive symptoms and lower pain
catastrophizing scores. A strong, positive relationship between higher chronic pain acceptance
and general mindfulness was also found. The correlation between chronic pain acceptance and
functional disability was less robust, but also approaching significance ($r = -.23, p = .09$),
suggesting a possible relationship between higher acceptance scores and lower functional
disability. General mindfulness was also negatively correlated with depressive symptoms ($r = -
.45, p < .01$) and pain catastrophizing ($r = -.64, p < .01$), suggesting that increased general
mindfulness was associated with lower pain catastrophizing and depression. However, unlike
pain specific acceptance, the relationship between general mindfulness and functional disability was neither significant nor approaching significance.

Participants’ CDI scores were strongly, positively correlated with PCS-C scores ($r = .564, p < .01$), suggesting that children who reported higher depressive symptoms also reported higher pain catastrophizing.

Table 2

*Bivariate correlations among variables of interest*

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Typical Pain</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Worst Pain</td>
<td>.50***</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Pain Frequency</td>
<td>.02</td>
<td>.01</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Functional Disability</td>
<td>.30*</td>
<td>.27*</td>
<td>.25</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. General Mindfulness</td>
<td>-.04</td>
<td>-.26</td>
<td>-.06</td>
<td>-.16</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Pain Acceptance</td>
<td>-.10</td>
<td>-.06</td>
<td>.12</td>
<td>-.23</td>
<td>.53**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Depression</td>
<td>.02</td>
<td>.17</td>
<td>-.06</td>
<td>.26</td>
<td>-.45**</td>
<td>-.48***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Pain Catastrophizing</td>
<td>.18</td>
<td>.17</td>
<td>.06</td>
<td>.27</td>
<td>-.64**</td>
<td>-.59***</td>
<td>.56***</td>
<td></td>
</tr>
</tbody>
</table>

* $p < .05$, ** $p < .01$, *** $p < .001$

Regression Models

**Hypothesis 1.** It was hypothesized that individual child demographic and pain characteristics (i.e., older age, female gender, and higher pain intensity) would predict higher levels of functional disability, as measured by the CALI-21.
This hypothesis was tested using hierarchical multiple regression. The independent variables (IV’s) in block 1 of the regression equation were age and gender. Block 2 consisted of typical pain intensity ratings, as measured by VAS scores. Block 3 consisted of worst pain ratings, also measured by VAS scores. The dependent variable (DV) was CALI-21 scores. As stated previously, examination of zero-order correlation coefficients revealed that both pain intensity ratings (VAS typical and worst pain) were significantly correlated with functional disability at the .05 level. However, gender was not related to functional disability ratings. Results of hypothesis 1 suggested that when controlling for age and gender, typical pain intensity ratings predicted functional disability ($B = .33, p < .05$). However, worst pain ratings did not provide any additional predictive power when added to the model over and above the contribution of typical pain intensity and child demographics. The full regression model including all variables is shown in Table 3. This hypothesis was partially supported in that pain intensity was predictive of functional disability; however, individual participant demographics were not predictive.

Table 3

*Individual and pain factors associated with functional disability scores*

<table>
<thead>
<tr>
<th></th>
<th>β at entry</th>
<th>β at final step</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step One:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>-.22</td>
<td>-.24</td>
</tr>
<tr>
<td>Sex</td>
<td>.13</td>
<td>.17</td>
</tr>
<tr>
<td><strong>Step Two:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Typical Pain Intensity</td>
<td></td>
<td>.33*</td>
</tr>
<tr>
<td><strong>Total R²</strong></td>
<td></td>
<td>.10*</td>
</tr>
</tbody>
</table>

*p < .05*
**Hypothesis 2.** The second hypothesis postulated that pain-specific acceptance, as measured by the CPAQ-A would have a unique and significant contribution in predicting functional disability, beyond the effects of known covariates, such that higher pain-specific acceptance would be associated with lower functional disability.

This hypothesis was also tested using hierarchical multiple regression. Although participant age and gender were not significantly predictive of functional disability, they were still retained for the current analyses in order to account for any possible interactions between age, gender, and intensity ratings. Therefore, block 1 consisted of participant age, gender, and typical pain intensity ratings. CPAQ-A scores were used for block 2 and the dependent variable was CALI-21 scores. Results from this hypothesis suggested that although the overall model significantly predicted functional disability scores, CPAQ-A scores did not uniquely predict CALI-21 scores. Thus, this hypothesis was not supported. Pain-specific acceptance did not appear to have a unique and significant effect on functional disability, beyond the effects of pain intensity ratings.

**Hypothesis 3.** The third hypothesis was that pain-specific acceptance would be more highly associated with functional disability scores than general mindfulness, as measured by the CAMM, such that higher pain-specific acceptance would be more highly correlated with lower functional disability than general mindfulness.

This hypothesis was tested using Pearson product moment correlations. Correlation coefficients were computed between CPAQ-A scores and CALI-21 scores and between CAMM scores and CALI-21 scores. Neither of the aforementioned correlation coefficients were statistically significant, thus, a comparison of the magnitude of the relationships was not warranted. Both correlations indicated negative non-significant relationships between functional
disability and general mindfulness and between functional disability and pain-specific acceptance. Therefore, this hypothesis was not supported.

**Hypothesis 4:** It was hypothesized that depressive symptoms, as measured by the CDI, and Pain Catastrophizing, as measured by the Pain Catastrophizing Scale, would both be positively correlated with level of functional disability, as measured by the CALI-21.

Pearson product moment correlations were also used to test this hypothesis and neither correlation was found to be clinically significant. Therefore hypothesis 4 was not supported. However, as stated previously, pain catastrophizing and depression ratings were positively and significantly correlated ($r = .564, p < .01$).

**Hypothesis 5:** Hypothesis 5 stated that the relationship between depressive symptoms and functional disability would be moderated by level of pain-specific acceptance, such that participants who were high in depressive symptoms and low in pain-specific acceptance would have the highest functional disability.

Hierarchical multiple regression analyses were used to test the hypothesized two-way interaction between depression and pain-specific acceptance on the criterion variable, functional disability. Interaction terms were created by centering the variables and then multiplying the depression and pain-specific acceptance variables (i.e., DEP x PSA). This hypothesis was tested in blocks; block 1 included previously discussed covariates (i.e. age, gender, pain intensity), block 2 included main effects, and block 3 included the interaction term. Given that none of the main effects or interactions were found to be significant, no further analyses or probing of the simple slopes was conducted. Removal of typical pain intensity from the model did not result in any significant findings. In summary, this moderation hypothesis was not supported.
**Hypothesis 6:** Finally, the last hypothesis postulated that the relationship between pain catastrophizing and functional disability would be moderated by level of pain-specific acceptance, such that participants who were high in pain catastrophizing and low in pain-specific acceptance would have the highest functional disability.

As described for hypothesis 5, this hypothesis was also be tested using hierarchical multiple regression analyses. Hierarchical multiple regression analyses were utilized to test the hypothesized two-way interaction between pain catastrophizing and pain-specific acceptance on the criterion variable, functional disability. Interaction terms were created by centering the variables and then multiplying the depression and pain-specific acceptance variables (i.e., PC x PSA). Again, block 1 included previously discussed covariates, block 2 included main effects, and block 3 included interaction terms. Similarly to hypothesis 5, the main effects and interactions were not found to be statistically significant; thus, this hypothesis was not supported.

**Discussion**

The current study was conducted in an effort to examine associations between various intervening psychological variables and functional outcomes of pediatric chronic pain. This information is not only required to better understand the impact of chronic pain for the pediatric population, but also has direct implications for the treatment of chronic pain. Prevalence rates for pediatric chronic pain have been estimated to be between 20-40% (Abu-Arafeh et al., 2010; Goodman & McGrath, 1991; Huguet & Miro, 2008; Perquin et al., 2000; Stanford et al., 2008), highlighting the alarming number of children who suffer from chronic and recurrent pain. Moreover, research has demonstrated that the experience of chronic pain causes significant functional impairment for children and adolescents, ranging from school and social interference to clinically-significant psychological difficulties, including depression (Kashikar-Zuck et al.,
Given the large and debilitating impact of chronic pain on many children’s lives, the psychological community has spent considerable energy developing and implementing evidence-based interventions to alleviate suffering associated with chronic pain. Acceptance- and mindfulness-based approaches have gained considerable momentum in research and intervention related to pediatric pain in recent years. The current study sought to further examine the associations among acceptance and mindfulness with functional outcomes in addition to already-established covariates of pediatric chronic pain. The current study is the first in pediatric pain literature to directly compare pain-specific acceptance and general mindfulness.

Summary of Findings

The first aim of this study was to examine predictors of functional disability in youth, ages 8-17, with chronic pain. Demographic characteristics reported by participants in the current study were similar to those found to be generally representative of the clinical pediatric chronic pain population. Specifically, chronic pain syndromes are reported more frequently in older age adolescents, females, and Caucasians (Perquin et al., 2000). These demographic characteristics were also reported by most of the participants in the current study. The most common pain locations reported by respondents were headache, back pain, stomach/abdominal pain, and leg/limb pain; again, these results are consistent with extant literature in the pediatric pain field. Participants also reported high levels of pain intensity, which is expected given that research participants were recruited through a clinical setting, which is accessed by children and families suffering from significant chronic pain syndromes.

When looking at functional outcomes, 25% of participants in the current study reported clinically significant depressive symptoms, as measured by the CDI and participants reported a
mean CALI-21 score of 33.63 ($M = 40.53$, $SD = 18.86$ in the development sample). These results indicate that even within a relatively small sample of pediatric chronic pain patients, chronic pain syndromes are related to significant impairments in both psychological and everyday functioning. These results are especially striking, given that those participants who are most impaired may not have completed the current survey, as participation in the current study required that youth and their caregivers complete online surveys that took up to 45 minutes. This aspect of the study procedure may have precluded the most impaired youth, since those individuals may not have been capable of sitting at a computer for the extended period of time and thus, were unable to complete this online survey. Therefore, the current study participants may represent a subset of the larger group of youth with more debilitating chronic pain.

Results of regression models indicated that participants’ typical pain intensity ratings were the strongest predictor of functional disability scores. These results are commensurate with previous pediatric pain literature, which suggests that a child’s perception of pain intensity significantly impacts his or her ability to engage in age-appropriate daily activities (Kashikar-Zuck et al., 2001). However, functional disability was not predicted by older age or female gender, as previously hypothesized. It is important to note that these results may have been impacted by the non-normality of these variables; there were far more female participants in the current study than male participants (75% versus 25%), and participant age was negatively skewed, with more participants reporting older age, as indicated above. Interestingly, pain frequency was not correlated with any of the other variables examined, suggesting no relationship between how often children are experiencing pain and other pain variables or outcomes. These findings are highly suggestive of the notion that the perception of pain intensity is far more predictive of the negative impact of pain than pain frequency.
The second aim of the current study was to explore correlates of pain-specific acceptance and general mindfulness in youth with chronic pain. Statistically significant correlations were found between general mindfulness and pain-specific acceptance, suggesting that increased mindfulness is related to increased pain-specific acceptance. Significant correlations were also found between pain-specific acceptance and depressive symptoms, suggesting that higher levels of pain-specific acceptance are associated with lower depressive symptoms. These results are commensurate with extant literature in the field of pain, further supporting the robust relationship between these two variables (Casier et al., 2008; Kratz et al., 2007). A relationship approaching statistic significance was found between chronic pain acceptance and functional disability. While general mindfulness and pain-specific acceptance have not been directly compared within the pediatric pain population to date, previous research studies have also determined not only a correlational relationship, but a predictive relationship between acceptance and functional disability as well (e.g., Casier et al., 2008; Weiss et al., 2013).

The third aim was to test a model in which pain-specific acceptance would moderate associations between psychological factors and functional disability in adolescents with chronic pain. It was hypothesized that chronic pain acceptance would uniquely, and significantly predict functional disability. However, results indicated that while an overall model including pain intensity, participant age, gender, and pain-specific acceptance significantly predicted functional disability scores, pain-specific acceptance did not provide any additional predictive power. These results were not surprising, given that neither pain-specific acceptance nor general mindfulness were significantly correlated with functional disability scores. However, these results are certainly in opposition to previous literature examining the relationship between mindfulness, acceptance, and functional disability related to chronic pain, which has found strong
relationships between these variables (e.g., Weiss et al., 2013). Due to the lack of statistically significant correlations between these variables, hypothesized moderation models were also found to be insignificant. More specifically, pain-specific acceptance did not moderate the relationship between depression and functional disability or between pain catastrophizing and functional disability.

These results suggest that pain-specific acceptance and general mindfulness were not associated with functional disability outcomes, as measured by the CALI-21 in this sample. From one perspective, this information brings the use of acceptance- and mindfulness-based interventions with pediatric chronic pain patients into question. Increasing pain-specific acceptance and general mindfulness may not have positive effects for this sample of predominantly female adolescents with chronic pain. However, it is important to note that extant literature in both adult and pediatric pain populations has generally supported the use of these approaches with chronic pain patients (e.g., Gauntlett-Gilbert et al., 2013; Weiss et al., 2013). Researchers have recently utilized acceptance-based treatment in a pediatric interdisciplinary chronic pain rehabilitation program and found that post-treatment changes in chronic-pain acceptance significantly predicted changes in depressive symptoms and functional disability (Weiss et al., 2013). Thus, within the context of existing literature, this study alone does not support the exclusion of acceptance-based interventions within this population. Moreover, several methodological issues affect the interpretability and conclusions of the current study and need to be addressed in future work.

Limitations

First, the current sample size is smaller than the ideal number required for conducting statistical analyses. Given small effect sizes, the power of the present study was likely inadequate
to detect significant effects in this sample. Preliminary power analyses suggested that a sample size of 82 was sufficient to detect a small effect, and a sample size of 32 was required to detect a moderate effect. Despite 20 months of data collection, only 58 participants were recruited, and only 55 participants’ surveys were retained for analyses due to missing items. Due to low numbers, attempts were made to recruit participants from other clinics, which unfortunately did not utilize the same intake procedures and resulted in loss of some information. Several trends in the data suggested that a larger sample size with a similar pattern of results would have yielded significant findings. A number of analyses conducted in the current study indicated results that were approaching significance; therefore, it could be argued that a larger sample size may have resulted in more statistically significant findings.

In addition to power and sample size concerns, statistics used to test hypotheses in the current study may have been impacted by the lack of variability in participants’ reports. Although this was a heterogeneous group in terms of chronic pain condition, results indicated a lack of variability in participant responses to a number of measures and ratings. It is possible that a sample with more normalized reports and ratings would have resulted in less restriction of range and variability, and therefore the potential to detect statistically significant effects.

Moreover, there were a number of missing items in the current data set. This obstacle in data collection was not surprising, given that information gained in this study was obtained from a clinical sample with a current impairment. Some information required for analyses was obtained from clients’ intake paperwork in the Pediatric Pain Management Clinic, and overall there was a loss of information across these items as participants tended to leave specific items blank. It is important to note that these items appeared to be randomly distributed throughout the survey and paperwork, and no pattern of neglected items was apparent. Although the purpose of
the current study was to examine the experiences of a clinical population, data collection in such a population is challenging and can result in less than ideal completion of study items.

Another important limitation of the current study is in relation to potential selection bias. As stated previously, participants in the current study were required to not only commit to the completion of a large survey, but were also required to have access to the survey via the Internet. Although paper copies of the survey were available, none of the current participants requested paper copies in lieu of the online survey. Recruitment procedures were also directed toward parents of the participants, who then decided whether or not to participate in the study and allow their children to participate. Thus, it can be inferred that the current sample consists of children and adolescents who had access to a computer or other device capable of accessing an online survey, ability to complete a large survey, and had parents who were interested in study participation. These children may be inherently different from those who chose not to participate in the current study or those who attempted to participate but were unable to complete the entire survey. Further, those youth who experienced less intense chronic pain, or whose lives were not as adversely affected by the pain may not have been as motivated to participate in chronic pain research as their more adversely impacted peers. Therefore, the design of the current study itself may have resulted in the selection of a very particular group of individuals who are seeking help for their chronic pain, yet have a moderate level of pain (i.e., excluding both the highest and lowest groups).

Future Directions

Future directions suggested by the current study include examining the role of general mindfulness and pain-specific acceptance in functional disability in a larger sample of youth suffering from chronic pain. Potential ways to achieve this objective would be to recruit
participants from multiple settings or to allow for onsite completion of questionnaires, thereby eliminating potential barriers to at-home completion of the study. By including all required information in the online questionnaire forms, participants who suffer from chronic pain, but who are seen in other specialty clinics, can also be included.

Additionally, examining these constructs within a community sample (i.e., a non-pain specific sample) where some participants have pain and some do not, may provide additional information regarding the relationship between pain ratings, psychological intervening variables, and functional outcomes. Specifically, given the lack of variability in many measured areas in the current study, a study with a non-clinical group of children and adolescents in the general population may allow for additional variability in pain ratings and other measured areas. This added variability might result in more robust statistical analyses, and subsequently, a more accurate examination of aforementioned constructs. Moreover, participant age may have also played a role in study results. Because all survey items relied on participant self-report, including preadolescent children in the sample may have diluted some effects, especially for those measure that require more sophisticated self-reflection and report. Restricting the age range for future studies to adolescents only may provide more significant findings related to complex constructs such as pain-specific acceptance and pain catastrophizing.

Future studies may also include parent reports of variables of interest, in order to examine the role of parental mindfulness and acceptance in children’s experience of pain. As mentioned previously, pain management is often conceptualized within a biopsychosocial context (Bush & DeLuca, 2001). Different levels of intervening psychological variables, such as mindfulness, acceptance, and pain catastrophizing may be inherited and/or modeled by parents of children suffering from chronic pain, and may subsequently impact a child’s ratings of these variables and
their relationship to functional disability. Exploration of the role of mindfulness and acceptance within parents or caregivers may therefore provide useful information regarding potential benefits of parental involvement in acceptance-based approaches with children and adolescents who have chronic pain.

**Conclusion**

Results of the current study may appear to invalidate the use of acceptance- and mindfulness-based approaches with pediatric chronic pain patients, due to the lack of associations of variables with functional disability and depressive symptoms. However, given the methodological issues inherent in the current study (i.e., lack of power), such conclusions are not warranted. Despite this lack of power, many significant correlations were found between variables of interest, particularly in regard to pain-specific acceptance. These findings, coupled with extant literature supporting the predictive role of acceptance in a pain patient’s level of functional disability, indicate that mindfulness-based approaches that focus on acceptance of pain are still a valid and important avenue of research for pediatric chronic pain. Literature demonstrating the effectiveness of these approaches has surfaced in recent years with both adult and pediatric pain populations and the influence of acceptance and mindfulness is becoming widely accepted based on theoretical and scientific foundations. Because chronic pain is often inexplicable from a medical standpoint and efforts to control the experience of pain are often unsuccessful, acceptance-based approaches to pain treatment are highly indicated. Future studies that are designed to assess the same variables included in current studies will be valuable in the pursuit of increased functional outcomes for pediatric chronic pain patients. Similar to the study conducted by Weiss et al. (2013), acceptance-based intervention studies with pre-, and post-treatment measurement of pain-specific acceptance and functional outcomes will also provide
useful information regarding the effectiveness of acceptance-based treatments for pediatric chronic pain. Despite the long-time suffering of many chronic pain patients, the emergence of mindfulness and acceptance-based treatment approaches for use with this population is both promising and worthy of ongoing empirical investigation.
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