

The Effect of Explanatory Frameworks and Metaphors on Understanding Chronic Pain

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### Abstract

Parents play an important role in their children's understanding of pain. However, research is needed to fully understand how to best explain pain to parents. This study examined the effect of explanatory frameworks on parents' beliefs about and understanding of pediatric pain in a sample of 249 general population parents. The study looked to see if the type of framework the participants received impacted their beliefs and understanding. The impact of metaphors on participant beliefs and understanding were also examined. There were five different explanatory frameworks utilized in the study including a biomedical framework, psychological framework, biopsychosocial framework, metaphor framework, and biopsychosocial and metaphor combination framework. The type of framework read by the participants did not impact participant understanding or beliefs. However, the presence of a metaphor did impact the participants' endorsements of pain attributions. Findings regarding other aspects of the study are also reviewed. Implications for future research are discussed.

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## The Effect of Explanatory Frameworks and Metaphors on Understanding Chronic Pain

### **Introduction**

Chronic pain, defined as pain that lasts for at least 3-6 months, affects between 25-35% of children (Dahlquist & Nagel, 2009). A child afflicted with chronic pain often must learn to rely on a team of medical professionals to help navigate this condition. The parents of these children also face a new reality, one in which their child is no longer developing typically and must handle potentially severe daily pain.

Parents may react to the diagnosis of their child's pain differently based on a variety of factors including age, socioeconomic status, and education level (Matziou et al., 2016). However, an important aspect of how parents react to a diagnosis is how they both are told about the diagnosis and in the degree to which they understand the diagnosis. Parents often have a large amount of control over their children's treatment regimens. They can often control which treatments a child receives and can both help and hinder treatment adherence. Because of this, it is important to know how much a parent knows about a chronic pain disorder, what treatments, if any, they believe will be effective, and what attributions they give to a disorder. If a child receives a diagnosis that the parents do not fully understand, it is possible that they could hinder their child's treatment process because of a lack of information (Coakley & Schechter, 2013). Therefore, it is important to know the best ways to enhance parental understanding of pediatric chronic pain diagnoses.

The goal of this study is to investigate the impact of providing explanatory frameworks on parents' understanding of pediatric chronic pain diagnoses. Specifically, the study will examine how different frameworks, including a biomedical framework, a cognitive behavioral framework, a biopsychosocial framework (i.e. one that combines the biomedical and cognitive behavioral aspects of pain), and the integration of metaphors to explain pain, impact parents'

knowledge of a pain disorder, acceptance of a range of treatment options, and overall understanding of the chronic pain condition. Current research has found that a multidisciplinary approach to pain assessment can result in greater parental understanding and willingness to accept a variety of treatment options (Duncan, 2000; Novy et al., 1995). Much of the current knowledge about explanatory frameworks is from direct clinical interaction with families. However, because of this it can be difficult to control confounding variables, such as parental biases and experience with pain, that are in each clinical interaction between clinicians, patients, and families (Claar et al., 2013). Therefore, the proposed study utilizes vignettes presented to parents who do not have their own personal experience of parenting a child with chronic pain. By using an experimental approach, this study will fill a void by avoiding these potential confounds in studies utilizing information from patients in pain clinics. The following review of the research literature in this field will explore chronic pain and Complex Regional Pain Syndrome, chronic pain and the family, parental views and behaviors related to child pain, understanding chronic pain, and explanatory frameworks and chronic pain.

## **Literature Review**

### **Chronic Pain and the Family**

Research has found that the most common forms of childhood chronic pain include abdominal, musculoskeletal, and headache pain (Palermo, Valrie, & Karlson, 2014). Parents have been found to underestimate their child's pain and have been found to believe that girls are in more pain than boys (Matziou et al., 2016).

The experience of chronic pain changes as a child ages. Pain in infancy and preschool is often poorly characterized because the caregiver must serve as the primary interpreter and communicator of the child's pain. Parent and family influences during this time period are particularly important because they influence the development of early pain management skills

that may be useful when the child enters school and has to manage his or her pain while also managing academic and social demands. Once the child is in school, he or she can provide accurate reports of his or her pain experience. Researchers have found that chronic pain often leads to impaired school functioning (Logan, Simons, Stein, & Chastain, 2008). However, with a supportive family environment, children have been found to have similar levels of social skills as their typically developing peers (Palermo, Valrie, & Karlson, 2014). The supportive family is characterized by organization and role understanding, cohesion, communication, affective environment, and problem solving (Palermo, Valrie, & Karlson, 2014). Chronic pain and pain-related disability have been found to peak in adolescence. This is mainly attributed to the many changes that take place during puberty. Adolescents are also learning how to gain autonomy from their parents and learning to take control of their treatment and pain.

Parents of children who live with pain report high levels of stress, anger, depressive symptoms, and anxiety (Palermo & Chambers, 2005). According to Palermo and Chambers' 2005 review, higher levels of parent stress are related to heightened pain-related disability among their children. Poor health functioning in parents has also been found to lead to poor functioning in children with chronic health problems. Therefore, it is important to realize that there are consequences for the whole family when a child has to live with pain. Different factors about the child and parent, such as age and gender, interact. For example, child and parent gender socialization interact with societal beliefs about pain to create the family's pain experience (Palermo & Chambers, 2005).

Parents are also able to impact their child's pain experience through their own interactions with the child's health care team. In a study conducted by Twycross and Finley (2013), the researchers had ten parents complete the *Information About Pain* questionnaire that asked them about their perceptions of the quality of their child's pain management treatment and

medical team. They were asked about the length of time their child was in pain, the amount of pain their child was in, and their satisfaction with pain management and recommendations (Twycross & Finley, 2013). Parents who report that they received information about their child's pain management were more likely to be satisfied with their child's care. This also resulted in the child facing fewer difficulties with his or her own pain management, which was measured by having the children complete interviews about living with their pain while in the hospital (Twycross & Finley, 2013).

### **Child Understanding of Pain**

While this study will focus on parental views and understanding of pain, it is important to understand how children grow to learn about pain. Clinicians and parents are often tasked with teaching children about pain in themselves or others. Therefore, it is necessary for both parties to understand pain and childhood development in such a way that makes it somewhat easy for children to understand.

Pain is often a difficult and abstract concept for children to understand. Therefore, parents and practitioners often have to work hard to come up with language to accurately explain pain diagnoses to children. Clinicians find that it is often helpful to have children start by explaining their pain and giving their own pain narrative when starting the explanation process (Carter, 2004). This helps the children to feel empowered so that they feel as though they are being heard. If children are feeling empowered they tend to feel as though their pain is valid and real (Carter, 2004).

Researchers have tried to plot children's understanding of illness pain developmentally. Theorists have found that children's understanding of illness follows Piaget's theory of development (Bibace & Walsh, 1981; Perrin & Gerrity, 1981). Because of this, it was argued that children's overall understanding of illness was limited. However, there are some that

believe that this underestimates children's understanding of illness (Baillargeon, 1993). Now, research finds that children's knowledge of illness becomes much more accurate and sophisticated with age (Myant & Williams, 2005). In a study with a sample of children between four and twelve-years-of-age, the most common definitions of illness were based on both the presence of symptoms and the feeling of being sick (Myant & Williams, 2005). However, the participants' definitions of health were based on behavioral factors instead of the lack of illness. This helps to prove that Millstein and Irwin's 1987 theory that children view health and illness as different constructs that have overlapping elements. A common finding is also that children have similar views of illness and health as their parents (Myant & Williams, 2005). These results showcase that it is important for parents to be aware of how they explain and talking about illness and pain around children because it does have an impact on their overall understanding and knowledge.

### **Parental Views and Behaviors Related to Child Pain**

Parental reactions to pain are extremely important and influential in the child's life. Parent responses can impact the development and maintenance of the child's pain behavior. Maladaptive parental responses to pain were related to increased disability and somatic symptoms in children. These responses include criticism, discounting of pain, increased attention to pain, and granting of special privileges (Claar, Simons, & Logan, 2008).

Parental behavior resulting from their own extreme fear and anxiety has been heavily researched because of its direct impact on their child's health. In studies comparing maternal and paternal responses, mothers have reported higher levels of anxious thoughts and behaviors related to their child's pain. Specifically, mothers were more likely than fathers to ruminate about their child's pain (Hechler et al., 2011). Hechler and her colleagues studied this occurrence by asking 230 sets of parents or children with a pain diagnosis about their

catastrophizing behavior, parental school absence reports, and pain-related parent behavior (Hechler et al., 2011). Rumination was studied by asking parents the question “When my child is in pain, I cannot think of anything else,” (Hechler et al., 2011). Parents then answered the question on a scale ranging from “definitely like me” to “definitely not like me.” This maternal behavior was associated with heightened child pain intensity. When mothers were more upset, children were more likely to be in more pain. This was attributed to both mothers reacting to their child’s pain, but also the child reacting to his or her mother’s distress. On the other hand, paternal extreme worry and anxiety was related to heightened distraction responses (Hechler et al., 2011). Therefore, the authors believe that there may be a cyclical relationship between parent anxiety and child pain (Hechler et al., 2011). This study focused on parental behaviors but did not focus on how the child’s gender impacted their behavior and only focused on this single item. Parents’ quality of life is heavily influenced by their child’s pain diagnosis. Research has shown that high parental worry and anxiety influences the child’s pain (Hechler et al., 2011; Logan, Simons, & Carpino, 2012; Palermo & Eccleston, 2009). In fact, parent attitudes about their children’s pain can even influence how teachers perceive the pain (Logan, Coakley, Scharff, 2007).

### **Understanding Chronic Pain**

Chronic pain can be described as persistent pain that extends longer than the average injury healing time or arises without a clear precipitant (Palermo, Valrie, & Karlson, 2014). This time frame is usually defined as three to six months of persistent pain (Palermo, Valrie, & Karlson, 2014). Chronic pain can be difficult to understand because the living with this pain can vary much more between patients than in those experiencing acute pain. In fact, it can be hard for clinicians and medical providers to fully understand patients’ pain (Tait, Chibnall, & Kalauokalani, 2009). Research has found that there is a range of contributing factors to patient’s

experiences of living with chronic pain, including genetic predisposition to inflammatory response to neurochemistry and neurophysiology to psychological factors (Simons et al., 2008). Because of this, it can be quite difficult for clinicians to help patients understand chronic pain symptomology. This is especially challenging when the patients are children because clinicians must be able to explain the diagnosis in appropriate terms to both the child and the parent. This difficulty in understanding could be part of the reason as to why treatment adherence is low following an initial diagnosis in a pediatric pain clinic (Simons et al., 2008). Currently, the biopsychosocial model is thought to be the most comprehensive way to approach chronic pain (Gatchel et al., 2007). This model goes against the traditional dualistic view that viewed the mind and body as functioning independently from each other. The biological factors of the biopsychosocial model can include basic neuroscience, while the psychological aspects involve emotion and cognition. Social aspects include family expectations, previous treatment experiences, and environmental stressors (Gatchel et al., 2007). The biopsychosocial model looks at disease and illness as an interaction between biological, psychological, and social factors (Gatchel et al., 2007). A disease is the biological event in the body, while the illness is the subjective experience or attributions that a disease present. Therefore, illness is how a sick person and members of the family live with the diagnosis (Gatchel et al., 2007).

The difference between disease and illness in the biopsychosocial approach can be utilized in the world of pain, in the understanding of nociception and pain. Nociception is the stimulation of nerves that send information about potential tissue damage to the brain. However, pain is the subjective perception of that information. This perception could be influenced by the patient's genetic disposition, prior learning history, current psychological status, and sociocultural influences (Gatchel et al., 2007).

The wide variety of understanding of pediatric chronic pain diagnoses might also be

attributed to the fact that clinicians and medical doctors often use different explanatory frameworks when describing chronic pain to families. Therefore, patients and parents may have differing understandings of the same diagnosis based solely on the explanatory framework utilized by providers. In specialized pediatric chronic pain clinics, it is now important that a multidisciplinary assessment is used. This assessment is often viewed as an intervention in itself because throughout the assessment the patient and family will receive information from a variety of disciplines (e.g. psychology, medical, etc.) and will hear a variety of explanations for ways to both treat and understand the pain. The main goal of a multidisciplinary assessment is to help patients and parents understand that the mind-body duality model is not actually accurate (Duncan, 2000; Novy et al., 1995). This increased understanding of pain often results in a greater openness to different intervention strategies. The utilization of metaphors in explaining pain has also been found to have benefits in overall understanding (Eccleston, Williams & Rogers, 1997; Gallagher, McAuley & Moseley, 2013; Moseley, 2012; Coakley & Schechter, 2013).

### **Explanatory Frameworks**

Explanatory frameworks are utilized by clinicians to explain pain diagnoses to patients. Currently, it is common to find clinicians utilizing a biomedical framework, cognitive behavioral framework, or a biopsychosocial framework (Moseley & Butler, 2015). A biomedical framework says that pain has a physical cause and thus can be eliminated by treating the physical pathology (Dickson, 2017). If a practitioner utilizes a biomedical framework, the patient will likely learn about the biological causes of pain and will learn about pain in a physical sense. This framework can result in frustration in parents and patients because certain treatments may not seem appropriate. For example, it may seem counterintuitive to have children engage in psychological therapy and exercise when they are in pain. However, both of these treatments

have proven to be quite effective (Coakley & Schechter, 2013). Those who utilize a cognitive behavioral framework will learn about pain's psychological basis. This framework can often result in frustration because parents want a reason for their children's pain (Coakley & Schechter, 2013). Being told that pain is the result of a psychological disorder often leads to parents feeling disengaged and defensive.

Finally, those that utilize a biopsychosocial framework will teach their patients that pain arises from, and can be impacted by, both biological and psychological causes as well as by social factors. Biological influences can include neurovascular changes, age, and sex (Dickson, 2017). Psychological factors include emotions and the ways people view pain diagnoses, while social influences include the patient's home and school environment, as well as the child's relationship with his or her parents (Dickson, 2017). Many multidisciplinary clinics utilize the biopsychosocial model because it can help patients and family to realize that pain is not generally caused by just psychological or biological factors. It gives patients a broader understanding of their pain. However, even though this framework can be utilized it can also still be difficult for patients and families to understand complex medical terminology. It is important for families and patients to understand their diagnoses for a variety of reasons, but research has found that an accurate understanding of pain is associated with increased pain tolerance thresholds, reduced pain frequency, improved functioning, and reduced catastrophizing (Moseley, 2002; Moseley et al., 2004).

Research has begun to look at whether the use of metaphors could be incorporated into frameworks to make diagnoses easier to understand. Gallagher et al. (2013), have found that metaphors are more effective compared to standard frameworks in helping patients to understand pain diagnoses. There are a variety of ways that analogies can be utilized including the explanation of the difference between acute and chronic pain, pain transmission and spreading,

factors that influence the experience of having pain, and pain rehabilitation (Coakley & Schechter, 2013). According to Coakley and Schechter (2013), there are a variety of different metaphors that practitioners can use in these categories. An example of a chronic pain diagnosis metaphor framework is, “Persistent pain is like a doorbell that goes haywire. Usually when you press a doorbell it rings one house one time and that’s all. But, in the case of chronic pain, it’s as if the doorbell on one house actually rings every house on the block. And the doorbell doesn’t just ring once, it rings all day and all night,” (Tupper, 2012). This metaphor helps children and families to create a visual image of the experience of living with pain. Pain transmission is often explained using a railroad crossing gate metaphor as it helps to explain the gate control theory of pain (Coakley and Schechter, 2013). Factors that can impact the effectiveness of pain metaphors work to explain a variety of variables that affect pain such as the amount of attention given to pain, the meaning that is given to the pain, and family stressors among others. One of the more prevalent metaphors in this category is one of volume control, which says that when the patient is not in pain, the nervous system volume is low. However, when the patient is in pain, the nervous system volume is high. Finally, a metaphor commonly utilized for pain recovery is the bonfire metaphor. It says, “Recovery from chronic pain is like the challenge of trying to put out a bonfire that’s been burning for a long time. When you throw water on a fire like this, only the flames go away. The coals are still smoldering underneath and the fire can flame back up at any time. Many pain medications are kind of like throwing water on this bonfire. They may put out the flames temporarily, but don’t work well on the hot coals. We have to look beyond medication treatments to figure out how to get those coals extinguished,” (Conway, 2012).

The utilization of metaphors throughout the diagnosis and treatment process can help patients and their families to better understand what is happening to the patient’s body. This understanding has also been found to help strengthen the clinician-patient relationship (Coakley

& Schechter, 2013). However, more information is needed to know if metaphors on their own can be effective, or if it would be best to combine metaphors with another framework, a void this study would help to fill. Overall, it is important to know how to best describe pediatric chronic pain disorders to patients and families because the level understanding can greatly impact the patients' experience.

### **Pain Diagnosis: Complex Regional Pain Syndrome**

Complex Regional Pain Syndrome (CRPS) is a diagnosis in which there is constant regional neuropathic pain that has been found to be associated with abnormal sensory, autonomic, motor, and/or trophic changes. It usually occurs after an injury to a limb, such as a fracture, soft tissue injury, or surgical trauma, but the pain is disproportionate in both time and intensity to what is typical for the sustained injury (Fukushima et al., 2014). The pain is typically described as a burning, tingling, stabbing, numbness, or electric shock (Allen, Galer, & Schwartz, 1999). Common symptoms of CRPS can be grouped into four overarching categories, sensory, motor/trophic, vasomotor, and sudomotor/edema. Sensory symptoms include hyperalgesia and allodynia, while motor/trophic symptoms include a decreased range of motion, weakness, and dystonia. Vasomotor symptoms include temperature changes and skin color changes and sudomotor/edema symptoms include increase or asymmetrical sweating and edema (Dickson, 2017). CRPS' incidence and prevalence in children is not known. However, the incidence of CRPS in the general population is estimated to be around 5.5/100,000 persons per year and the incidence in children and adolescents under twenty-years-old is estimated to be around 1.58/100,000 persons per year (Abu-Arafeh & Abu-Arafeh, 2016). The prognosis of CRPS in children is more favorable than in adults. However, longitudinal studies have shown that pediatric pain patients face relapses throughout adulthood in a significant number of patients (Williams & Howard, 2016). According to Fukushima et al. (2014), because there is not a lot of

research about successful treatment options for patients, it is important for clinicians to work with children and families to try to find which treatment would work best for the child and the family.

Including parents in the treatment of CRPS is extremely important. Family Systems Theory has been utilized in many pain clinics through the mentality that parents influence their child's pain. Therefore, clinicians must include parents in the treatment process to help address their anxieties and concerns, as well as any anger they may feel at the medical system (Dickson, 2017). By working closely with patients, clinicians can help to alleviate confusion and can help parents to understand different treatment options for their children (Dickson, 2017). This is important because if parents are willing to talk with clinicians and have formed a trusting relationship everyone will be better able to help the child.

### **Complex Regional Pain Syndrome Treatment**

Because CRPS is not well understood, research is ongoing as to the best treatment and intervention methods. Currently treatment for CRPS is a biopsychosocial intervention involving physical and psychosocial treatments along with psychopharmacology strategies (Williams & Howard, 2016). Common treatment plans include pain education, physiotherapy, desensitization, trial of oral or topical analgesia, and psychological assessment and intervention (Williams & Howard, 2016). Psychological interventions include pain-focused cognitive-behavioral therapy (CBT). Research has shown that when CBT is utilized in a multidisciplinary approach, patients experience an improvement in physical function, pain intensity, school attendance, anxiety, illness behavior, and medication use (Williams & Howard, 2016). Other common interventions include acupuncture and homeopathy as well as noninvasive neurostimulation and scrambler therapy (Williams & Howard, 2016). More research needs to be completed about interventional strategies in pediatric populations. Current research mainly

focuses on adult samples and cannot be fully generalized to a pediatric population.

### **Integrative Model of Parent and Family Factors**

This study utilizes a model created by Palermo and Chambers (2005) to help explain the dynamic interaction of pediatric pain and the family. These researchers created an integrative model of parent and family factors in pediatric chronic pain, which is utilized throughout this study. The model has three levels, individual variables (e.g., parenting style, parental reinforcement), dyadic variables (e.g., parent-child interactions), and family level variables (e.g., family environment, overall functioning) (Palermo & Chambers, 2005). These three levels both impact and are impacted by the pain, moderators and mediators (e.g., child gender, emotional symptoms, age and developmental status, and parental pain history), and functional disability (Please see Figure 1) (Palermo & Chambers, 2005). This study will focus on the second level, or the dyadic variables. It is important to note that according to the model, the relationships are all within a developmental context in which it is vital that family variables are considered in relation to the age and developmental status of the child (Palermo & Chambers, 2005). The creators of the model state that there is a need for more research to be completed on this topic. It is imperative to utilize models in this research in order to operationalize variables and to better understand factors that impact the family's lived experience of pain, such as SES, family variables, and disability (Palermo & Chambers, 2005).

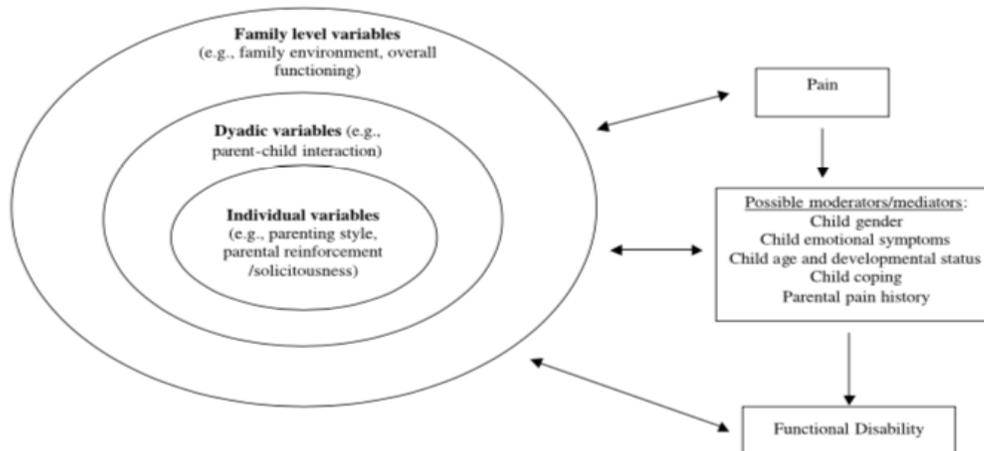


Fig. 1. Integrative model of parent and family factors in pediatric chronic pain and associated disability (Palermo & Chambers, 2005).

### Family Systems Theory

Family Systems Theory looks at the family unit as a whole and helps researchers to understand how families organize themselves throughout daily and lifelong tasks (Fleming & Fleming, 2003). These tasks also relate to families adjusting to meet the developmental needs of their members. Therefore, one must understand that there are individual members of the system, but it is most important to understand the family unit as a whole (Bowen, 1978). The family should be viewed as more than the sum of its parts as it is essential to know how they come together.

Organization of the family is essential to the understanding of this theory. Hierarchies are used to describe this organization process in which families break themselves up into smaller subsystems (Minuchin, 1974). For example, these subsystems are often classified as marital, parental, or sibling. These subsystems are often formed and activated to help complete tasks or to solve problems (Fleming & Fleming, 2003). This study will focus on the parental subsystem. The main problem or task that will be studied is the idea of pediatric pain. The parent will be

working on this “problem” with the child as members of the parental subsystem. However, it is essential to remember that each individual family member and members of the other subsystems are both influenced by and dependent on one another (Bertalanffy, 1975; Whitchurch & Constantine, 1993). Therefore, while the parental system might be directly involved with the experience of living with pain, the marital and sibling subsystems and their members will also be impacted by the pain experience. Therefore, when working with families, clinicians must understand their patients’ families’ dynamic.

Families must also create boundaries in relation to whom or what is included in the family system. This is important to understand in the clinical setting because families may begin to include their doctors or clinicians into the family unit. This can be a good thing because it shows that the family trusts their practitioner. However, in some clinician/family relationships it can be a bit harder for this trust to form (Fleming & Fleming, 2003). As it is common for families with children experiencing pain symptoms to seek medical advice and treatment at a number of different facilities, it can often be somewhat hard for this trust to form. Therefore, the language that one uses can be essential because families are often seeking understanding and want to be heard (Dickson, 2017).

Other important aspects of Family Systems Theory are the ideas of equilibrium and homeostasis. Equilibrium describes how families want and work towards a sense of balance between the problems and challenges they must face and the families’ resources (Fleming & Fleming, 2003). This balance is called homeostasis. In other words, families want to have a sense of balance and will utilize their resources to reach this point. In a clinical setting, the clinician and other medical resources are part of the family’s resources. Therefore, they play an important role in the families drive for homeostasis. It is important for clinicians to know how to best explain pain to families in order to best help them throughout the course of their

relationship. This is part of why many families become frustrated at the high number of clinics and other facilities that they must visit when their child is experiencing pain. If families do not feel that they have the resources they need to reach their version of homeostasis, they will feel frustration.

Finally, Family Systems Theory also views the family as goal oriented (Fleming & Fleming, 2003). Families work to reach certain goals and objectives. This is completed through equifinality, or the ways in which the family can accomplish the same goal through different routes (Bertalanffy, 1968). In other words, a family can face one problem or similar beginning that can result in many different outcomes, which can be reached through many different paths (Fleming & Fleming, 2003). The study will focus on this through a variety of different means. First, by asking about ideas about different forms of treatment expectations, we will be testing different roads to the same goal. This will also be tested by asking participants about their pain attributions. Perhaps if clinicians understand how parents view pain causes, they can better help to explain pain to them and will help the family to reach their goals involved with living with pain.

### **The Proposed Study**

The goal of the proposed study is to test how different explanatory frameworks impact parents' understanding of, attributions about, and treatment expectations for chronic pediatric pain. The study will explore the different explanatory frameworks commonly utilized by practitioners to explain pain syndromes (specifically CRPS) to parents. Another focus of the study will be to see if the addition of metaphors to the explanatory framework adds any benefit. These frameworks include a biomedical framework, a cognitive behavioral framework, a biopsychosocial framework, a metaphor based framework, and a biopsychosocial framework that utilizes metaphors.

**Study Aims.** The study has two aims. The first is to test the impacts of the different explanatory frameworks on participants' attributions and attitudes about pain, their knowledge of chronic pain, and their treatment expectations. Regarding this study aim it is hypothesized that participants' attributes for the child's pain problem will be influenced by the explanatory framework. Those participants who are exposed to the unidimensional frameworks (biomedical and cognitive behavioral) will endorse pain attributions and attitudes that correspond with those frameworks. However, those exposed to the biopsychosocial framework will endorse attitudes and attributions that are a combination of both the biomedical and psychosocial attributions. It is also hypothesized that those participants exposed to the biopsychosocial framework will have greater knowledge when completing a measure designed to assess comprehensive knowledge of pain than those exposed to the biomedical or psychosocial framework. Finally, it is hypothesized that those exposed to the biopsychosocial framework will accept a larger range of treatment options for the chronic pain diagnosis and will report expectations of a better prognosis for the vignette child than those exposed to the biomedical or psychosocial framework.

The second aim for the study is to measure the impacts of the addition of a pain metaphor to the biopsychosocial framework. For this aim, it is hypothesized that those participants exposed to the metaphor and the biopsychosocial framework will demonstrate greater knowledge, endorse a greater range of accepted treatment options, and will demonstrate a greater perceived understanding of chronic pain than those exposed to just the biopsychosocial framework.

**Contributions to the field.** This study has many future implications. First, results from this study can help clinicians to better explain pain to parents and families. If parents are better able to understand their children's pain, the families' pain experience can be improved. While families may work together utilizing each member's strengths to help the impacted child, this

knowledge and understanding can help. Clinicians and families work together every day to help patients handle their pain. The results of this study could aid in this process.

## **Methods**

### **General Information**

This study was performed through Boston Children's Hospital's Pain Treatment Services Lab. The principal investigators were Dr. Deirdre Logan and Dr. Alison Smith, and the research coordinator was Tessa Wihak, M.A.

### **Participants**

**Eligibility criteria.** Parents whose children were between the ages of 8 and 18 were eligible to be included in the study. This age range was decided upon because it is the age range that is typically seen in chronic pain clinics. Participants also needed to be sufficient in their ability to both read the vignette and answer the questionnaire in English. Participants were recruited through flyers, both in online and in physical form, and through word-of-mouth. All participants were adults ages 18 and over and capable of consenting to participation.

**Study sample.** The sample consisted of 249 parents, 76% female. The mean age of participants was 44.98 years ( $SD = 7.67$ ). Participants had an average of 2.37 children ( $SD = 0.91$ )

### **Recruitment**

Participants were recruited via flyers and word-of-mouth. The flyer informed participants about the study and provided the REDCap survey link. The flyers were posted around the greater Boston area as well as throughout the Mid-Atlantic region.

### **Design**

The current study utilized a cross-sectional between-subjects design. The participants were randomly assigned to one of five study conditions. These conditions utilized different

frameworks to explain a pediatric pain diagnosis to parents. Three of the conditions manipulated a single factor of the explanatory framework – i.e. a biomedical, cognitive behavioral, or biopsychosocial explanatory framework. The final two conditions utilized metaphors as the primary framework for explaining the pain diagnosis or utilized metaphors along with a biopsychosocial model, respectively. The vignettes all described a child who has developed Complex Regional Pain Syndrome (CRPS). This was a condition that is relatively unfamiliar to the general public and is commonly seen in chronic pain centers. The data were collected at a single time point via Boston Children’s Hospital’s REDCap electronic research database. Once all data had been collected, there was a drawing for an I-Pad, which one participant received. IRB approval was obtained from Boston Children’s Hospital and Tufts University.

### **Procedure**

Study participants followed a secure link to the REDCap encrypted survey software. They were presented with their randomized vignette and asked to answer a series of questions. The questions focused on background information, pain attributions, pain attitudes, knowledge of chronic pain, and treatment expectations. The survey took approximately thirty minutes for the participants to complete. There was a manipulation check question that every participant answered, no matter which vignette he or she received. Patients were excluded if their answer to a question about the content of the vignette they read was incorrect. This exclusion criteria was chosen because it tested the participants’ overall understanding of the vignette.

### **Materials**

The parent measures selected for this study have been utilized in studies throughout academic literature regarding pediatric pain patients and their parents. The measures were selected to assess the constructs of interest in this study. All selected scales have been validated in adult populations, thus they were appropriate for data analysis.

**Background information.** Background information including participant age, gender, parenting status (number of children, age of children, and gender of children), and ethnicity was collected. Participants were also asked if they had ever heard of or known anyone with CRPS, as it was an important factor in the study. Finally, participants were also asked whether they or any of their children had been diagnosed with a chronic pain condition, such as headaches, abdominal pain, or fibromyalgia.

**Pain attributions.** Pain attributions were measured through participant reports about their beliefs regarding the degree to which physical and psychological factors are involved with or contribute to the vignette child's pain. These reports were measured on a 3-point response scale ("probably no", "maybe", and "probably yes") with five questions about physical/medical contributors to pain and five psychological contributors to pain. The questions were adapted from the Inventory of Causes for Abdominal Pain (Claar & Walker, 1999). This adapted version has been validated by Dr. Deirdre Logan in her previously published work, which had support for its psychometric properties (Logan et al., 2007). Responses to this measure were dichotomized into probable versus uncertain or not probable pain contributors. Scores showcased the degree of balance or imbalance between biomedical and cognitive behavioral pain attributions. Answers were coded based on the accuracy of the participants' attributions. If attributions were correct, they received one point. However, if the attributions were incorrect, the participants received zero points. The total scores for the five physical/medical contributors and the five psychological contributions were summed both separately and together to best understand the data.

**Pain attitudes.** Pain attitudes were measured using a subset of sixteen items from the Survey of Pain Attitudes (SOPA), which was a validated measure testing attitudes and beliefs about chronic pain (Jensen et al., 1987). The sixteen items had been selected from the original

SOPA's 57 items and represented the following six subscales: Control (the belief that it is possible to control pain), Medical Cure (the belief that there is a medical cure for chronic pain), Medication (belief that medications are an appropriate treatment for chronic pain), Emotion (the belief that emotions impact pain), Exercise/Harm (beliefs about whether activity makes pain better or worse), and Disability (beliefs about the relationship between pain and function). Internal consistencies of the selected items were examined before this measure was utilized in analyses. It is important to note that because the SOPA is designed for individuals with their own experience of living with chronic pain, further adaptations were necessary to yield a questionnaire that could be linked to our vignette and administered to a sample without personal experience with pain (e.g., an item was changed from "Being scared makes my pain hurt more" to "Being scared will make Samantha's pain hurt more"). The answers were coded on a one-three system, with three being for positively valenced responses. The scoring for this measure were completed by summing the participants' answers in each of the subsections.

**Knowledge of chronic pain.** Knowledge of chronic pain was tested utilizing an adapted measure from previous studies by Mosely et al. (2004) and Gallagher et al. (2014). The measure was expanded to include an understanding of both biomedical and psychological factors that are related to chronic pain. The response options were true, false, and unsure. Participants were also asked to respond to two items about their self-reported understanding of the explanation of chronic pain they read. The two options were: "The explanation of this child's pain condition makes sense to me" and "Based on the information I read I have a good understanding about Samantha's pain." For these two questions only, response options were presented on a 5-point Likert scale ranging from "strongly disagree" to "strongly agree." The remaining items were coded based on correctness. Each of the true and false questions had correct and incorrect answers. Correct answers were given one point. The score for this measure was found by

adding up the participants' total scores.

**Treatment expectations.** Finally, treatment expectations were evaluated using the Claar and Scharff (2007) measure utilized in previous published studies, which provides participants with a list of common treatment recommendations for pediatric chronic pain and asks, "How much do you think the following will be helpful in the treatment of this child's pain?" Response options were presented on a five-point Likert scale ranging from "not at all" to "completely." A total score was used to represent a stronger belief in a greater number of treatment approaches. Participants were also asked to respond to two items regarding the child's prognosis: "How likely do you think it is that this child's pain will decrease? How likely do you think it is that this child will be able to return to her typical level of functioning?" Response options were presented on a five-point Likert scale ranging from "not at all likely" to "extremely likely." This measure was coded based on how positive the participants were about the different treatment options. Positively answered questions received one point and negatively answered questions received zero points. The participants' total score was tallied and used for data analysis.

### **Data Analysis Plan**

This study had a cross-sectional design. Once data collection was complete, it was examined to make sure that it met the assumptions required for parametric statistical testing. The hypotheses were tested utilizing an ANOVA approach. The first aim was tested by comparing the biomedical framework, cognitive behavioral framework, and biopsychosocial framework groups on their pain attributions, knowledge of pain, and treatment expectations. The second aim was tested by comparing the biopsychosocial framework, metaphor framework, and the biopsychosocial and metaphor combination frameworks on their pain knowledge and treatment expectations. One-Way ANOVAs were used for each aim with power set at 0.80 and alpha set at 0.05. Descriptive statistics were also run in order to have the best possible understanding of the

data. All data was analyzed using IBM SPSS Statistics for Mac, Version 25.

## Results

The results of all analyses are presented below. Initial descriptive statistics, correlation coefficients, and one-way Analysis of Variance (ANOVA) results are also detailed in Tables 4-6.

### Descriptive Findings and Bivariate Correlations

The study had a total of 249 participants, with 49 in the biomedical group, 47 in the psychological group, 48 in the biopsychosocial group, 52 in the metaphor-only group, and 53 in the biopsychosocial and metaphor combination group. Of those participants, 17% had heard of CRPS and 5% knew someone who had been diagnosed with CRPS. Twenty-three percent of the participants had been diagnosed with chronic pain and 17% of the participants had had another of their children's caregivers with a chronic pain diagnosis. Finally, 13% of the participants had a child with a chronic pain diagnosis. Please refer to Table 1 for comprehensive demographic information.

Knowledge of the pain diagnosis was calculated by assessing the number of factual questions out of 14 the participant answered correctly ( $M = 9.88$ ,  $SD = 3.00$ ). Causes, or attributions, of pain were calculated by assessing the number of psychological causes out of five the participants endorsed ( $M = 2.10$ ,  $SD = 1.80$ ), the number of physical causes out of five the participant endorsed ( $M = 1.86$ ,  $SD = 1.52$ ), and the total number of endorsements out of ten the participant made ( $M = 3.96$ ,  $SD = 2.89$ ). Treatment expectations were calculated by calculating the total positively valenced answers out of 16 provided by participants ( $M = 14.69$ ,  $SD = 4.53$ ). Pain attitudes were calculated utilizing the Survey of Pain Attitudes. This measure has six sub-categories including items addressing control ( $M = 6.95$ ,  $SD = 2.16$ ), disability ( $M = 5.07$ ,  $SD = 1.90$ ), exercise ( $M = 2.95$ ,  $SD = 1.24$ ), emotion ( $M = 8.01$ ,  $SD = 2.18$ ), medication ( $M = 4.65$ ,  $SD = 1.45$ ), and medical cure ( $M = 6.13$ ,  $SD = 1.89$ ). Please refer to Table 2 for descriptive statistics.

Bivariate correlations among vignette group and knowledge of pain, pain attributions, treatment expectations, and pain attitudes can be found in Table 3. Correlations were significant between group and the endorsement of both psychological and physiological attributions ( $r = 0.16, p < .05$ ) and group and psychological attribution endorsements ( $r = 0.19, p < .01$ ). The groups that received metaphors scored higher than those groups who did not receive metaphors, suggesting an association between receiving pain explanations using metaphors and endorsing an overall greater number of potential causes/contributors for the pain condition described in the vignette. Respondents who reported their child had another caregiver with chronic pain tended to have higher numbers of both physical and psychological endorsements ( $r = 0.14, p < .05$ ) and only physical endorsements ( $r = 0.15, p < .05$ ). Those whose children had another caregiver with chronic pain who received metaphor frameworks were more likely to endorse physical-only pain attributions and the combination of physical and psychological endorsements than those who did not receive metaphor frameworks. Finally, significant correlations were also found between vignette group and the control attitude subscale ( $r = 0.13, p < .05$ ), medication subscale ( $r = 0.13, p < .05$ ), and emotion subscale ( $r = 0.14, p < .05$ ). Those who received either of the frameworks that included metaphors were more likely to believe in the ability for individuals to control their pain, the effectiveness of medication for pain, and the relevance of emotions in the experience of living with chronic pain than those who did not receive metaphor frameworks.

### **Analyses of Variances**

One-way Analysis of Variances (ANOVAs) were conducted and all of the results can be found in Tables 4, 5, and 6.

**Aim one analyses.** Analyses were run between the biomedical, psychological, and biopsychosocial groups. Results of an ANOVA between participants' knowledge of pain diagnosis were not significant,  $F(2, 141) = 0.321, p = 0.726$ . Results of an ANOVA involving

participants' expectations for treatment were not significant,  $F(2, 141) = 0.172, p = .842$ .

ANOVAs were also run involving those participants who endorsed physical causes for pain, psychological causes for pain, and total endorsements. The results for physical endorsements were not significant,  $F(2, 141) = 0.166, p = 0.847$ , as were the results for psychological endorsements  $F(2, 141) = 1.598, p = 0.206$ . Analyses for total endorsements were also not significant,  $F(1, 141) = 0.405, p = 0.668$ .

Pain attitudes were calculated utilizing an adapted version of the Survey of Pain Attitudes (SOPA). ANOVAs were run comparing six sub-groups of the pain attitudes measure. None of these ANOVAs were significant. This results of the measure's six sub-categories included items addressing control ( $F(2, 141) = 0.052, p = 0.949$ ), disability ( $F(2, 141) = 0.377, p = 0.687$ ), exercise ( $F(2, 141) = 0.159, p = 0.853$ ), emotion ( $F(2, 141) = 0.416, p = 0.660$ ), medication ( $F(2, 141) = .091, p = 0.913$ ), and medical cure ( $F(2, 141) = 0.276, p = 0.759$ ).

**Aim two analyses.** Analyses were run between the biopsychosocial, metaphor only, and biopsychosocial and metaphor groups. Results of an ANOVA between participants' knowledge of pain diagnosis were not significant,  $F(2, 150) = 0.773, p = 0.463$ . Results of an ANOVA involving participants' expectations for treatment were not significant,  $F(2, 150) = 0.565, p = .569$ . ANOVAs were also run involving those participants who endorsed physical causes for pain, psychological causes for pain, and total endorsements. The results for physical endorsements were not significant,  $F(2, 150) = 2.554, p = 0.081$ , as were the results for psychological endorsements  $F(2, 150) = 2.271, p = 0.107$ . Analyses for total endorsements were significant,  $F(1, 150) = 3.119, p < 0.05, \eta^2 = .040$ . Participants who read a vignette that had only a metaphor ( $M = 5.04, SD = 3.087$ ) were significantly more likely to endorse both psychological and physiological causes of pain than those who read a vignette with biopsychosocial components ( $M = 3.54, SD = 3.128$ ).

Pain attitudes were calculated utilizing an adapted version of the Survey of Pain Attitudes (SOPA). ANOVAs were run comparing six sub-groups of the pain attitudes measure. None of these ANOVAs were significant. This results of the measure's six sub-categories included items addressing control ( $F(2, 150) = 1.110, p = 0.332$ ), disability ( $F(2, 150) = 0.048, p = 0.953$ ), exercise ( $F(2, 150) = 0.059, p = 0.943$ ), emotion ( $F(2, 150) = 1.178, p = 0.311$ ), medication ( $F(2, 150) = 1.670, p = 0.192$ ), and medical cure ( $F(2, 150) = 0.526, p = 0.592$ ).

### **Discussion**

With growing interest in the language used to describe pain diagnoses to parents, there is a known need to understand pediatric chronic pain from a parent's perspective (Coakley & Schechter, 2013; Palermo et al., 2014). As was previously stated, current research has looked at how multidisciplinary assessments and the use of metaphors have impacted parent and patient understanding of pain disorders. However, this study would add to this field of research because of its experimental approach and use of a general sample instead of a sample of only families with experience with living with chronic pain (Claar et al., 2013). Also, while research suggests that metaphors are helpful in aiding patient and family understanding, it is not known if metaphors can be effective on their own (Coakley & Schechter, 2013). This study worked to fill this void in research by comparing a metaphor-only framework with a metaphor and biopsychosocial combination framework. Overall, this study's purpose was to inform clinical professionals about how their use of language and explanatory frameworks could be impacting parents' overall knowledge about pain diagnoses, willingness to accept a range of treatment options, and perceived understanding of chronic pain diagnoses. The current study was designed to assess the effectiveness of different explanatory frameworks used to inform parents about pediatric chronic pain. The following discussion addresses major themes related to the study's research questions and aims.

### **Summary of Findings**

Given the many aims and aspects of this study, a summary of the main findings is provided. The type of vignette that parents read was significantly, positively correlated with parents' overall ideas about the causes of pain. The vignette type was also significantly, positively related to parents endorsing psychological aspects of pain. Finally, those participants that read a vignette with only metaphor components were significantly more likely to endorse both psychological and physiological causes of pain than those who read a vignette with biopsychosocial components.

### **Knowledge of Pain**

Overall, the findings did not support the hypothesis that parents would be more knowledgeable of pain if they read the biopsychosocial vignette or if explanations were enhanced with the use of metaphors. This is surprising because those parents who received a biopsychosocial framework were given much more information about pain than those who received only the biomedical or psychological vignettes. It is possible that the results were due to other factors. Future studies should look at the potential impacts of race and education/socioeconomic status on knowledge of pain. Perhaps if we had controlled for these factors, our results would have been different.

It is also important to note that personal experience with pain was not controlled for in this particular study. It would be expected that a participant who either had their own pain experience, had a child with a pain condition, or had a parenting partner with a pain condition would have a greater knowledge about pain. Future studies should look into this potential link to help explain knowledge differences.

Family Systems Theory comes into play here because it is important to know that the knowledge that a parent has about pain can be utilized as a resource to help them reach

homeostasis. Therefore, it is important for parents to know how about their child's diagnosis and symptoms. The parents in this particular study only averaged earning a 71% on the knowledge test. Therefore, this sample does somehow need to gain more knowledge about pediatric pain. It is important to note that while both parents could have participated, this survey showcases that perhaps family systems are not operating with the knowledge needed to adequately make decisions to reach the families' goals.

This also relates to the Integrative Model of Parent and Family Factors because the dyadic variable level is impacted by individual characteristics, such as knowledge. The relationship between the parent and child can be impacted by the parent's knowledge because it can impact the ways in which pain is understood throughout the family unit. It is also important that the family understands pain in such a way that they can explain pain to their child in a developmentally appropriate manner. Overall, knowledge of pain can have a major impact on the family relationship when a child has pain and can also impact the overall experience of the family.

### **Pain Attributions**

With regard to pain attributions, those results involving physical causes of pain and psychological and physical causes of pain were not significant. In most pain clinics, a multidimensional, biopsychosocial approach is used (Dickson, 2017). Therefore, research has shown that it is important for parents to understand the biomedical, psychological, and social components of pain. However, the results of this study showed that those who received this framework did not necessarily endorse pain attributions differently. Previous research has looked at the ways in which teachers perceive pain and have found that medical evidence and direct communication were important aspects of teacher pain understanding (Logan, Coakley, & Scharff, 2007). Future research should look at this study's results as well as other common ways

to explain pain to find if there is a different way to describe pain to parents so that they can better understand the different causes of childhood pain.

This aspect of the study had significant correlations. The vignette group was positively correlated with physiological and psychological endorsements and only psychological endorsements. The more information that was presented to the participants, the more likely they were to endorse physical and psychological attributions of pain, as well as psychological attributions on their own. Interestingly, those participants whose children had another caregiver with chronic pain endorsed significantly more physical and psychological pain attributions as well as psychological-only pain attributions. Future research should focus on this relationship because it could help to explain how to best inform families with a history of chronic pain about pediatric pain.

These results are also a bit of a surprise because as hypothesized, it was expected that there would have been differences between those who received psychological and biomedical vignettes. For examples, those who received biomedical vignettes were expected to have physical pain attributions, while those who received psychological vignettes were expected to endorse psychological pain attributions. Future research should be completed to better understand pain attributions in the general public. While participants were asked to answer all questions in regard to the vignette, it is likely that their own previous knowledge and attributions may have had an impact on the way that they responded. It is also possible that the social desirability effect played a role in participant responses. If the participants thought that a certain response was wanted, they may have felt pressured to give those “ideal” answers.

### **Pain Attitudes**

The findings regarding pain attitudes were also not significant. This was surprising because there were no significant ANOVA differences between the vignette groups among the

six different subsections (control, disability, exercise, emotion, medication, and medical cure). For example, one would expect that those receiving a psychological based framework would rate emotional items high, while someone who received a biomedical based framework would positively rate exercise items. This is not something that necessarily happened in any of the subgroups. While each of the groups rated the different subscales differently, it was in such a small manner that it did not end up making much of a difference. While the ANOVA may not have been significant, the bivariate correlations were. The vignette group was positively correlated with the control attitude subscale medication subscale, and emotion subscale. Future research should be utilized to look at how this link can be used in future clinical practice. The results showcased that metaphors could help clinicians to explain the benefits of medication in pain treatment, the impact of emotion on the pain experience, and one's ability to control his or her pain. By fully explaining this to parents, they may be able to better handle, understand, and explain their children's pain.

The Integrative Model of Parent and Family Factors comes into play with these results because of the interaction between the individual level and the dyadic level as well as the interaction between the family system and the moderating and mediating variables. This section of the survey tested six different subsections of pain attributions. Because of this, the data was able to show individual differences between participants. This goes to show how a child's pain can interact with parental variables, such as pain attitudes, to impact the overall parent-child dyadic relationship. This section could also have been impacted by not controlling for parental pain history. This is a common individual characteristic in the Integrative Model of Parent and Family Factors. Therefore, a parent's history with pain could easily impact how they view pain in relation to control, disability, exercise, emotion, medication, and medical cure. This relates to previous research that found that those parents who had a previous experience with pain and

sought treatment for that pain were more likely to have children with higher pain ratings. In fact, child catastrophizing was found to be a mechanism through which parental and family medical history influenced child ratings of their own pain (Schanberg et al., 2001). Future research can utilize this model to help conceptualize how individual family members, dyadic family relationships, and the overall family unit can interact together and also interact with the parent's individual experience with pain. This could help clinicians to better understand why parents may have certain attitudes about pain.

### **Treatment Expectations**

With regard to treatment expectations, the findings did not support the hypothesis that parents who received the biopsychosocial framework would be more positive about a range of potential treatment options than those parents who received only biomedical or psychological explanations. This hypothesis was created because of the idea that those who received more information about the diagnosis would have a greater range of expectations about how CRPS could be treated. Perhaps participants did not understand some of the treatments or had other ideas about which treatments would be the most effective.

The survey gave participants the option to state their own ideas about treatment options that may not have been a part of the questions. Around 6% of survey responses state that prayer would potentially have a positive impact on the patient. While this is not a large number of total participants, religion could have played a role in the study's results. Studies have found that religion impacts the ways in which parents view medical treatments (Herrera, 2005). Religious beliefs were not asked during the demographic questions. Therefore, it is not possible to control or test to see if they may have had any impact on the study results.

Family Systems Theory clearly connects to potential ideas about treatment expectations. When a child is experiencing pain, it becomes the family's problem. Therefore, families will

work to achieve the goal of eliminating that problem. This survey worked to better understand which treatment options are related to different frameworks in order to know how parents view these potential pain treatments. While the data showed that there were not significant differences between the groups, it did show that there were slight differences between the treatment options. Therefore, parents may have been utilizing different paths to reach the same goal. Future research should look into the different paths that parents commonly endorse positively. Therefore, clinicians will be better aware of which common treatment methods have parental support and which methods might need a bit more explanation. This relates to previous research as it has been found that parents commonly endorse medication, rest/sleep, and temperature therapies for treating pain and few utilized psychosocial treatments (Claar & Scharff, 2007).

### **Metaphors**

The second aim of the study was to test if those participants who received a vignette with a metaphor performed differently on the survey than those who did not receive a metaphor. According to the results of the study, the use of a metaphor did not have an impact on the participants' overall pain knowledge, pain attitudes, pain attributions, and treatment expectations. However, the results did show that those participants who received a metaphor-only framework were more likely to endorse both psychological and physiological attributions of pain than those who received a biopsychosocial framework. This is important because it showed that those who received the common biopsychosocial model framework were less likely to endorse psychological and physiological pain attributions. Because pain clinics often employ a biopsychosocial approach, it is essential that parents understand that pain can have a multitude of causes. Therefore, these results suggest that in explaining the causes of pain it can be useful in a clinical setting to include the use of metaphors. These results were also important because it showed that the use of a metaphor did have a positive impact. The inclusion of this language

resulted in parents endorsing the understanding that pain can have a variety of psychological and physiological attributions. This endorsement shows that the use of a metaphor in pain clinic settings can help parents to better understand their children's pain and offer more support to their children.

There are a variety of reasons that metaphors may not have had the expected impact on participant responses. Perhaps there is a better metaphor to use in this setting. There are a variety of different metaphors that can be used to help explain pain (Coakley & Schecter, 2013). Maybe the volume control metaphor simply was not effective in this sample. It is also possible that participants did not understand the metaphor. There were a number of participants who stated that they had a hard time understanding the vignettes. While I do not know which vignettes these participants received, it is possible that the metaphor added to this confusion. Future studies should look to see which, if any, metaphors result in the greatest understanding of pediatric pain. Research can then focus on how these metaphors impact parents pain knowledge, pain attributions, pain attitudes, and treatment expectations.

### **Effect Sizes**

Overall, the effect sizes on the relationships between the variables were quite small. Therefore, while there were significant relationships between variables, they may not have explained the differences between parents' responses to the survey. Because there were small effect sizes, it is possible that the significant findings were significant due to other variables. This is surprising because it was expected that the parents would respond differently to the survey questionnaire based on the vignette they were presented; for example, it was expected that parents who were presented the biological vignette would have supported more biological pain attributions than those parents who were presented the psychological vignette. It is possible that participants' experience with pain may have been a significant aspect of their responses.

This, along with the parent's age and other family attributions, such as parenting style fall in line with the Integrative Model of Parent and Family Factors (Palermo & Chambers, 2005).

### **Limitations and Future Directions**

Due to its design, this study was potentially limited by the presentation of data gathered from multiple people with similar experiences with pain. Additionally, while participants were asked about their experiences with pain, these experiences were not controlled for during data analysis. It is possible that those who have experience with pain will have similar attributions about and knowledge of pain resulting in similar responses. Future studies should control for the participant pain experience in order to try to better understand experience's impact on pain knowledge, attributions, and attitudes.

It is also possible that the study had a homogeneous sample. While some demographic information was asked during the survey, participants were not asked about their race or socioeconomic status. This information could have shown if the sample was representative demographically. If the sample was homogeneous, participants may have had extremely similar experiences throughout their lives. Therefore, while they may not have had direct experience with chronic pain, they might still have similar knowledge and beliefs. The sample was also smaller than the ideal sample size of 260. This smaller sample size may have had an impact on the results of the study.

A small but potentially powerful limitation is the use of the name "Samantha" in the vignettes. Gender is an important socializing factor in Western society. Therefore, some participants may have had some attributions about the child's pain and experience simply because they were reading about a female patient. Future studies should implement a more ethnically diverse and gender neutral name. This would make it so that it would be less likely for participants to utilize stereotypes and other attributions when reading the vignettes and

answering the questions. However, this choice was made because the majority of chronic pain patients are female in clinical settings.

While multiple parents or caregivers for the same family could participate in the study, the sample was overwhelmingly female. This is consistent with other completed studies involving chronic pain and parents (e.g., Claar et al., 2008). Traditional mother-child relationship ideals might have impacted the ways in which mothers responded to the vignette child's pain. It was also not asked if the responding parent was the primary caregiver for his or her children. This experience might have an influence on the participant's view of childhood pain. There is also not a way to verify that participants were actually parents. Those who were targeted for participation were parents, but there was not a way to control who was actually taking the survey.

The survey did ask for the participant's children's ages and genders. However, this was not controlled for or evaluated in this particular aspect of the study. Future studies could utilize this data to see if there were differences between parents of girls, boys, or both. It would also be interesting to see if there are differences between parents of older children than the parents of younger children. Because of the low effect sizes found in this study, these variables and those mentioned above, may be of interest in future research. However, these participants are an important resource for better understanding parents' knowledge, attributions, and expectations of pediatric chronic pain. The data from this sample was used to generate findings that can help to better inform research, especially research with a more diverse sample.

Another factor that may have influenced the study results is the social desirability effect, which states that participants may give answers that they think they should give. If participants thought that certain answers were correct or expected, they may not have answered honestly. Therefore, it may not have mattered which vignette they received. It is also possible that simply

reading a short vignette did not lead to participants feeling as attached to the child. Therefore, they may have not have spent the time to answer the questions as thoughtfully as they might have if they were focusing on their own or their child's experiences with pain.

Even with these limitations, the present study's findings add to previous research and help to inform future areas of research, specifically about gender, racial differences, and pain experience in relation to parents' views and expectations about the childhood experience with pain. The study inspires future directions because the results showcased that common explanatory frameworks may not be conveying all that we hope they do. Understanding parental views on pain is important in not only a clinical research setting, but also because it can help us to better inform families about pain. For example, based on the significant differences in attributions, clinicians should perhaps incorporate metaphors in their pain explanations. By incorporating metaphors and different explanatory frameworks into daily practice, clinicians can better serve their clinic's patients and families.

Pain is something that most people will experience throughout their lifetime. Therefore, it is important for clinicians to best understand how to explain pain to patients and families. This study helped to inform this practice because of its use of different explanatory frameworks and metaphors. While the results were mainly insignificant, they can be utilized to best inform future research on the topic through the inclusion of previous experience with pain in data analysis and can help clinicians to know that metaphors can help patients and families better understand pain.

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**Tables**

Table 1

*Demographic Information – Pain Experience, N = 249*

	Percentage of Participants
Heard of CRPS	17%
Knew Someone with CRPS	5%
Personal Chronic Pain	23%
Diagnosis	
Caregiver for Child with Chronic Pain	17%
Child with Chronic Pain	13%

Table 2

*Descriptive Statistics, N = 249*

	Biomedical Framework Mean(SD) N = 49	Psychological Framework Mean(SD) N = 47	Biopsychosocial Framework Mean(SD) N = 48	Metaphor Framework Mean(SD) N = 52	Biopsychosocial and Metaphor Framework Mean(SD) N = 53
Pain	9.80(3.08)	9.40(3.57)	9.92(3.11)	10.44(2.70)	9.81(2.50)
Knowledge					
Physiological Attribution Endorsement	1.78(1.34)	1.70(1.47)	1.60(1.58)	2.31(1.62)	1.89(1.52)
Psychological Attribution Endorsement	1.45(1.58)	2.02(1.60)	1.94(1.91)	2.73(1.88)	2.28(1.82)
Physiological and Psychological Endorsement	3.22(2.45)	3.72(2.64)	3.54(3.13)	5.04(3.09)	4.17(2.83)
Medication Attitude	4.39(1.51)	4.51(1.44)	4.50(1.75)	5.02(1.28)	4.77(1.20)
Emotion Attitude	7.53(2.42)	7.96(2.34)	7.88(2.55)	8.13(1.98)	8.49(1.46)
Control Attitude	6.69(2.31)	6.62(2.28)	6.77(2.37)	7.30(2.00)	7.30(1.79)
Medical Cure	6.12(1.99)	6.19(2.02)	5.90(2.10)	6.25(1.70)	6.19(1.70)

## Attitude

Disability	5.35(2.09)	5.04(1.96)	5.02(2.16)	4.92(1.68)	5.02(1.66)
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## Attitude

Exercise	3.02(1.23)	2.89(1.26)	2.90(1.31)	2.94(1.21)	2.98(1.22)
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## Attitude

Treatment	14.82(4.47)	14.45(5.03)	14.25(4.97)	14.71(4.17)	15.19(4.17)
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Expectations

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Table 3  
*Bivariate Correlation*

	Heard of CRPS	Know Someone with CRPS	Chronic Pain Diagnosis	Other Caregiver with Chronic Pain	Child Diagnosed with Chronic Pain	Knowledge	Physical Endorsements	Psych. Endorsements	Physical and Psychological Endorsements	Medication	Emotion	Control	Medical Cure	Disability	Exercise	Treatment Expectations
Heard of CRPS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Know	0.512***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Someone with CRPS																
Chronic Pain Diagnosis	-0.044	-0.024	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other Caregiver with Chronic Pain	-0.144*	-0.103	-0.195**	-	-	-	-	-	-	-	-	-	-	-	-	-
Child Diagnosed with Chronic Pain	-0.235***	-0.142*	-0.125	0.084	-	-	-	-	-	-	-	-	-	-	-	-
Knowledge	-0.062	-0.072	-0.050	0.058	-0.009	-	-	-	-	-	-	-	-	-	-	-
Physical Endorsements	0.074	-0.031	-0.057	0.155*	-0.107	0.244***	-	-	-	-	-	-	-	-	-	-
Psych. Endorsements	0.028	0.017	0.033	0.091	-0.098	0.237***	0.513***	-	-	-	-	-	-	-	-	-
Physical and Psychological Endorsements	0.057	-0.006	-0.009	0.138*	-0.117	0.276***	0.845***	0.893***	-	-	-	-	-	-	-	-
Medication	0.093	-0.069	-0.095	0.148*	-0.115	0.403***	0.334***	0.272***	0.345***	-	-	-	-	-	-	-
Emotion	0.021	-0.085	-0.030	0.099	-0.075	0.492***	0.235***	0.359***	0.347***	0.646***	-	-	-	-	-	-
Control	0.009	-0.050	-0.030	0.105	-0.004	0.513***	0.221***	0.336***	0.326***	0.640***	0.786***	-	-	-	-	-
Medical Cure	0.093	-0.014	-0.077	0.105	-0.087	0.417***	0.217**	0.206**	0.242***	0.658***	0.719***	0.703***	-	-	-	-
Disability	0.100	0.003	0.027	0.049	-0.152*	0.175**	0.153*	0.066	0.122	0.427***	0.528***	0.327***	0.438***	-	-	-
Exercise	0.107	0.008	0.004	-0.059	0.049	0.059	-0.008	0.022	0.010	0.355***	0.432***	0.247***	0.433***	0.539***	-	-
Treatment Expectations	0.099	0.010	-0.082	0.101	-0.030	0.268***	0.194**	0.144*	0.192**	0.489***	0.682***	0.682***	0.599***	0.611***	.549***	-

Note. \*<.05, \*\*<.01, \*\*\*<.001

Table 4

*ANOVA Aim 1, N = 144*

	df Between	df Within	F-Score	Effect Size ( $\eta^2$ )
Pain	2	141	0.321	0.005
Knowledge				
Physiological	2	141	0.166	0.002
Attribution				
Endorsement				
Psychological	2	141	1.598	0.022
Attribution				
Endorsement				
Physiological	2	141	0.405	0.006
and				
Psychological				
Endorsement				
Medication	2	141	.091	0.001
Attitude				
Emotion	2	141	0.416	0.006
Attitude				
Control	2	141	0.052	0.001
Attitude.004				
Medical Cure	2	141	0.276	0.004
Attitude				

Disability	2	141	0.377	0.005
Attitude				
Exercise	2	141	0.159	0.002
Attitude				
Treatment	2	141	0.172	0.002
Expectations				

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Table 5

*ANOVA Aim 2, N = 153*

	df Between	df Within	F-Score	Effect Size ( $\eta^2$ )
Pain	2	150	0.773	0.010
Knowledge				
Physiological	2	150	2.554	0.033
Attribution				
Endorsement				
Psychological	2	150	2.271	0.029
Attribution				
Endorsement				
Physiological	2	150	3.119*	0.040
and				
Psychological				
Endorsement				
Medication	2	150	1.670	0.022
Attitude				
Emotion	2	150	1.178	0.015
Attitude				
Control	2	150	1.110	0.015
Attitude				
Medical Cure	2	150	0.526	0.007
Attitude				

Disability	2	150	0.048	0.001
Attitude				
Exercise	2	150	0.059	0.001
Attitude				
Treatment	2	150	0.565	0.007
Expectations				

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*Note.* \* $<.05$

Table 6

*ANOVA 2, Post-Hoc Test: Both Physiological and Psychological Endorsements*

	Mean Difference
Biopsychosocial vs. Metaphor	-1.497*
Biopsychosocial vs. Biopsychosocial and Metaphor	-0.628
Metaphor vs. Biopsychosocial and Metaphor	0.869

*Note.* \* $<.05$

Figures

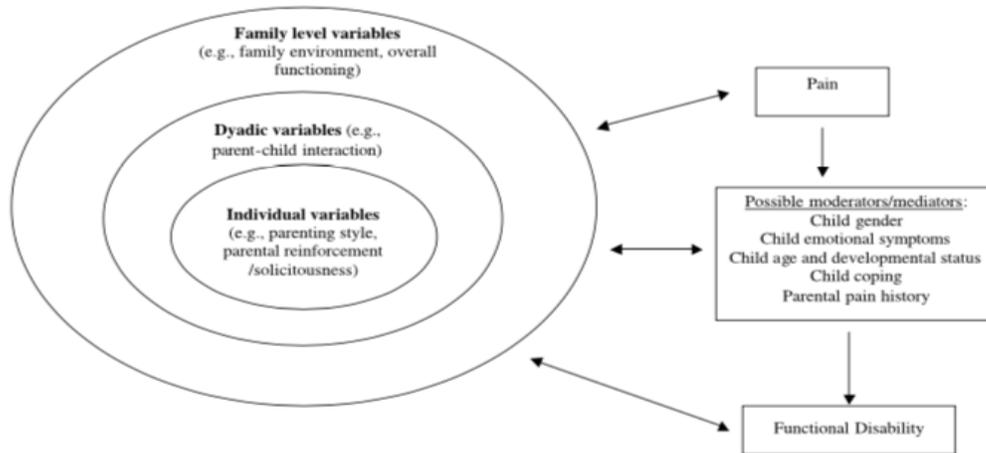


Fig. 1. Integrative model of parent and family factors in pediatric chronic pain and associated disability (Palermo & Chambers, 2005).

## Appendix I

### Vignettes

#### Biomedical Framework

Samantha is a 13 year old girl with Complex Regional Pain Syndrome (CRPS). CRPS is a "neuropathic" or nerve-based chronic pain condition. It is believed to be caused by an irregularity of the nervous system, which includes the brain, the spinal cord, and the nerves that signal to the rest of the body.

The main symptom of CRPS is significant pain, typically described as burning or pins-and-needles pain, often accompanied by changes in skin color, skin temperature, and/or swelling in the affected area. CRPS often causes disruptions to many areas of a child's normal functioning, such as school attendance, participation in physical activities, sleep, and spending time with family and friends.

CRPS is best understood as an abnormal functioning of the nerves. The underlying causes of CRPS are not well understood. It may be caused by an injury or a surgery. Even very minor injuries can trigger CRPS for some people. Evidence suggests that abnormalities in the nervous system, blood vessels, immune system and one's genetic makeup may all play a role.

#### Psychological Framework

Samantha is a 13 year old girl with Complex Regional Pain Syndrome (CRPS). CRPS is a "neuropathic" or nerve-based chronic pain condition. It is believed to be caused by an irregularity of the nervous system, which includes the brain, the spinal cord, and the nerves that signal to the rest of the body.

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such as school attendance, participation in physical activities, sleep, and spending time with family and friends.

CRPS is best understood as an abnormal functioning of the nerves. The underlying causes of CRPS are not well understood. It may be caused or exacerbated by emotional stress, previous experiences with pain, and difficulty adjusting to things going on in one's life. Evidence suggests that psychological factors like mood, anxiety, or the way one thinks about things can also play a role in a patient's experience of pain. Pain sensation, pain experience, stress and emotional factors all appear to interact in a cycle where each makes the other worse.

### Biopsychosocial Framework

Samantha is a 13 year old girl with Complex Regional Pain Syndrome (CRPS). CRPS is a "neuropathic" or nerve-based chronic pain condition. It is believed to be caused by an irregularity of the nervous system, which includes the brain, the spinal cord, and the nerves that signal to the rest of the body.

The main symptom of CRPS is significant pain, typically described as burning or pins-and-needles pain, often accompanied by changes in skin color, skin temperature, and/or swelling in the affected area. CRPS often causes disruptions to many areas of a child's normal functioning, such as school attendance, participation in physical activities, sleep, and spending time with family and friends.

CRPS is best understood as an abnormal functioning of the nerves. The underlying causes of CRPS are not well understood. Biological, genetic, physical, and psychological factors may all play a role. Evidence suggests biological factors such as abnormalities in the nervous system, blood vessels, immune system and one's genetic makeup can contribute to CRPS. Psychological factors such as stress, anxiety, depression, previous experiences with pain, and difficulty adjusting to things going on in one's life also contribute to a patient's experience of pain.

### Metaphor Framework

Samantha is a 13 year old girl with Complex Regional Pain Syndrome (CRPS). CRPS is a "neuropathic" or nerve-based chronic pain condition. It is believed to be caused by an irregularity of the nervous system, which includes the brain, the spinal cord, and the nerves that signal to the rest of the body.

The main symptom of CRPS is significant pain, typically described as burning or pins-and-needles pain, often accompanied by changes in skin color, skin temperature, and/or swelling in the affected area. CRPS often causes disruptions to many areas of a child's normal functioning, such as school attendance, participation in physical activities, sleep, and spending time with family and friends.

In chronic pain conditions like CRPS, it is helpful to think of the nervous system in the body as having a volume control dial like a radio or an iPod. When the nervous system volume is low, there is less pain. When the nervous system volume is turned up high, a person experiences a lot of pain. This volume dial in the nervous system is turned up or down depending on many factors. For example, having pain problems in the family, the presence of a chronic illness, or a recurrent injury can turn up the volume in the nervous system and make a person more sensitive to pain. Other factors that impact the volume in the nervous system include how a person thinks about pain, how active they are, and what medications they take.

### Biopsychosocial and Metaphor Framework

Samantha is a 13 year old girl with Complex Regional Pain Syndrome (CRPS). CRPS is a "neuropathic" or nerve-based chronic pain condition. It is believed to be caused by an irregularity of the nervous system, which includes the brain, the spinal cord, and the nerves that signal to the rest of the body.

The main symptom of CRPS is significant pain, typically described as burning or pins-and-

needles pain, often accompanied by changes in skin color, skin temperature, and/or swelling in the affected area. CRPS often causes disruptions to many areas of a child's normal functioning, such as school attendance, participation in physical activities, sleep, and spending time with family and friends.

CRPS is best understood as an abnormal functioning of the nerves. The underlying causes of CRPS are not well understood. Biological, genetic, physical, and psychological factors may all play a role. Evidence suggests biological factors such as abnormalities in the nervous system, blood vessels, immune system and one's genetic makeup can contribute to CRPS. Psychological factors such as stress, anxiety, depression, previous experiences with pain, and difficulty adjusting to things going on in one's life also contribute to a patient's experience of pain.

In chronic pain conditions like CRPS, it is helpful to think of the nervous system in the body as having a volume control dial like a radio or an iPod. When the nervous system volume is low, there is less pain. When the nervous system volume is turned up high, a person experiences a lot of pain. This volume dial in the nervous system is turned up or down depending on many factors. For example, having pain problems in the family, the presence of a chronic illness, or a recurrent injury can turn up the volume in the nervous system and make a person more sensitive to pain. Other factors that impact the volume in the nervous system include how a person thinks about pain, how active they are, and what medications they take.

## Appendix V



# Are you the parent of a child between the ages of 8-18?

HELP RESEARCHERS AT BOSTON CHILDREN'S HOSPITAL  
LEARN HOW PARENTS UNDERSTAND CHRONIC PAIN IN  
CHILDREN

Participate in a short online survey from researchers at the  
Pain Treatment Service at Boston Children's Hospital.

*All participants will be entered in a drawing for an iPad!*

### Who can participate?

- Parents of children ages 8-18
- Able to read the survey in English
- Have internet access

### What's involved?

- Go to this link:  
[https://redcap.tch.harvard.edu/redcap\\_edc/surveys/?s=JDPxYGoNnh](https://redcap.tch.harvard.edu/redcap_edc/surveys/?s=JDPxYGoNnh)
- Read a short story about a child with chronic pain
- Answer a brief survey about your understanding of pediatric chronic pain

