CHANGES IN PAIN SELF-EFFICACY AND FUNCTIONAL SELF-EFFICACY FROM CHILDHOOD TO YOUNG ADULTHOOD

By

Kezia Coleman Shirkey

Dissertation

Submitted to the Faculty of the

Graduate School of Vanderbilt University

in partial fulfillment of the requirements

for the degree of

DOCTOR OF PHILOSOPHY

in

PSYCHOLOGY

December, 2011

Nashville, Tennessee

Approved:

Professor Lynn S. Walker

Professor Bruce Compas

Professor Craig Smith

Professor James Pace

ACKNOWLEDGEMENTS

This work would not have been possible without the financial support from a grant from the National Institute on Child Health and Development (grant R01 HD23264, Lynn S. Walker, P.I.)—this research does not represent official views of the National Institute on Child Health and Development or the National Institutes of Health. The following grants also supported aspects of this research: the Vanderbilt Kennedy Center (P30 HD15052), the Vanderbilt Digestive Disease Research Center (DK058404), and the Vanderbilt General Clinical Research Center (M01 RR-00095). I also wish to acknowledge all the hard work of data collection and database management by the students who worked in the Walker lab before me that made this dissertation possible. The support and assistance provided by current lab members is also greatly appreciated. None of this research would exist without the participation of our wonderful participants who took time out of their schedules to answer our questions on multiple occasions.

I would like to thank my readers, Dr. Lynn Walker, Dr. Craig Smith, Dr. Bruce Compas, and Dr. James Pace for their comments and assistance. I would especially like to thank Lynn, my advisor, for spending countless hours reading and re-reading and given me such constructive feedback. Her suggestions and guidance on research and writing style have been invaluable and her support throughout my graduate training has helped to shape my career path.

Finally, I want to acknowledge the support of my family and friends who inspired me and supported me along the way. I have valued their willingness to provide feedback, discuss possible ideas, and encourage me when writing became difficult.

TABLE OF CONTENTS

Page

LIST OF TABLES

Table Page

LIST OF FIGURES

Figure Page

CHAPTER I

INTRODUCTION

Overview of Chronic Abdominal Pain (CAP)

Abdominal pain is the most common chronic pain complaint reported in childhood (McGrath, 1990) and is one of the most common reasons for referral to pediatric primary care providers (Starfield et al., 1980). Chronic abdominal pain (CAP) is defined as at least three episodes of abdominal pain severe enough to interrupt activities over a period of at least three months (Apley, 1975). CAP is a description of symptoms rather than a diagnosis (von Baeyer & Walker, 1999). Children with CAP exhibit high levels of somatic symptoms, anxiety and depressive symptoms, functional impairment, and health service use at the time of initial presentation (e.g. Garber, Zeman, & Walker, 1990; Lipani & Walker, 2006; L. S. Walker, Garber, Smith, van Slyke, & Claar, 2001) Medical evaluations typically do not indicate any identifiable organic illness (Dorn et al., 2003; L. S. Walker, et al., 2001; L. S. Walker, Garber, van Slyke, & Greene, 1995; L. S. Walker, Guite, Duke, Barnard, & Greene, 1998).

Several studies support the idea that the pattern of CAP and related symptoms can continue into adolescence and adulthood (Mulvaney, Lambert, Garber, & Walker, 2006; L. S. Walker, et al., 1995; L. S. Walker, et al., 1998; L. S. Walker & Heflinger, 1998). Participants with CAP and no identifiable organic diagnosis showed increased somatic symptoms, abdominal pain, and depressive symptoms when compared to well control group participants five years after initial evaluation (L. S. Walker, et al., 1995; L. S.

Walker, et al., 1998; L. S. Walker & Heflinger, 1998). A recent longitudinal study (Mulvaney, et al., 2006) demonstrated three distinct trajectories of symptoms and functional impairment at follow-up. Both low risk and short-term risk groups showed little elevation in symptoms and functional impairment five years after the clinic visit. However, a long-term risk group that represented 14% of the sample maintained significant levels of symptoms and functional impairment commensurate with initial reported levels. Thus, there is a need to further understand what contributes to symptom maintenance and functional impairment and the relation of psychological variables to outcomes in order to improve treatment and consequently long-term outcomes for CAP patients.

Contemporary Theories of Pain

The modern definition of pain is: "An unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage"("IASP Pain Terminology: Pain," 2008). Until the 1950's, theories of pain held that the psychological experience of pain was commensurate with the severity of the injury or damage, meaning that pain needed to involve tissue damage. The brain was constrained to the role of recipient of the peripheral signals of pain; thus individuals who endorsed pain without having clear organic damage were seen as having psychological impairment (Melzack & Katz, 2004).

Gate control theory (Melzack & Wall, 1965), one of the earlier theories involving the brain's role in pain, was proposed in 1965 and by the mid 1970's the theory was widely cited in medical text books. It is the foundation for current understanding of the

mechanisms of pain and pain perception (Melzack & Katz, 2004) and has inspired numerous clinical applications aimed at controlling pain (Novy, Nelson, Francis, & Turk, 1995). Gate control theory asserts that the signals sent from the periphery to the receptors on the spinal cord are modulated by inputs from the gate control system. These inputs sent from the gate control system are influenced by signals sent from the brain; thus, the brain has an influential role in how peripheral signals are interpreted and consequently one's experience of pain (Melzack & Katz, 2004).

It is important to recognize the role of the brain in the pain experience if we are to understand how the pain process works generally and specifically in individuals both with and without evidence of organic etiology for their pain. Research examining the experience of phantom limb pain has demonstrated that the brain is not a passive recipient of sensory inputs from the periphery (Hadjistravropoulos & Craig, 2004), but rather the brain generates sensory experience and the inputs from sensory neurons modulate the experience (Melzack & Katz, 2004). The importance of the brain in pain suggests that interventions should be aimed not just at the site of the injury, but also at the higher levels of the brain involved in perception (Melzack & Katz, 2004). The importance of the brain in the pain process also suggests that interventions aimed at cognitions, also a product of the brain, may impact one's experience of pain.

Psychology's role in the understanding and treatment of pain has been increasing since the introduction of the gate control theory of pain. Hadjistravropoulos and Craig (2004) emphasize the importance of psychological research and understanding in the field of pain. In the past, pain has been viewed from a dualistic model where it was seen as either entirely related to tissue damage or entirely in one's head and related to

psychological illness (Hadjistravropoulos & Craig, 2004). Those theories which focused only on psychological or biological causes of pain have been classified as restrictive (Novy, et al., 1995). Both restrictive views separated the mind from the body. Current conceptions of pain, including the gate control theory, embrace the mind-body connection. Theories that include both psychological and biological components have been classified as comprehensive and include gate control theory, nonradical operant behavioral theory, and cognitive behavioral theory (Novy, et al., 1995). Currently, the influences of physiological damage as well as cognitions, behavior, affect, and social factors are recognized in comprehensive theories of pain (Asmundson & Wright, 2004) both in adults and in children (Bush & DeLuca, 2001; Zeltzer, Tsao, Bursch, & Myers, 2006).

Several models incorporating biopsychosocial elements have been proposed (Asmundson & Wright, 2004). The operant model asserts that illness behavior is initially reinforced by the reduction in pain and then maintained by the addition of positive reinforcers such as social attention or negative reinforcers such as decreases in demands placed on the individual. The Glasgow model proposes that the interaction of biological and psychological factors can lead to illness behavior and that physical pathology is an important precipitant. The biobehavioral model suggests that a diathesis-stress interaction is responsible for the development of persistent pain and disability where the diathesis is a predisposition to a lower pain threshold. The fear-avoidance model asserts that the appraisal of pain as a threat results in avoidance and subsequent disability whereas an appraisal of pain as non-threatening allows one to confront the pain, leading to recovery. Asmundson and Wright (2004) suggest an integrated diathesis-stress model

resulting from their review of the above models. This integrated model suggests that some individuals have a diathesis to respond to pain with an appraisal that the pain is a threat thus leading to anxiety and apprehension, then avoidance and disability. This pattern cycles back onto itself and is moderated by social influences as well as vulnerability factors.

Contemporary theories of pain suggest that biological, cognitive, affective, behavioral, and social variables affect both the experience of pain and the maintenance or cessation of pain. Persistent pain has also been shown to have consequences on one's functioning in life (Asmundson & Wright, 2004) and can lead to pain associated disability syndrome (Zeltzer, et al., 2006). Interventions for chronic pain thus often seek to reduce difficulties in functioning, both physically and emotionally (Ashburn & Staats, 1999; Turk et al., 2003).

Self-Efficacy

Definition

Research on the construct of self-efficacy began in the 1970's and since that time has expanded greatly (DeVellis & DeVellis, 2001; J. Walker, 2001). Self-efficacy is defined as "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (Bandura, 1997, p. 3). Self-efficacy is a major component of social cognitive theory and originally grew out of social learning theory, which is grounded in operant conditioning principles. Operant conditioning states that behaviors are determined by their consequences. Rotter expanded these principles to

social behavior when he developed social learning theory. Bandura also developed a separate social learning theory, later known as social cognitive theory. Social learning theory purports that the value people put on an outcome and the expectancy that the behavior will result in the outcome are the two major determinants of behavior (DeVellis & DeVellis, 2001). Thus, if people believe a behavior will produce a valued outcome, they are likely to execute the behavior.

Rotter also introduced the concept of locus of control pertaining to belief about whether an outcome is under one's control or under the control of an external entity (DeVellis & DeVellis, 2001). Though self-efficacy grew out of the locus of control literature, they are separate constructs. People's understanding of their control in a situation can have differing effects on their self-efficacy, depending on whether they feel talented in handling that situation. If they do not feel capable and feel they have control they will have low self-efficacy (Bandura, 1977a). Conversely, one may have self-efficacy for an action but not believe this will have any effect on an outcome such as their health and would then have high self-efficacy but low internal locus of control (Ewart, 2004). However, the belief about causality ascribed to a particular behavior, either skill or chance, can mediate the resulting effects of the behavioral outcome on later perceptions of self-efficacy (Bandura, 1977a). Social cognitive theory purports that three major factors (personal, behavioral, and environmental) influence each other and resulting human agency (Ewart, 2004). Bandura's social cognitive theory differed from Rotter's social learning theory as it included imitation as a means of learning and he later developed the construct of self-efficacy; however, Kirsch (1985) has challenged the uniqueness of Bandura's construct of self-efficacy.

The construct of self-efficacy refers to people's beliefs about their capabilities, whereas traditional social learning theory focuses on outcome expectancies or people's beliefs about locus of control and the relation between behavior and outcome (Bandura, 1977a; DeVellis & DeVellis, 2001). Thus, self-efficacy is not about whether an outcome will happen but whether people believe they are able to perform the behavior thought to lead to that outcome (Bandura, 1977b). While self-efficacy has been shown to predict outcomes, its ability to predict outcomes is not related to the theoretical underpinnings of the construct of self-efficacy. The actual achievement of the outcome is not the focus in self-efficacy. Rather, people's perception that they can perform the behavior necessary for the outcome is the emphasis of self-efficacy. The behavior is not simply the subset of skills, but also the coordination of these skills into the necessary coordinated behavior (Bandura, 1997; DeVellis & DeVellis, 2001).

People's ratings of their self-efficacy are typically defined in relation to a fairly specific task or domain. It follows that self-efficacy is not a trait but rather varies within specific contexts (DeVellis & DeVellis, 2001). For example, one might feel efficacious about her ability to cook a gourmet meal but feel inefficacious about singing an opera or even something in a similar domain such as baking a wedding cake. However, when self-efficacy increases in one behavioral domain, self-efficacy in other domains, particularly similar ones, often increases (Bandura, 1977a). Some researchers suggest that self-efficacy does not have to be measured in reference to very specific tasks and that while there is not a generalized self-efficacy, it is useful to combine across tasks or dimensions and use a total self-efficacy score in research (Levin, Lofland, Cassisi, Poreh, & Blonsky, 1996). There is some disagreement about this in the literature, especially

regarding the utility of using a more generalized self-efficacy for research versus its clinical utility. Self-efficacy research across domains demonstrates that self-efficacy significantly affects one's motivation and psycho-social functioning (O'Leary, 1985).

Self-efficacy theory is concerned with the effects of people's perceptions of their capabilities and how these self-perceptions affect behavior, motivation, thoughts, and emotions (O'Leary, 1985). It is theorized that one can have self-efficacy for coping with a stressor, either in an active or accommodative manner. One's perception that she can cope in a given situation will influence whether the attempt to cope is undertaken (Bandura, 1977a). If one has high self-efficacy regarding a behavior, she will persist longer and make stronger efforts toward accomplishing this behavior, even in the context of an aversive stressor. However, one's expectation that she can handle something will not necessarily produce the desired outcome as she has to have the necessary ability to perform the behavior (Bandura, 1977a).

Self-efficacy (Keefe, Rumble, Scipio, Giordano, & Perri, 2004) is associated with improved outcomes and is an important contributor to current understandings of associations between psychological factors and chronic pain. Self-efficacy is a hypothetical construct (Chronbach & Meehl, 1955; Garber & Strassberg, 1991), meaning that it is an hypothesized process or attribute that cannot be directly observed. In the context of chronic pain, self-efficacy can be defined as a belief about one's ability to perform specific tasks despite pain and to cope while in pain (Nicholas, 2007). Self-efficacy has received extensive attention both in the general psychological literature as well as in pain specific literature, particularly in relation to functioning while in pain.

Self Efficacy and Pain

While Bandura's (1977a) research speaks largely to self-efficacy's key role in phobias—fearful and avoidant contexts—the theory can be applied to contexts of pain where people are often fearful or avoidant of behaviors that may cause increased pain. There are two ways that the construct of self-efficacy has been conceptualized in the context of chronic pain. Some investigators view self-efficacy in the context of chronic pain as people's beliefs that they can function, by performing specific behaviors, and cope emotionally despite the pain (functional self-efficacy) (e.g., Lackner & Carosella, 1999; Nicholas, 2007), whereas others view it as people's beliefs that they can alleviate pain (pain self-efficacy) (Anderson, Dowds, Pelletz, Edwards, & Peeters-Asdourian, 1995).

Bandura combines both of these versions of self-efficacy stating that perceived self-efficacy relates both to people's judgments about their ability to do certain behaviors as well as to their ability to assert control over situations (Bandura, O'Leary, Taylor, Gauthier, & Gossar, 1987). The pain literature includes studies that conceptualize self-efficacy in both of these ways. The majority of studies examining the relation between self-efficacy and functioning in the context of pain conceptualize self-efficacy as people's beliefs that they can perform specific or general behaviors despite the pain (functional self-efficacy), rather than as people's beliefs that they can alleviate the pain (pain self-efficacy) (e.g., Chong, Cogan, Randolph, & Racz, 2001; Estlander, Vanharanta, Moneta, & Kaivanto, 1994; Kaivanto, Estlander, Moneta, & H., 1995; Nicholas, 2007). Lackner, Carosella, & Feuerstein (1996) report that functional self-

efficacy is more predictive of physical performance in those with lower back pain than is pain specific self-efficacy.

Higher levels of pain self-efficacy and functional self-efficacy have related to better functional outcomes. Arnstein (2000) states that self-efficacy is typically conceptualized as a mediator, a mechanism that explains how chronic pain leads to disability. When self-efficacy is described as a mediator between pain intensity and disability (Arnstein, 2000; Arnstein, Caudill, Mandle, Norris, & Beasley, 1999; Costa, Maher, McAuley, Hancock, & Smeets, 2011) it aids our understanding of how pain leads to problems in functioning. Bandura (1987) explains that self-efficacy may divert attention away from pain by allowing one to focus on other tasks at hand rather than focusing solely on the pain. Thus, when one engages in activities, it may foster distraction that in turn reduces one's perception of pain. Those with pain may find that when they increase their activity, pain does not necessarily increase and may actually decrease (Arnstein, 2000), potentially by the mechanism described above by Bandura (1987). Mediation models support the idea that when people live with chronic pain, their self-efficacy for their ability to function may lead to actual increases in functioning (Arnstein, 2000).

Successful management of chronic pain does not necessarily mean getting rid of the pain. Rather, interventions are often aimed at increasing levels of psychological and physical functioning in spite of pain (Ashburn & Staats, 1999). Turk et al. (2003, p. 342) state that while pain levels should be managed where possible, care should also be aimed at improving "physical functioning, emotional functioning, participant ratings of global improvement and satisfaction with treatment, symptoms and adverse events, and

participant disposition". The authors specifically mention both physical and emotional functioning and note that pain levels and functioning levels are only modestly related in many studies and thus pain reduction should not be the only outcome of interest in pain intervention and research. Thus, people's belief in their ability to function in the presence of pain, functional self-efficacy, is as important as their belief that they can reduce the pain.

Self-Efficacy—Relation to Pain, Physical, and Psychological Functioning

Psychosocial factors, including self-efficacy, help predict disability from chronic pain beyond disability predicted by pain levels (Arnstein, 2000; Costa, et al., 2011). Disability resulting from chronic pain can include loss of work time and inability to perform everyday activities. Functioning is the absence of disability and the ability to carry-on every day and perform meaningful behaviors. Self-efficacy has been found to be a predictor of disability in a variety of chronic pain populations (e.g. musculoskeletal (Denison, Asenlof, & Lindberg, 2004), fibromyalgia (Buckelew, Murray, Hewett, Johnson, & Huyser, 1995), and lower back pain (Anderson, et al., 1995; Ayre & Tyson, 2001; Costa, et al., 2011; Lackner, et al., 1996; Levin, et al., 1996)). Self-efficacy has been studied in a variety of settings including pain clinics (Anderson, et al., 1995; Masedo & Esteve, 2007; Meredith, Strong, & Feeney, 2006) and primary care clinics (Barry, Guo, Kerns, Duong, & Reid, 2003; Denison, et al., 2004).

Perceived self-efficacy can effect functioning in numerous ways. It influences which activities are attempted, how much effort will be put forward, the length of persistence at an activity when challenges arise, and adherence to treatment regimens

(Bandura, 1977a; O'Leary, 1985). A literature review on physical functioning in pain patients briefly discusses the importance of self-efficacy in predicting performance on physical tasks (Geisser, Robinson, Miller, & Bade, 2003). Self-efficacy was the strongest predictor of both pain and physical activity included in this study. Self-efficacy in relation to pain has been found to correlate strongly with several important variables including disability, pain intensity, depression, work status, and catastrophizing (Denison, et al., 2004; Rahman, Reed, Underwood, Shipley, & Omar, 2008). Self-efficacy is inversely related to measures of pain throughout the literature (e.g., Buckelew, et al., 1995; Chong, et al., 2001). These relations point to the importance of knowing how these variables interact in the presence of pain.

There is strong support, across a variety of pain populations, for the importance of self-efficacy in aiding our understanding of pain and improving functional adjustment to pain (Ayre & Tyson, 2001; Borsbo, Gerdle, & Peolsson, 2010; Buckelew, et al., 1995; Denison, et al., 2004; Estlander, et al., 1994; Kaivanto, et al., 1995). In a highly cited article (Arnstein, 2000), self-efficacy[1] was shown to strongly[2] mediate the relation between disability and pain intensity using path analytic strategies. Self-efficacy accounted for more of the variance in disability than did pain intensity in two of the three samples included in the study (Arnstein, 2000). In a study examining people in a rehabilitation program for their chronic pain, functional self-efficacy[3] was once again shown to be a stronger predictor of disability than pain intensity (Meredith, et al., 2006).

---

[1] Self-efficacy refers to a *total* self-efficacy in the context of chronic pain that includes functional self-efficacy but is not limited to only functional self-efficacy and includes other self-efficacy subscales, such as pain self-efficacy.

[2] In this review the following scale is used in order to designate the strength of Pearson correlations: .1-.3=weak, .3-.5=moderate, .5-.7=strong (Hopkins, 2002).

[3] The term functional self-efficacy is used when the study examined the functional self-efficacy in isolation, rather than as part of a larger self-efficacy scale.

In back pain patients, functional self-efficacy accounted for a significant amount of the variance in physical disability levels, even after pain levels were controlled (Ayre & Tyson, 2001). In a recent longitudinal study of patients with low back pain (Costa, et al., 2011), functional self-efficacy was a predictor of the level of disability at a 12-month follow-up and mediated the influence of pain, whereas pain catastrophizing was not a significant mediator for the 12-month disability levels. The construct of functional self-efficacy moderately relates to functional disability after pain levels have been taken into account.

A review of the literature shows that when compared with other predictive variables, functional self-efficacy consistently remains one of the strongest predictors of disability. Across various chronic pain populations, ages, scales, functioning levels, and multiple countries, functional self-efficacy relates to both physical and psychological functioning as well as pain levels. In some cases functional self-efficacy has even shown greater utility in predicting disability than has pain levels (e.g., Estlander, et al., 1994; Kaivanto, et al., 1995) and functional self-efficacy has shown unique contributions beyond self-report disability measures (Kaivanto, et al., 1995).

Only two of the studies that examined the relation between pain self-efficacy and disability or functioning in the context of chronic pain were longitudinal in design (Barlow, Cullen, & Rowe, 2002; Costa, et al., 2011) and one (Barlow, et al., 2002) did not measure self-efficacy at the baseline, but rather only at follow-up. Therefore, most studies cannot draw conclusive causal inferences. In a two sample study looking at musculoskeletal pain patients in a primary care setting, self-efficacy was the strongest predictor (24% and 21% of variance) of functioning when all other variables were

controlled (Denison, et al., 2004). Fear avoidance accounted for a small (7% and 6% of variance) though significant amount of the variance when all other variables were controlled. However, the measures of disability and self-efficacy were fairly similar as they both focused on the completion of certain tasks (interference and confidence respectively) and the study was cross-sectional.

While many studies have examined the role of self-efficacy in relation to other variables such as coping, anxiety, and depression in the context of chronic pain in adults, very few studies have looked at the role of self-efficacy on anxiety and depression in children with pain, particularly not those with chronic abdominal pain (Kaminsky, Robertson, & Dewey, 2006). In a study including children, child and parent reports of functional self-efficacy were not significantly related to child reports of physical or psychological functioning (Bursch, Tsao, Meldrum, & Zeltzer, 2006). Parent and child reports of children's high functional self-efficacy related to parent reports of increased physical functioning and mental health, but not to parent reported pain levels (Bursch, et al., 2006). When looking at recurrent abdominal pain in children, Kaminsky et al. (2006) found that greater depressive symptoms are significantly related to lower levels of self-efficacy when controlling for pain levels; however, no analyses examined the relations between self-efficacy and functioning or how health locus of control and self-efficacy are related or if self-efficacy levels varied by age in pediatric populations. Thus, there is ample room for further study into the role of self-efficacy in pediatric chronic pain populations.

In general, these findings suggest that pain-related[4] self-efficacy is a key component in understanding the relation between pain and disability and suggest that people may become disabled from chronic pain, in part, because of their low self-efficacy or lack of belief in their abilities (Arnstein, 2000). Increased functioning due to higher self-efficacy may be a similar process to increased functioning because of the placebo effect. People feel more confident that they can perform a task, either because of their own resources or those provided by the "medicine" (placebo), and they consequently have a higher level of functioning (O'Leary, 1985). It may also be that people with high functional self-efficacy catastrophize less and thus have less negative outcome expectancies of performing a given task (Lackner, et al., 1996).

The type of chronic pain has varied widely across studies, often even within the same study. Some types of pain are known to be caused by underlying organic disease (e.g. rheumatoid arthritis) while the etiology of others is less known (e.g. fibromyalgia). The impact of either pain self-efficacy or functional self-efficacy on functioning may vary depending on the type of pain or on whether there are means of sufficiently alleviating pain. Some pain conditions may have more treatments available that can alleviate the pain. Using participants with one pain disorder, comparing individuals with distinct types of pain, or controlling for type of pain will be important in future research.

A review of the literature (Marks, 2001) examined articles applying self-efficacy theory to interventions aimed at improving arthritis management. Most of the studies demonstrated either improvements in self-efficacy or improvements in arthritis management and pain levels following an intervention. However, some studies did not

[4] The term pain-related self-efficacy is used to simultaneously encompass both types of self-efficacy that occur in the pain literature: pain self-efficacy and functional self-efficacy

show improvements across the board. One showed improvements in one type of self-efficacy (pain) while not in another type (functioning). Marks (2001) points to the importance of improving self-efficacy and its ability to enhance arthritis management as well as psychological well-being. He also states that it is still unclear whether improving self-efficacy will change functioning. The ability of psychological intervention to manipulate self-efficacy increases the importance of understanding self-efficacy's development and impact on outcomes. By manipulating self-efficacy, we may be able to improve physical and psychological functioning, though this is still an area needing further research. Thus, there are applied as well as theoretical benefits to greater study of the development of pain-related self-efficacy.

Self-efficacy in the context of chronic pain, both pain self-efficacy and functional self-efficacy, relates to better physical and psychological outcomes. However, no studies were found that examine pain-related self-efficacy longitudinally and its relation to longitudinal outcomes or how it changes across time. Longitudinal studies are needed in order to provide a clearer picture of the process by which pain, physical and psychological functioning, and pain-related self-efficacy relate to each other across time and development.

Development of Self-Efficacy

Relatively little is known about the development of self-efficacy across time and ages. Very few studies have examined longitudinal changes in self-efficacy levels in any subject domain. No studies of pain-related self-efficacy were found that included longitudinal assessment of change in self-efficacy.

Bandura (1977a) lists four factors that influence the development of self-efficacy: performance accomplishments, vicarious experiences, verbal persuasion, and physiological states. More recently (Bandura, 2004), he has added that social support also has the ability to increase one's coping efficacy, but if it is offered in a way that increases dependence on others rather than belief in one's self, then social support can lead to declines in self-efficacy. Limited research has examined what factors contribute to long-term increases in self-efficacy and to what outcomes changes in self-efficacy are related.

A few studies have examined change in self-efficacy from one time point to another where interventions were not used. Some of the variables predicting change in self-efficacy were domain specific and generalizations to pain-related self-efficacy are difficult because of the domain and task specific nature of self-efficacy. A study of changes in smoking self-efficacy (Carey & Carey, 1993) found that those who quit showed increases in self-efficacy, while those who quit and then relapsed or were never able to quit showed decreases in self-efficacy. Participants in a study examining changes in self-efficacy for refraining from behavior related to HIV risk showed three patterns of change: increased, stable, and decreased self-efficacy (Kang, Deren, Andia, Colon, & Robles, 2004). The authors did not report what, if any, factors related to membership in these three groups. A study looking at changes in self-efficacy in engineering students produced a model showing that self-efficacy predicted changes in other variables, but none of the predictor variables (outcome expectancies, goals, interests) predicted changes in self-efficacy (Lent et al., 2008). Self-efficacy for self-regulated learning decreased for students from junior to senior year, especially for males (Caprara et al., 2008). Overall, it

appears that experiencing success in a specific domain typically leads to increases in self-efficacy in that domain; however, generally, both the pain and the larger self-efficacy literature is very limited and provides no clear pattern regarding the development of self-efficacy.

Gender

The impact of gender on the development of self-efficacy beliefs appears to be context dependent on the type of self-efficacy studied; however, it appears that while females tend to begin with lower levels of self-efficacy, these levels increase over development. In a study of adolescence transitioning to young adults in college, girls reported lower initial levels of science self-efficacy (Larose, Ratelle, Guay, Senecal, & Harvey, 2006); however, girls were more likely to show increased science self-efficacy over the course of the study. In young adolescents, females exhibit significantly higher academic self-efficacy, but significantly lower social self-efficacy than boys (Bandura, Pastorelli, Barbaranelli, & Caprara, 1999). Longitudinally, adult females with alcohol use disorders showed greater increases in alcohol-related self-efficacy over the course of 16 years than did males (McKellar, Ilgen, Moos, & Moos, 2008).

Pain-related self-efficacy does not show a consistent relation to gender cross-sectionally and has not been studied longitudinally. In a study of adults, group membership in high or low pain-related self-efficacy groups was not influenced by gender or age; however, this study was not longitudinal and did not examine changes in self-efficacy (Denison, Asenlof, Sandborgh, & Lindberg, 2007). Gender was not related to child or parent reported pain-related self-efficacy in a study of children with chronic

pain (Bursch, et al., 2006); again, this was not longitudinal and did not look at changes in self-efficacy. Another study of children and adolescents (Vierhaus, Lohaus, & Schmitz, 2010) using a constructed pain-related self-efficacy scale that appears similar to emotion-focused coping potential found that boys had higher self-efficacy levels and that self-efficacy mediated the relation between sex and experimental pain ratings. Chong et al. (2001) reports discrepancies in the literature examining cross-sectional relations of pain-related self-efficacy and gender with some studies indicating higher self-efficacy in males while others show no differences. Their study resulted in no significant differences in pain-related self-efficacy based on gender.

Age

There is little consistency in the relation between age and self-efficacy across various studies covering several different types of self-efficacy. Across all domains, self-efficacy appraisals will change across development because the contingencies upon which they are based fluctuate with age (Cervone, Artistico, & Berry, 2006). For instance, in relation to pain, one's access to coping means such as medication or social support may vary with age and consequently so would one's self-efficacy for these behaviors. In a study examining changes in physical self-efficacy in pre-adolescents (8-12 years old) after a physical activity intervention, no age differences were found. The author (Annesi, 2007) concluded that there were no differences in self-efficacy change based on age or based on Piaget's developmental stages; however, this study used age by time interactions in regressions rather than examining changes in slope via multilevel modeling. A longitudinal study of children (6-18 years old) found that self-efficacy

beliefs regarding aggression and achievement were more predictive of behavior for older children than for younger children. (Davis-Kean et al., 2008).

The literature on pain-related self-efficacy reports little information about the relation between age and self-efficacy. The age ranges in the studies are typically very large including young adults and the elderly, making focused questions regarding age challenging. One study of pain-related self-efficacy (Chong, et al., 2001) found that self-efficacy was lower in young adults (17-35 years of age) than in middle aged adults (36 to 55 years of age) in participants with various pain types (Chong, et al., 2001). Chong et al. commented in their discussion that their findings indicate that the youngest pain group could benefit the most from enhancing their self-efficacy, forgetting that those under the age of 17 are in an even younger age group. Group membership as high or low pain-related self-efficacy was not influenced by age in a study of patients with musculoskeletal pain (Denison, et al., 2007). In a study of children with chronic pain (Bursch, et al., 2006), no relation was found between child and parent reported self-efficacy and age. No study examined the change in self-efficacy and its relation to age. Thus, there is need to understand what, if any, differences exist in pain-related self-efficacy across the developmental continuum and how this impacts how we deliver interventions to patients of various ages.

Examining developmental differences by including both children and adults would help to bridge the gap in our current knowledge, given the limited information on developmental differences in self-efficacy in adults (Chong, et al., 2001). Future longitudinal studies could also speak to developmental differences. Additionally, longitudinal studies will enable researchers to assess the effect of functional self-efficacy

on physical and psychological functioning as well as the direction of the causal relation between pain and self-efficacy.

Initial Coping

Keefe et al. (2004) suggest that future research should examine the relations between self-efficacy and both behavioral and cognitive coping strategies as self-efficacy may influence how one copes with pain. Self-efficacy to cope with pain may be a common factor linking the various psychological influences on the experience of pain (O'Leary, 1985). Self-efficacy is a significant predictor of whether people would use a particular coping strategy even after controlling for pain severity and outcome (Jensen, Turner, & Romano, 1991). Thus, people's confidence that they can carry out a behavior, not just that they think the behavior will produce good outcomes, is an important factor in predicting their use of coping strategies.

Coping in child populations has been found to vary by age and stage of development. Older children often use a greater number of coping strategies and may use strategies, such as avoidance, which require more cognitive abilities (Reid, Dubrow, & Carey, 1995). It has been suggested that children at different developmental stages may involve people differently in their coping process because they look at problems relationally in different ways (Berg, Meegan, & Deviney, 1998). Thus, it is possible that the relation between coping and self-efficacy changes across development. In a study examining how general coping changes across adult development, it was found that age did not show a direct relation to coping, but that active coping was predicted by self-efficacy while passive coping was not (Trouillet, Gana, Lourel, & Fort, 2009).

Additionally, researchers have shown that those patients in alcohol treatment who show increases in coping also report higher levels of alcohol related self-efficacy at follow-up (McKellar, et al., 2008).

Initial Disability

The chronic pain literature shows that higher pain-related self-efficacy is associated with better physical and psychological functioning (e.g. Arnstein, 2000; Ayre & Tyson, 2001; Buckelew, et al., 1995; Denison, et al., 2004; Estlander, et al., 1994; Kaivanto, et al., 1995). No studies have examined the longitudinal relation of pain-related self-efficacy to later disability.

Current Study

The current study, which is part of a larger study, investigated how pain-related self-efficacy changes over the course of development, among individuals evaluated for chronic abdominal pain as children and adolescents. This study also investigated what factors present at the initial medical evaluation for abdominal pain discriminated different patterns of change in pain-related self-efficacy. In addition, the current study examined at what time change in pain-related self-efficacy levels is most influential in predicting outcomes. Because this study was the first known study to examine the developmental changes in pain-related self-efficacy using longitudinal data analyses, analysis of hypothesized effects were accompanied by exploratory analyses.

In this study, pain self-efficacy was assessed with the Problem-Focused Coping Potential (PFCP) scale on the Pain Beliefs Questionnaire (PBQ) as PFCP assesses beliefs

about one's ability to cope in a manner that alleviates the problem of pain. Functional self-efficacy was assessed with the Emotion-Focused Coping-Potential (EFCP) scale as EFCP assesses belief in one's ability to handle having pain, and to carry on in spite of pain. While these scales' items are not as specific as many scales of pain-related self-efficacy, they are a reasonable proxy. The PBQ and its subscales are detailed below in the measures section.

The study was longitudinal in design with four assessment points. Each individual completed self-report measures at baseline (Time-one) in the clinic. Depending on the cohort and retention, participants then variously also participated in the 2-week (Time-two) follow-up over the phone, the 6-month (Time-three) follow-up over the phone, and/or the long-term (Time-four) 5-15 year follow-up conducted in parts over the phone, in person, and via online questionnaires. The details of the study design and who participated at specific time points are detailed below in the methods section.

Research Questions and Hypotheses

As there is no literature on the development of pain-related self-efficacy, exploratory analyses examined how pain self-efficacy and functional self-efficacy change over the course of development, both in terms of age and passage of time since the initial evaluation. Specifically, the course of change describing early, mid-range, and late changes was modeled. The following Hypotheses were tested.

Hypothesis 1: Change in self-efficacy

Given prior literature (Mulvaney, et al., 2006) showing larger changes in psychological variables initially than in a long-term follow-up of children with CAP, it is hypothesized that the greatest change in pain-related self-efficacy will occur early, between the initial clinic visit and the two-week follow-up.

Hypothesis 2: Gender

It is hypothesized that females will begin with lower initial pain-related self-efficacy levels and will demonstrate more increase over time given the literature in non-pain domains that demonstrates this pattern, particularly in adolescents transitioning to adulthood in academic self-efficacy domains.

Hypothesis 3: Impact of age at initial visit

Self-reported pain-related self-efficacy for patients who were older at the time of initial visit will be more strongly related with long-term outcomes than will pain-related self-efficacy for younger patients. This hypothesis is based on the general self-efficacy literature that indicates self-efficacy of older children is more predictive of behavior than is self-reported self-efficacy of younger children.

Hypothesis 4: Relation of age to levels of self-efficacy

Age at initial visit will not be related to differing levels of pain-related self-efficacy given the current literature showing limited relations between pain-related self-efficacy and age and the child literature demonstrating no relation between age and pain-

related self-efficacy (Bursch, et al., 2006). However, these patterns will be explored and detailed if there are differentiations.

Hypothesis 5: Coping related to changes in pain-related self-efficacy

As Bandura (1977a) theorizes experiences and accomplishments influence the development of self-efficacy, it is hypothesized initial coping will be related to changes in functional self-efficacy such that lower levels of Passive coping will predict increases in functional self-efficacy as people with lower passive coping are more engaged and more likely to have experiences of successful functioning. To a lesser extent, higher levels of initial Accommodative coping will also relate to increases in functional self-efficacy as Accommodative coping has aspects of acceptance and accommodation that relate to increased functioning.

Exploratory analysis will examine whether initial levels of Active coping relate to changes in self-efficacy. Active coping is often not strongly related to outcomes, so this question is exploratory in nature (Smith, Wallston, & Dwyer, 2003; L. S. Walker, Smith, Garber, & Claar, 2005).

As pain self-efficacy is associated with ameliorating pain rather than coping with it, no hypotheses are made regarding the relation of initial coping and changes in pain self-efficacy; however, these relations will be explored if they exist.

Hypothesis 6: Disability at initial visit

The literature suggests that disability and pain–related self-efficacy are consistently related; however, little is known about the direction of causality. It is

hypothesized that those with higher levels of disability at Time-one will show decreases in both pain self-efficacy and functional self-efficacy because they are experiencing a lack of success at functioning which would lower their self-efficacy.

Further research questions are aimed at understanding the importance of changes in pain-related self-efficacy in predicting outcomes. No studies were found that examine how changes in pain-related self-efficacy relate to outcomes, so the hypotheses are primarily exploratory in nature.

Hypothesis 7: Change in pain-related self-efficacy predicting long-term outcomes.

The largest change in pain-related self-efficacy is hypothesized to occur early on; however, it is predicted that later change will have a greater impact on long-term outcomes because of its proximity in time to the outcomes.

Analyses will examine the relation of change in pain-related self-efficacy to a variety of outcome variables at the long-term follow-up. These variables will include physical functioning, severity of gastrointestinal symptoms, and mental health outcomes including symptoms of anxiety and depression utilizing measures described below. Given previous literature (Lackner, et al., 1996), it is predicted that functional self-efficacy will be more predictive of long-term physical functioning than will pain self-efficacy.

CHAPTER II

METHODS

Participants

Power analyses were conducted to determine the number of participants needed to ensure adequate statistical power. The traditional conventions of d=.2, .5, and .8 for small, medium, and large effect sizes (Cohen, 1992) were used. The Diggle model (Diggle, Liang, & Zeger, 1994) for two equal groups was used. These longitudinal power analyses were conducted on a hypothetical outcome with a mean of 50 and a standard deviation of 10 for ease in interpretation. The power analyses were designed to determine how small a change could occur over time and be detected using traditional standards (alpha=5%).

The power analyses assumed 4 waves conducted at an initial time point, two-weeks, six-months, and 10.06 (the mean at the time of the power analysis) years after the initial visit. Average cross-wave correlations for PFCP (r=0.44) and EFCP (r=0.42) were computed for the current sample and used in the power analyses to add validity to the estimates. The sample at the time of the power analysis was weighted for the number of time points they contributed (4 time points=1, 3 time points=0.75, and 2 time points=0.5) in order to calculate the effective sample size that was be used in multilevel method analyses. Those with only one time point were not included as they can be used only to estimate the intercept, but not the slope. The weighted calculations resulted in an effective sample size of 246.75 and 247.25 people for PFCP and EFCP respectively.

According to the Diggle model, a small to moderate effect (d=0.28) in change in the end point of EFCP or PFCP could be detected by the power analysis sample size. Thus, the sample size had adequate to excellent power to detect the hypothesized effects.

Time-one Participants (N=863)

Participants comprised three separate cohorts of consecutive new patients to the Pediatric Gastroenterology clinic at Vanderbilt University Medical Center. Patients were referred to this tertiary care clinic for evaluation of abdominal pain after an evaluation by a primary care provider did not reveal any evidence of organic disease. The three different cohorts initially participated at the clinic over the span of 15-years (1993-1995, 1996-1999, and 2001-2007). The same criteria and procedure were used across cohorts with some variation in the instruments collected across the years. Eligibility criteria included: 1) a report of at least three abdominal pain episodes occurring over the course of three months in duration or longer severe enough to interrupt activities and 2) no evidence of organic disease, known chronic health condition, physical disability, or mental retardation. At the time of the initial data collection, participants ranged in age from 8 to 18 years old.

The first cohort, GICOPE, was collected from 1993-1995 and included 155 participants in the Time-one data collection. The majority of participants were females and the age ranged from 8-18 years of age. Of those completing the Time-four follow-up assessment (N=79), the time since the clinic visit ranged from 12.83 to 16.167 years (M=14.17, SD=0.69), the age at follow-up ranged from 22 to 32 (M=25.91, SD=2.618), 96.3% were Caucasian, and 47 (58.0%) were female.

The second cohort, Diary, was collected from 1996-1999. Two hundred twenty-nine families were initially contacted, 57 (25%) failed to meet eligibility criteria and 18 (8%) families declined participation. This resulted in a final sample of 154 participants, 150 of these completed the Pain Beliefs Questionnaire (PBQ). The participants ranged in age from 8-15. Of those completing the Time-four follow-up assessment (N=50), the time since the clinic visit ranged from 9.58 to 13.08 years (M=11.145, SD=0.95), the age at follow-up ranged from 18-26 (M=21.82, SD=2.24), 91.3% were Caucasian, and 28 (59.6%) were female.

The third cohort, Clinic, was collected from 2001-2007. This sample was comprised of a final sample of 558 participants. The participants ranged in age from 8-17. Of those completing the Time-four follow-up assessment (N=129), the average time since the clinic visit equaled 6.10 years (SD=0.79), the age at follow-up ranged from 12-28 (M=18.02, SD=2.89), 90.0% were Caucasian, and 70 (57.9%) were female.

Time-two Participants (N=300).

A portion of the participants from the GICOPE and the Diary cohorts participated in a two-week follow-up study conducted over the phone. One hundred fifty-three participants who previously participated in the GICOPE study participated in this Time-two data collection. One hundred forty-seven participants who previously participated in the Diary study participated in this Time-two data collection. The 300 participants ranged in age from 8-18 years (M=11.13, SD=2.35) and were predominately female (56.9%).

Time-three Participants (N=121)

A portion of the participants from the GICOPE cohort participated in a six-month follow-up study conducted over the phone. Participants ranged in age from 8-18 years (M=11.87, SD=2.59) and were predominately female (56.9%). Additionally, all of the participants who completed the six-month follow-up also completed the two-week follow-up.

Time-four Participants (N=254).

Two hundred fifty-four participants, comprised from a mixture of all three cohorts, participated in the current study that involved a longitudinal follow-up. Participants were assessed five years or more following their initial participation, though three participants completed the Time-four assessment less than five years post the initial assessment. Other eligibility criteria include having shifted from one developmental cohort (child=8-12, adolescent=12-18, adult=18+) to another developmental cohort. Of the 254 participants, Time-one data are available for 250, Time-two data are available for 122, and Time-three data are available for 62 participants. Participants in this sample represent the following cohorts: GICOPE N=78 (30.70%), Diary N=50 (19.69%), Clinic N=126 (49.61%). Participants ranged in age from 12-32 (M=21.21, SD=4.37) and were predominately female (N=150, 59.5%). The time since each participant completed the Time-one initial assessment ranged greatly, 2.83-16.167 years (Mean=9.56, SD=3.70).

Table 1. Sample sizes who completed the PBQ at various time points

Time 1 (clinic visit)	**Total**	**DOPCAP**
GICOPE (1993-1995)	155	76
Diary Study (1996-1999)	150	50
Clinic (2001-2007)	558	124
Time 1 TOTAL	**863**	**250**
Time 2 (2 week follow-up)	**Total**	**DOPCAP**
GICOPE (1993-1995)	153	74
Diary Study (1996-1999)	147	48
Clinic (2001-2007)	0	0
Time 2 TOTAL	**300**	**122**
Time 3 (6 month follow-up)	**Total**	**DOPCAP**
GICOPE (1993-1995)	121	62
Diary Study (1996-1999)	0	0
Clinic (2001-2007)	0	0
Time 3 TOTAL	**121**	**62**
Time 4 (>=5 year follow-up)	**Total**	**DOPCAP**
GICOPE (1993-1995)	79	78
Diary Study (1996-1999)	50	50
Clinic (2001-2007)	129	126
Time 4 TOTAL	**258**	**254**

GICOPE=1st wave of participants, Diary=2nd wave of participants, Clinic=3rd wave of participants
DOPCAP refers to the current study of Developmental Outcomes of Pediatric Chronic Abdominal Pain and is the long-term follow-up and Time-four assessment.

Measures

Self-reported pain-related self-efficacy.

Pain Beliefs Questionnaire. Participants completed the Pain Beliefs Questionnaire (PBQ; van Slyke, 2001; L. S. Walker, et al., 2005) at all four time points. The PBQ follows the framework set forth by Lazarus and Folkman (1984). Conceptually derived subscales were gathered from the 32 items comprising the PBQ, including primary and secondary appraisals. The PBQ contains two subscales assessing secondary appraisals: one's belief in her efficacy to cope in a problem-focused manner and alleviate pain (Problem Focused Coping Potential, PFCP); and one's belief in her efficacy to cope in an emotionally-focused manner and cope in the presence of unremitting pain (Emotion

Focused Coping Potential, EFCP). In the current study, PFCP is used as an indicator of pain self-efficacy and EFCP is used as an indicator of functional self-efficacy. Each subscale is composed of six Likert scaled items anchored at "not at all true" (0) and "very true" (4) on a five point scale. Items were reverse coded as appropriate. The PFCP and EFCP subscales were calculated by summing the items to arrive at a total score. High scores on the PFCP and EFCP subscales indicate higher self-efficacy.

The PBQ has been used in several studies examining pain-related self-efficacy (van Slyke, 2001; L. S. Walker, et al., 2005). It has been used in studies involving children and adults. In past research, the subscales have shown internal consistency and have significantly predicted health outcomes. We have used the PBQ with both pediatric and adult samples. Through the course of ongoing research investigating the PBQ's factor structure using split-halves analyses, a refined version of the PBQ was utilized in this study. This version of the PBQ eliminated item 11 from the PFCP subscale and item 9 from the EFCP subscale as the internal consistency was improved when these items were excluded. Alpha reliabilities in the two split halves for PFCP when item 11 was eliminated were good (0.82 and 0.77) as were alpha reliabilities for EFCP when item 9 was eliminated (0.82 and 0.77). Analyses affirmed the continued use of the dichotomy between the PFCP and EFCP subscales was warranted. The PBQ appears in the appendix.

Self-reported coping.

Pain Response Inventory. Participants completed the Pain Response Inventory (PRI; L. S. Walker, Smith, Garber, & Van Slyke, 1997) at both the initial assessment and the Time-

four follow-up assessment. The PRI is a 60-item questionnaire that assesses cognitive and behavioral responses to chronic or recurrent pain. Items are assessed using a five point Likert scale. The PRI generates broad scales for Active, Passive, and Accommodative coping as well as 13 subscales. Active coping is comprised of seven subscales including problem-solving, seeking instrumental support, seeking emotional support, using distraction, rest, massage/guard, and condition-specific strategies. Passive coping is comprised of three subscales including behavioral disengagement, self-isolation, and catastrophizing. Finally, Accommodative coping is comprised of four subscales including acceptance, self-encouragement, minimizing pain, and ignoring pain. Test-retest reliability and construct and predictive validity have been documented in CAP patients. The PRI appears in the appendix.

Self-reported pain.

Abdominal Pain Index. Participants completed the Abdominal Pain Index (API; L. S. Walker, et al., 1997) at all four time points. The API assesses the frequency, duration and intensity of abdominal pain episodes experienced in the previous two weeks. A total severity score is calculated by standardizing and summing each of these ratings. Past alpha reliabilities are reported as .80-.93. The API was used to control for pain levels at various assessment times as well as an outcome measuring pain levels at follow-up. A single API item was also used to assess pain intensity over the prior two weeks. The API appears in the appendix.

The Rome III Modular Questionnaire. Participants completed a 24-item version of the Questionnaire on Pediatric Gastrointestinal Symptoms-Rome III Version (QPGS-RIII) (Drossman, 2006) at the Time-four follow-up assessment. The QPGS-RIII is an

adaptation of earlier versions and includes new items in order to assess symptom criteria for the current Rome III. It assesses diagnostic symptom criteria for functional gastrointestinal disorders (FGIDs). It can be scored for presence/absence of various FGIDs (e.g., IBS, functional dyspepsia). The QPGS-RIII was used to assess the presence of CAP at Time-four follow-up. The QPGS-RIII appears in the appendix.

Self-reported functioning.

The Functional Disability Inventory. Participants completed the Functional Disability Inventory (FDI; Claar & Walker, 2006; Claar, Walker, & Smith, 1999; L. S. Walker & Greene, 1991) at three time points (baseline, two-week, and follow-up); however, those in the first cohort—GICOPE—only completed the FDI at the long-term follow-up. The FDI is a self-report measure that assesses the impact of physical health on functioning where higher values indicate greater disability. In CAP patients, coefficient alpha is .89 and three-month test-retest reliability is 0.60. The FDI appears in the appendix.

The Short Form Health Survey. Each participant completed the 36 item Short Form Health Survey (SF-36; Ware & Sherbourne, 1992) at the Time-four assessment. The SF-36 assesses eight domains of health perception: 1) physical functioning, 2) social functioning, 3) role limitations due to physical health, 4) bodily pain, 5) general mental health, 6) role limitations due to physical health, 7) energy and fatigue, and 8) general health perceptions. For this study, the total score was use of an index of overall functioning. Test-retest reliability and internal consistency for the SF-36 was reported to be good (e.g., Brazier et al., 1992). The SF-36 appears in the appendix.

Depressive and anxiety symptoms.

Center for Epidemiological Studies-Depression Scale. Participants completed the Center for Epidemiological Studies-Depression Scale (CES-D; Radloff, 1977) scale at the Time-four follow-up assessment. The CES-D is a self-report measure of the frequency of 20 depressive symptoms over the past week. The CES-D has previously shown to have good psychometric characteristics (Roberts et al., 1990) and has been used in previous longitudinal studies of chronic abdominal pain (Walker et al., 1998). The CES-D appears in the appendix.

Children's Depression Inventory. The Children's Depression Inventory (CDI; Kovacs, 1981 ; Kovacs & Beck, 1977) was administered at the baseline clinic visit. The CDI is a self-report measure with 27 items assessing children's depressive symptoms. Each symptom is rated on a 3-point scale. The items are summed to calculate a total score.

Spielberger State Trait Anxiety Index. Participants completed trait subscale of the Spielberger State Trait Anxiety Index (STAI; Spielberger, 1983) at the Time-four follow-up assessment. The STAI trait subscale measures self-reported general or long standing anxiety. The STAI trait subscale contains 20 items, each with a four point Likert scale ranging from "Almost Never" (1) to "Almost Always" (4). The STAI is used an outcome measure of general anxiety at the time of follow-up. The STAI appears in the appendix.

Self-reported somatization.

Child Somatization Inventory. Participants completed the Child Somatization Inventory (CSI; Garber, Walker, & Zeman, 1991; L. S. Walker, Garber, & Greene, 1991) at all four time points including the Time-four follow-up assessment. While the title

includes the word "child" the measure does not ask child specific items and was thus used with the adult participants as well as the child participants. The CSI assesses perceived severity of 35 nonspecific somatic symptoms (e.g., headaches, dizziness, fatigue). A recent revision (L. S. Walker, Beck, Garber, & Lambert, 2009) has refined this to 24 items and has demonstrated that the CSI is psychometrically solid. The CSI appears in the appendix.

Demographics.

Time variant and time invariant demographics were assessed at each time point. Age was asked explicitly and the participant's date of birth was recorded at each time point as well, allowing specific age calculation to the day. At Time-one through Time-three, and for adolescent participants at Time-four, parents completed the demographics information in reference to their children. Gender and race were assessed at each time point. The time since each prior point of assessment was calculated to the day.

Procedure

All data were collected via questionnaires. Time-one data were collected via interviews where trained research assistants read choices and recorded participants' responses. The interviews were conducted in the gastroenterology clinic at Vanderbilt University prior to the participants' initial clinic visit with the gastroenterologist. Time-one data were collected between the years of 1993 and 2007. Research assistants then called participants in both wave one (GICOPE) and wave two (DIARY) two-weeks following the initial clinic visit. At this follow-up phone call, Time-two data were

collected via interviews conducted over the phone. Time-three data were collected for wave one (GICOPE) six-months following the initial clinic visit. Again, research assistants called the participants who completed the questionnaires over the phone.

Time-four data (DOPCAP, Developmental Outcomes of Pediatric Chronic Abdominal Pain) were collected for all three waves via a combination of phone interview and online questionnaire completion via Survey Monkey (an online mechanism for completing self-report questionnaires). The following measures were completed over the phone: Demographics, SF-36, CSI, FDI, PPQ, API, and the QPGS-RIII. The following measures were completed via Survey Monkey at the completion of the study: STAI, CES-D, PBQ, and the PRI. As changes in the PBQ is the focus of this study, only participants who completed the Survey Monkey portion of the study were included in these analyses. Additionally, though there was a three-month follow-up for wave one (GICOPE) and wave two (Diary), this follow-up did not include the PBQ and thus was not included in this study.

CHAPTER III

RESULTS

Data Cleaning

In order to use multi-level modeling it was necessary to configure the data set such that it is in person-period format. This required that each individual have a row of data for each time point in which the individual participated (Singer & Willett, 2003). Typically, if a participant participated in Time-one and Time-four they would have two rows of data, thus eliminating the need for missing variables for people who did not complete all time points. Each variable, for instance EFCP, had only one column and the various time points were captured in the appropriate row for each individual. This transformation to a person-period data set can be performed by standard statistical packages. However, given the unique nature of these data, a decision was made to use splines[5] rather than all four time points in one model. Thus, four rows were retained for each participant.

Values of splines between baseline and two-weeks, two-weeks and six-months, and six-months and the long-term-follow-up were calculated for each participant for each spline regardless of participation in time point. The average time between the time points was used for participants who did not participate in a specific time point. The prior elapsed time was subtracted from the subsequent time points; thus, each spline had a value representing only the time in between the two specified time points. This

[5] Splines are joined linear segments of longitudinal data that allow one to examine curved data using linear models as they result in "piecewise linear patterns" (Fitzmaurice, Laird, & Ware, 2004, p. 147).

prevented falsely long splines for those subjects who did not participate in the middle time points.

A standard time metric was utilized in order to properly log when each data wave was collected for each individual since there is some variability, particularly at the Time-four wave. Time was arranged such that the initial clinic visit (Time-one) was coded as zero (the intercept) and each time point coded as the specific number of days since the initial clinic visit for that particular individual. When an individual did not participate in a particular time point, time was coded as the average days in time for those individuals who did participate in that time point. This transformation of Time-one to a zero or intercept metric enabled clear longitudinal modeling. In the results, information is sometimes presented as weeks or years rather than days for clarity as the number of days when there are several years becomes excessive, but both weeks and years are based on the time in days where there are 365 days in a year, 30 days in a month, and 7 days in a week.

Subjects who met criteria for an organic diagnosis responsible for their abdominal pain at the time of the initial clinic visit were excluded from this current study. This included two individuals from the GICOPE study because of a diagnosis of Crohn's disease. Three individuals were excluded from the Diary study, two for ulcerations and one for Crohn's disease. Four individuals were excluded from the clinic, one because of Celiac disease and the four due to Crohn's disease.

Primary Data Analyses

Multi-level modeling methods were used to test hypotheses one through five as these hypotheses focused on determining the change in pain-related self-efficacy over the course of development and thus needed to model the slope and intercept of this change (Singer & Willett, 2003). Multi-level modeling methods were particularly useful for this study design because they allow for flexibility in dealing with missing data caused by differences in which time points were collected, in which studies, and who participated in each time point. Variability in the number of waves collected is called "unbalanced data" and participants' statistical contributions to the model are weighted according to the number of waves collected. Additionally multi-level modeling is flexible in terms of using "time unstructured" data meaning that the waves do not have to occur at the same time for each participant (Singer & Willett, 2003). Having data collection weighted toward the earlier time points is acceptable and is preferred when it is thought that the majority of change occurs early on, as is hypothesized in this study (Singer & Willett, 2003).

Models were constructed to fit the data. Initially, a general model was constructed, including information obtained from the observed intercept, Time-one self-efficacy ratings, and observed slope. The pattern of change was divided into three splines, an early spline (Time-one to Time-two) a middle spline (Time-two to Time-three) and a late spline (Time-three to Time-four). Even though Hierarchical Linear Modeling (HLM) is resistant to variability, the great variability of times and long time between the 3rd and 4th time point made a three spline approach desirable in order to

avoid predicted curves across years based on limited information. Splines allowed for evaluation of hypothesis one and whether the greatest change occurs early on. Additionally, by splitting the model into three splines, the study controlled for any effect of the initial medical appointment, which occurred between Time-one and Time-two, on self-efficacy levels by not including Time-one data points with the other splines. The model incorporated three parameter estimates: intercept (Time-one), slope or rate of change in pain-related self-efficacy across the applicable time points, and an error component.

Based on the models, two variables representing an individual's rate of early and late change in self-efficacy, or slope, were calculated and captured in a data set. Initially, these slope variables were then used in order to assess hypothesis seven, at what point since Time-one is change in self-efficacy most predictive of long-term outcomes. However, it was later determined that using actual slope scores, calculated by subtracting the first time point of interest from the second time point of interest and dividing by the amount of time in between these assessments, was a more accurate and desirable approach. Even though using predicted slopes from HLM models would allow all participants to be included and provide a larger N, they are not preferred as the largest interval, Time-three to Time-four, was based on only one cohort and thus a fairly small proportion of the participants. Thus, even though using actual slope scores reduces the sample size, the increase in accuracy is desirable and was considered to be more important than the greater sample size. An example slope calculation is as follows: for the slope between the six-month follow-up and the long-term follow-up, Time-three values were subtracted from Time-four values and then this value was divided by the

time between the six-month follow-up and the long-term follow-up. However, given the large variability in Time-four follow-up, a dummy code of the average length in time between the six-month follow-up and the long-term follow-up was used in calculating the slope. This is because there is not hypothesized to be a continuous linear change occurring several years out from the initial evaluation and using actual time would create very disparate divisors in the calculation of the slope.

Linear regression was then used to determine which slope was more predictive of outcomes. The predictor variables and the step on which they were entered was as follows: (1) baseline measures of the outcome variable when available, FDI, CSI, API, and ROME III (the CDI, an alternative form assessing depression symptoms that was assessed at Time-one was entered in this initial step for rather than the CES-D) (2) the slope variables for early, middle, and late or Time-one to Time-four change in pain-related self-efficacy alone. The overall slope was not included in the same analyses as interval slopes. This sequence allowed initial levels of the outcome variable to be controlled and to determine whether specific slopes or the overall slope accounts for greater variance. The same model was applied to each outcome variable.

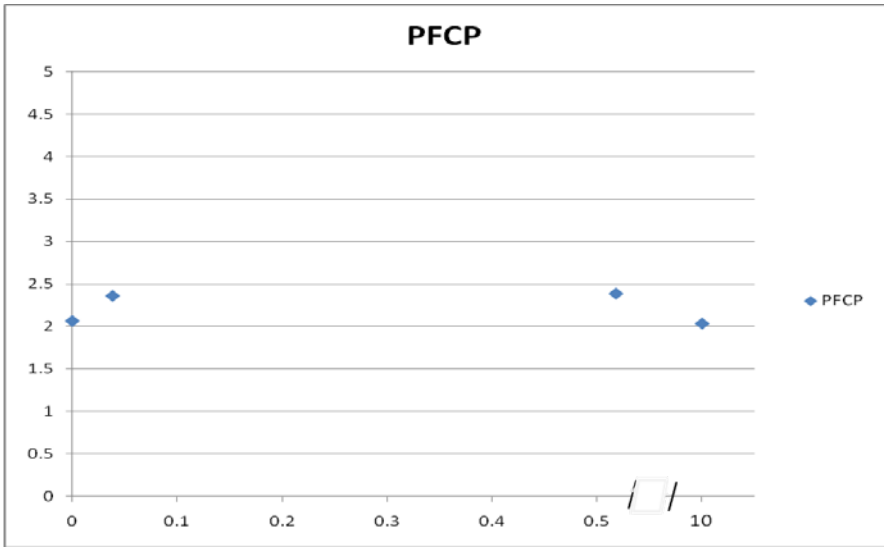
The results of these analyses are below:

Hypothesis 1: Change in self-efficacy

The first hypothesis predicted the largest change in pain-related self-efficacy would occur early on. Hierarchical linear modeling demonstrated that the change in PFCP from the initial clinic visit to the two-week follow-up and the change in PFCP from the two-week follow-up to the six-month follow-up were both significant increases

(Table 2, Figure 1). However, the change in PFCP from the six-month follow-up to the long-term follow-up was not significant (Table 2).

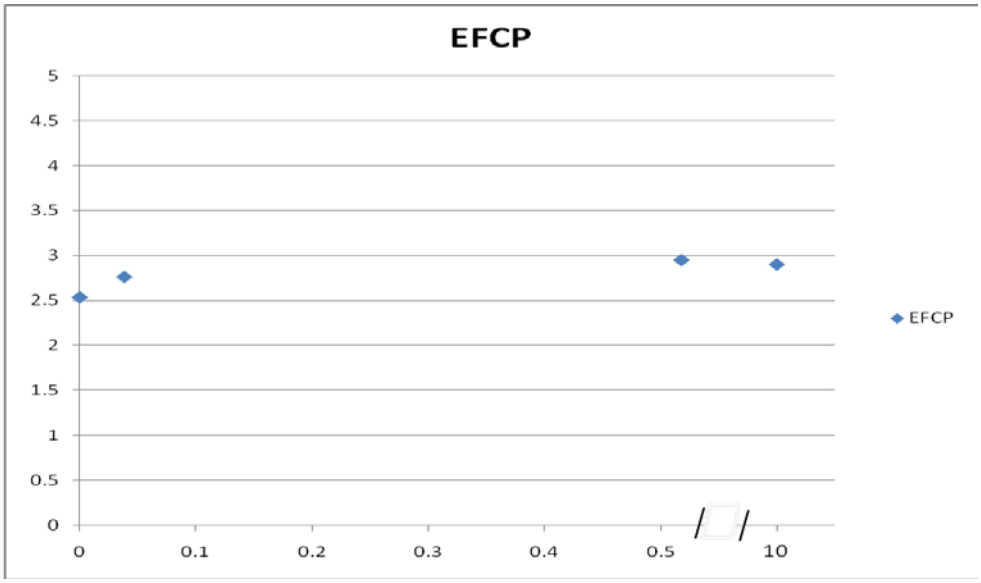
Figure 1: Predicted change in PFCP over time



The X-axis represents years. The break in the X-axis is between the 6-month and long-term follow-up to indicate a large passage of time.

The change in EFCP from the initial clinic visit to the two-week follow-up, from the two-week follow-up to the six-month follow-up, and the change in EFCP from six-month to long-term follow-up were all significant. These significant findings indicated significant increases in emotion-focused coping potential across all time points (Table 2, Figure 2).

Figure 2: Predicted change in EFCP over time



The X-axis represents years. The break in the X-axis is between the 6-month and long-term follow-up to indicate a large passage of time.

Table 2: Change in PFCP and EFCP over time using HLM

Outcome Variable	% of variance due to individual differences (ICC)	Intercept level	Estimate of point change per week from T1-T2	Estimate of point change per week from T2-T3	Estimate of point change per year from T3-T4	Degrees of Freedom
PFCP	45.35***	2.07***	0.15*** t=5.70***	0.01*** t=4.57***	-0.003 t=-0.39	672
EFCP	56.08***	2.53***	0.11*** t=5.12***	0.02*** t=6.87***	0.04*** t=5.69***	672

*p<.05 **p<.01 *** p<.001

As predicted in hypothesis one, for both EFCP and PFCP, the largest increase did indeed occur early on—between the initial clinic visit and the two-week follow-up. The

large significant Intraclass Correlations (ICC) also indicated that a significant proportion of the variability in the models was due to individual differences[6].

Hypothesis 2: Gender

The second hypothesis predicted that females would start with lower self-efficacy ratings and then show a larger increase over time. T-tests of means indicated that males had significantly higher levels of both PFCP and EFCP than females at the initial visit and two-week follow-up (Table 3, Figure 3, and Figure 4).

Table 3: T-tests of average PFCP and EFCP levels by gender.

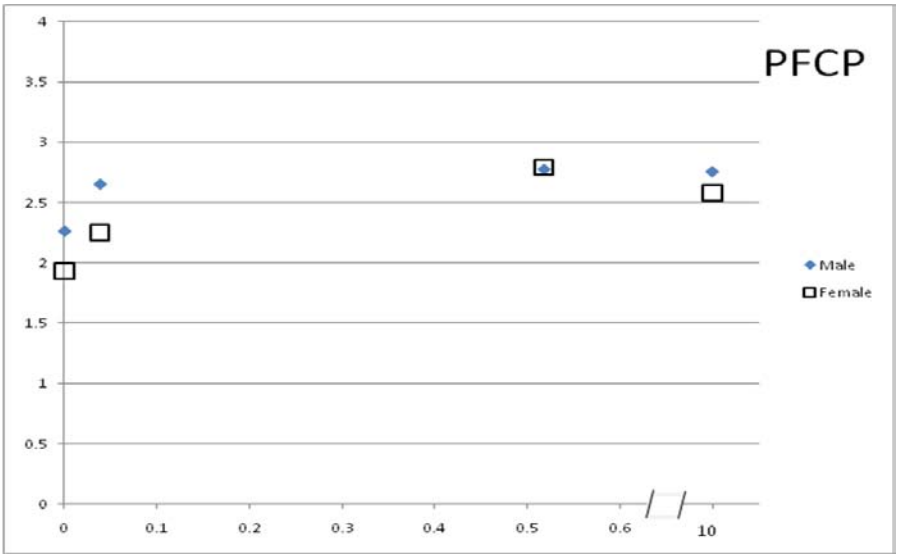
	PFCP Means	T-test (df)	P-values	EFCP Means	T-test (df)	P-values
Baseline M:	2.26	-4.69 (860)	<0.001	2.70	-4.31 (860)	<0.001
F:	1.93			2.41		
Two-week M:	2.65	-3.82 (298)	<0.001	2.98	-3.20 (298)	0.001
F:	2.25			2.63		
Six-month M:	2.77	0.09 (119)	0.93	3.16	0.57 (119)	0.57
F:	2.79			3.24		
Long-term M:	2.75	-1.57 (254)	0.12	3.60	-1.76 (254)	0.08
F:	2.58			3.47		

T-tests indicate that the difference in PFCP at initial visit was significant between males and females. Additionally, t-tests demonstrate that PFCP continued to be higher for males at the two-week follow-up, but not at the other two time points (Table 2 and Figure 3). Using hierarchical linear modeling, gender significantly differentiated initial

[6] The percent of variance due to individual differences refers to the Intraclass Correlation Coefficient (ICC) and represents the proportion of the total variance due to individual differences (Singer & Willett, 2003). Size of individual differences as decimals are classified as follows: small=0.05, medium=0.10, large=0.15 (Raudenbush & Xiaofeng, 2000).

PFCP levels such that females' scores were estimated to be 0.33 points lower than males (t=-4.94, p<.0001, df=668). However, the interactions of gender and time segment (initial to two-weeks, two-weeks to six-months, and six-months to long-term follow-up) indicated that the pattern of change in PFCP over time were not significantly different by gender for any of these time segments (t=-0.49, p=0.63, df=668; t=1.27, p=0.20, df=668; t=-0.26, p=0.79, df=668). In this HLM model, the ICC indicated that 44 percent of the variance was due to individual differences.

Figure 3: Actual mean values of PFCP by gender

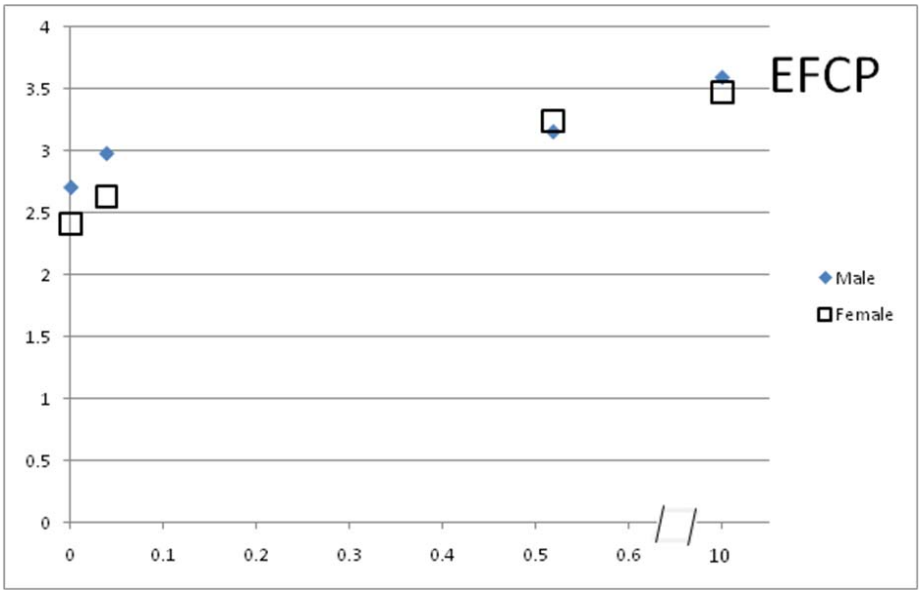


The X-axis represents years. The break in the X-axis is between the 6-month and long-term follow-up to indicate a large passage of time.

T-tests indicated that the difference in EFCP at initial visit was significant between males and females. Additionally, t-tests demonstrated that EFCP continued to be higher for males at the two-week follow-up, but not at the other two time points (Table 3 and Figure 4). Using hierarchical linear modeling, gender significantly differentiated initial EFCP levels such that females' scores were estimated to be 0.29 points lower than

males at baseline (t= -4.67, p<.0001, df=668). However, the interactions of gender and time segment (initial to two-weeks, two-weeks to six-months, and six-months to long-term follow-up) indicated that the pattern of changes in EFCP over time were not significantly different by gender for any of these time segments (t=-0.59, p=0.56, df=668; t=1.29, p=0.20, df=668; t=-0.05, p=0.97, df=668). In this HLM model, the ICC indicated that 55 percent of the variance was due to individual differences.

Figure 4: Actual mean values of EFCP by gender



The X-axis represents years. The break in the X-axis is between the 6-month and long-term follow-up to indicate a large passage of time.

As predicted in hypothesis two, there were significant differences in pain-related self-efficacy by gender. Specifically, females started with significantly lower values of both PFCP and EFCP. These differences then became insignificant, which may imply that relative to males' increase in self-efficacy ratings, females had a greater increase over time though the rates of change were not significantly different.

Hypothesis 3: Impact of age at initial visit

Hypothesis three was that the self-efficacy ratings of patients who were older at baseline would be more predictive of outcomes than the scores of younger patients. In order to test this hypothesis and to clarify interpretation of the results, initial age in days was adjusted such that the youngest individual's age was set to zero. An HLM approach showed that when PFCP and age were included in the model initial age was a significant predictor of centered values of somatization (CSI) and pain intensity. These relations indicated higher symptom severity with older age. However, age was not a significant predictor of functional disability (FDI). The interaction of PFCP and age at initial visit did not significantly relate to any outcome measure. This indicated that for each year increase in age there was no change in the relation between PFCP and outcome measures (Table 4). Each of these outcome values was evaluated in separate models and the majority had large proportions of their variance due to individual or between subject differences.

Table 4: Impact of initial age and PFCP on various outcome measures using HLM

Outcome Variable	**% of variance due to individual differences (ICC)**	**Intercept level of outcome assuming where age and PFCP are zero**	**Estimate of point change in outcome for each point increase of PFCP**	**Estimate of point change in outcome for each year increase in Age at baseline**	**Estimate of influence of interaction of PFCP and Age at T1 on outcome**	**Degrees of Freedom**
FDI	54.14***	8.94*** t= 15.37	-3.21*** t= -6.66	0.19 t= 1.56	-0.07 t= -0.72	304
Pain Intensity	24.4***	4.98*** t= 36.11	-0.90*** t= -7.20	0.08** t= 2.76	0.04 t= 1.61	556
CSI	50.00***	0.52*** t= 21.97	-0.13*** t= -6.89	0.02*** t= 4.77	-0.003 t= -.072	651

*p<.05 **p<.01 *** p<.001

An HLM approach to hypothesis three regarding EFCP showed that initial age was a significant predictor of centered values of Functional Disability (FDI), pain intensity, and somatization (CSI). The interaction of EFCP and age at initial visit did not significantly relate to any outcome measures (Table 5).

Table 5: Impact of initial age and PFCP on various outcome measures using HLM

Outcome Variable	**% of variance due to individual differences (ICC)**	**Intercept level of outcome assuming where age and EFCP are zero**	**Estimate of point change in outcome for each point increase of EFCP**	**Estimate of point change in outcome for each year increase in Age at baseline**	**Estimate of influence of interaction of EFCP and Age at T1 on outcome**	**Degrees of Freedom**
FDI	53.87***	8.42*** t= 15.25	-4.90*** t= -10.66	0.36** t= 3.04	0.11 t= 1.15	304
Pain Intensity	22.52***	4.77*** t= 35.68	-0.99*** t= -8.08	0.12*** t= 4.36	0.02 t= 0.76	556
CSI	53.87***	0.48*** t= 21.38	-0.18*** t= -10.62	0.03*** t= 6.62	<0.001 t= 0.00	651

*p<.05 **p<.01 *** p<.001

Overall, the findings did not support hypothesis three. Results indicated a lack of difference in pain-related self-efficacy's predictive utility of long-term outcomes based on age at initial visit.

Hypothesis 4: Relation of age to levels of self-efficacy

Hypothesis four examined the impact of age at baseline on pain-related self-efficacy and predicted that initial age would not be related to differing levels of self-efficacy. In the simplest model when only initial age—calculated such that the minimum

age was zero—was included, for each year increase in initial age above the minimum age of 8, the PFCP score was 0.07 (t= -5.54, p<.001, df=671), with 8 year olds having an average PFCP score of 2.50 at baseline. Across time points, for each year increase in age, PFCP decreased by 0.08 points (t=-5.94, p<0.001, df=667). Across time points, for each year increase in age at initial visit, PFCP decreased by 0.08 points (t=-5.92, p<0.001, df=665). Correlation analyses indicated that age at initial visit was negatively correlated with PFCP at baseline, two-week follow-up, and six-month follow-up but at not the long-term follow-up (Table 6).

Table 6: Correlations between Age at Baseline and PFCP across time points

	Time one PFCP	Time two PFCP	Time three PFCP	Time four PFCP
Age at Baseline	r=-0.19 p<.0001 N=863	r=-0.15 p=0.01 N=300	r=-0.24 p=0.01 N=121	r=-0.08 p=0.21 N=258

In the simplest model when only initial age was included, age at initial visit was not significantly related to EFCP levels at baseline, with 8 year-olds having a score of 2.78 at baseline. Across time points, EFCP did not vary significantly by age (t=-0.41, coefficient=-0.01, p=0.68). Across time points, EFCP did not vary significantly by age at initial visit (t= -0.90, coefficient -0.01, p=0.37). Correlation analyses indicated that age at the clinic visit was not significantly correlated with EFCP at any time point (Table 7).

Table 7: Correlations between Age at Baseline and EFCP across time points

	Time one EFCP	Time two EFCP	Time three EFCP	Time four EFCP
Age at Baseline	r=-0.02 p=0.47 N=863	r=-0.05 p=0.40 N=300	r=-0.05 p=0.61 N=121	r=-0.06 p=0.32 N=258

None of the interactions between age and time segments for either PFCP or EFCP were significant, thus the changes in PFCP and EFCP between time points were not related to age. None of the interactions between initial age and time segments for either PFCP or EFCP was significant thus the changes in PFCP and EFCP between time points were not related to age at initial visit. Therefore, analyses confirm that age at initial visit did not differentiate patterns of change in self-efficacy. However, younger age at initial visit related to higher PFCP at the baseline, two-week, and six-month assessments.

Hypothesis 5: Coping related to changes in pain-related self-efficacy

The fifth hypothesis predicted that initial coping would be related to changes in pain-related self-efficacy with lower levels of initial Passive coping relating to increases in functional self-efficacy (EFCP) and higher levels of initial Accommodative coping predicting increased EFCP. Regression analyses were used in order to isolate initial coping values as predictors. Change in EFCP was assessed by controlling for initial EFCP levels and looking at later EFCP levels as the outcome.

Regression analyses, controlling for initial levels of EFCP, were conducted to examine the relative contribution of Passive, Accommodative, and Active coping on

change in EFCP over various time increments. Long-term EFCP was predicted by Passive coping such that lower initial Passive coping predicted higher long-term EFCP (Table 8) and the addition of various coping types accounted for an additional five percent of the variance beyond that accounted for by Time-one EFCP. This was in the hypothesized direction.

Table 8: Multiple Regression Analysis Examining the Impact of Types of Coping on Long-term EFCP.

Predictor Variable	**B**	**T**	**R^2 change**
Step 1: Predictor Variables			0.06***
Time 1 EFCP centered	0.24	3.93***	
Step 2:			0.05**
Time 1 EFCP	0.17	2.15*	
Active Coping T1	-0.04	-0.60	
Accommodative Coping T1	-0.12	-1.81	
Passive Coping T1	-0.18	-2.31*	
*p<.05 **p<.01			
*** p<.001 df=251			

Lower initial Passive coping also predicted early change in EFCP as higher two-week EFCP was significantly predicted by Time-one Passive coping when initial EFCP was controlled (Table 9). No coping scales predicted the changes between two-weeks and six-months and six-months and the long-term follow-up. This may be because of the small sample size in analyses involving the six-month follow-up as only the GICOPE cohort participated at this time point. These findings partially support the hypothesis as lower initial Passive coping did relate to later higher EFCP, but Accommodative coping was not predictive. This fits with the larger literature where Passive coping is a stronger predictor than Accommodative coping (e.g., Grant, Long, & Willms, 2003; Litt, Shafer, & Napolitano, 2004; L. S. Walker, et al., 2005; L. S. Walker, et al., 1997).

Table 9: Multiple Regression Analysis Examining the Impact of Types of Coping on two-week EFCP scores.

Predictor Variable	B	T	R^2 change
Step 1: Predictor Variables			0.58***
Time 1 EFCP centered	0.76	20.01***	
Step 2:			0.02**
Time 1 EFCP	0.63	11.81***	
Active Coping T1	-0.02	-0.36	
Accommodative Coping T1	0.06	1.34	
Passive Coping T1	-0.17	-3.44**	
*p<.05 **p<.01			
*** p<.001 df=297			

Regression analyses, controlling for initial values of PFCP, were conducted to examine the relative contribution of Passive, Active, and Accommodative coping on later PFCP scores, though no a priori hypothesis were made.

Changes in PFCP were predicted by various types of coping. No coping subscale predicted long-term PFCP scores when controlling for Time-one PFCP levels. However, both initial Passive and Accommodative coping significantly predicted two-week follow-up PFCP scores when Time-one PFCP was controlled (Table 10) such that lower initial Passive coping and higher initial Accommodative coping predicted higher two-week PFCP. Initial Passive coping also predicted long-term follow-up scores in the opposite direction when the six-month scores were controlled such that higher initial Passive coping predicted a greater increase in PFCP from the six-month to long-term follow-up (Table 11). Thus, initial Passive coping was predictive of later changes in PFCP even when there was a small sample size, but it did not account for a significant amount of variability beyond that predicted by Time-three PFCP.

Table 10: Multiple Regression Analysis Examining the Impact of Types of Coping on two-week PFCP scores.

Predictor Variable	**B**	**T**	**R^2 change**
Step 1: Predictor Variables			0.53***
Time 1 PFCP centered	0.73	18.19***	
Step 2:			0.03**
Time 1 PFCP	0.63	13.26***	
Active Coping T1	0.04	1.03	
Accommodative Coping T1	0.14	3.32**	
Passive Coping T1	-0.11	-2.26*	
*p<.05 **p<.01			
*** p<.001 df=297			

Table 11: Multiple Regression Analysis Examining the Impact of Types of Coping on Slope of Change in PFCP from Time 3 to Time 4.

Predictor Variable	**B**	**T**	**R^2 change**
Step 1: Predictor Variables			0.21***
Time 3 PFCP	0.46	4.01	
Step 2:			0.07
Time 3 PFCP	0.56	4.48	
Active Coping T1	-0.21	-1.738	
Accommodative Coping T1	0.07	0.65	
Passive Coping T1	0.29	2.19*	
*p<.05 **p<.01			
*** p<.001 df=61			

Analysis of the impact of coping on PFCP was exploratory, but the findings paralleled those for EFCP in that low Passive coping predicted increases in PFCP; however for PFCP this was only early changes and then in the opposite direction for late change. Additionally higher initial Accommodative coping related to higher two-week PFCP which was not expected, but was in a direction that makes conceptual sense.

Hypothesis 6: Disability at initial visit

Hypothesis six was that those with higher levels of disability at baseline would show decreases in both PFCP and EFCP. Given that GICOPE subjects did not complete the FDI at any of the time points prior to the long-term follow-up and the GICOPE cohort was the only cohort that participated in a six-month follow-up, HLM was not used to analyze this hypothesis. Regression analysis using the FDI at Time-one and examining the change in PFCP and EFCP between baseline and the two-week follow-up and between baseline and the long-term follow-up were conducted. This was done by controlling for Time-one PFCP or EFCP levels and including Time-one FDI levels as a predictor of the Time-two or long-term follow-up PFCP or EFCP scores.

Results did not demonstrate any significant ability for baseline FDI scores to predict either two-week or long-term PFCP scores when controlling for baseline PFCP scores (Table 12 and Table 13).

Table 12: Multiple Regression Analysis Examining the Impact of Functional Disability at baseline on Two-week Follow-up PFCP scores.

Predictor Variable	**B**	**T**	**R^2 change**
Step 1: Predictor Variables			0.53***
Time 1 PFCP centered	0.73	12.76***	
Step 2:			0.001
Time 1 PFCP centered	0.71	11.43***	
FDI sum at Time 1 centered	-0.04	-0.65	
*p<.05 **p<.01			
*** p<.001 df=146			

Table 13: Multiple Regression Analysis Examining the Impact of Functional Disability at baseline on Long-term Follow-up PFCP scores.

Predictor Variable	**B**	**T**	**R^2 change**
Step 1: Predictor Variables			<0.001
Time 1 PFCP centered	0.02	0.23	
Step 2:			0.005
Time 1 PFCP centered	-0.01	-0.06	
FDI sum at Time 1 centered	-0.07	-0.94	
*p<.05 **p<.01			
*** p<.001 df=176			

Regression analyses did show a significant negative relation between baseline FDI scores and higher EFCP at the two-week follow-up such that greater baseline disability predicted lower EFCP after controlling for baseline levels (Table 14), though it explained only an additional two percent of the variance beyond that explained by Time-one EFCP. However, baseline FDI did not significantly predict long-term follow-up levels of EFCP when controlling for Time-one EFCP (Table 15).

Table 14: Multiple Regression Analysis Examining the Impact of Functional Disability at baseline on Two-week Follow-up EFCP scores.

Predictor Variable	**B**	**T**	**R^2 change**
Step 1: Predictor Variables			0.57***
Time 1 EFCP centered	0.76	13.88***	
Step 2:			0.02*
Time 1 EFCP centered	0.70	11.99***	
FDI sum at Time 1 centered	-0.15	-2.58*	
*p<.05 **p<.01			
*** p<.001 df=146			

Table 15: Multiple Regression Analysis Examining the Impact of Functional Disability at baseline on Long-term Follow-up EFCP scores.

Predictor Variable	**B**	**T**	**R^2 change**
Step 1: Predictor Variables			0.08***
Time 1 EFCP centered	0.28	3.81***	
Step 2:			0.01
Time 1 EFCP centered	0.25	3.20**	
FDI sum at Time 1 centered	-0.08	-0.99	
*p<.05 **p<.01			
*** p<.001 df=176			

Overall, there was only limited statistical support for hypothesis six, but much of it was not confirmed. Baseline FDI was predictive of only early change in EFCP and was not predictive of any change in PFCP.

Hypothesis 7: Change in pain-related self-efficacy predicting long-term outcomes.

Hypothesis seven asserted that the later changes in PFCP and EFCP would have the greatest impact on long-term outcomes. Additionally, it hypothesized that EFCP would have more impact on physical functioning than would PFCP. Actual calculated slope scores (e.g. [T4EFCP-T1EFCP]/[Time4-Time1] where Time1=zero as it is the initial clinic visit) were calculated rather than using predicted slope scores produced by HLM models. This statistical approach was taken given that the predicted slopes were based on very long intervals between either the two-week or six-month follow-up and the long-term follow-up. Thus, it is unclear that the pattern predicted would accurately capture what occurred in the interim. Using actual slopes was a more conservative approach both because it uses actual values and because it necessarily uses a smaller sample size.

Slopes rather than absolute change scores were used in order to account for the variability in time between the initial clinic visit and the long-term follow-up. However, given the large variability in Time-four follow-up, a dummy code consisting of the average length in time between the six-month follow-up and the long-term follow-up was used in calculating the slopes including the six-month interval. Dummy coding was used because there was not hypothesized to be a continuous linear change occurring several years out from the baseline and using actual time would create very disparate divisors in the calculation of the slope. Where applicable, various slope scores including slopes between Time-one and Time-two were included. However, inclusion of slopes in regression analyses limited the sample size for any particular analysis to the number of subjects who had all of the time points included in the slopes.

Regression analyses using the slope scores for either PFCP or EFCP were conducted, examining the relative influence of rate of change in pain-related self-efficacy on outcomes of interest. Baseline measures of the outcome variable were included in the first block unless otherwise stated.

Lower functional disability at follow-up, as measured by the FDI, was significantly predicted by increases in PFCP from Time-one to Time-four (β= -0.29, t=-3.96, df=160, $p<0.001$) and by increases in EFCP from Time-one to Time-four (β= -0.28, t=-3.12, df=160, $p<0.001$) when they were entered independently. When the slopes of both PFCP and EFCP from Time-one to Time-four were included in the regression model, only changes in PFCP (Table 16) remained significant. Neither the PFCP nor EFCP slope from Time-one to Time-two were predictive of FDI at Time-four (β=0.14, t=-1.08, p=0.29, df=43; β= -0.20 t=-1.51, p=0.14, df=43). As FDI scores were collected

only at baseline in the Diary and Clinic samples and only at two-week follow-up in the Diary sample, the sample size was reduced. As GICOPE participants—and consequently the entire six-month follow-up—were excluded because they did not complete the FDI prior to the long-term follow-up, only early slopes and overall slopes were assessed.

Table 16: Multiple Regression Analysis Examining the Impact of rate of change of Pain-Related Self-Efficacy on Functional Disability at Follow-up.

Predictor Variable	**B**	**T**	**R^2 change**
Step 1: Predictor Variables			0.11***
FDI sum at Time 1 centered	0.33	4.36***	
Step 2:			0.10***
FDI sum at Time 1 centered	0.39	5.34***	
Slope of change in PFCP Time 1 to Time 4	-0.20	-2.37*	
Slope of change in EFCP Time 1 to Time 4	-0.17	-1.96	
*p<.05 **p<.01			
*** p<.001 df=160			

In a separate analysis, neither initial levels of PFCP or EFCP were predictive of long-term FDI (Table 17), indicating that it is the change, not the initial levels of pain-related self-efficacy that predicted less functional disability.

Table 17: Multiple Regression Analysis Examining the Impact initial levels of Pain-Related Self-Efficacy on Functional Disability at Follow-up.

Predictor Variable	**B**	**T**	**R^2 change**
Step 1: Predictor Variables			0.11***
FDI sum at Time 1 centered	0.33	4.48***	
Step 2:			0.003
FDI sum at Time 1 centered	0.35	4.36***	
Time 1 PFCP centered	0.05	0.61	
Time 1 EFCP centered	0.03	0.03	
*p<.05 **p<.01			
*** p<.001 df=164			

Higher overall functioning, as measured by the SF-36, was significantly predicted by increases in PFCP from Time-one to Time-four (β= 0.20, t=3.07, p=.002, df=230) but not by increases in EFCP from Time-one to Time-four (β= 0.13, t=1.94, p=0.05, df=230). However, it was not clear when changes in pain-related self-efficacy are most predictive as none of the slopes between consecutive time points was significantly predictive when they were included in one model for EFCP and a separate model for PFCP (**PFCP**: T1-T2 β= 0.02, t=0.15, p=0.88, df=59; T2-T3 β= 0.04, t=0.24, p=0.81, df=59; T3-T4 β= 0.03, t=0.20, p=0.84, df=59; **EFCP**: T1-T2 β= 0.13, t=0.89, p=0.38, df=59 T2-T3 β= 0.004, t=0.03, p=0.98, df=59; T3-T4 β= 0.13, t=0.96, p=0.34, df=59). This is potentially due to decreased sample size. When both PFCP and EFCP were included in the model, only rate of change in PFCP from Time-one to Time-four remained significant (Table 18). As the SF-36 was not included at baseline, no baseline measures were included in the model.

Table 18: Multiple Regression Analysis Examining the Impact of rate of change of Pain-Related Self-Efficacy on SF-36 overall functioning at Follow-up.

Predictor Variable	**B**	**T**	**R^2 change**
Step 1: Predictor Variables			0.04**
Slope of change in PFCP Time 1 to Time 4	0.18	2.41*	
Slope of change in EFCP Time 1 to Time 4	0.04	0.53	
*p<0.05 **p<0.01			
*** p<0.001 df=230			

In a separate analysis, neither initial levels of PFCP or EFCP were predictive of long-term SF-36 (Table 19), indicating that it is the change in PFCP, not the initial levels of pain-related self-efficacy that predict overall functioning.

Table 19: Multiple Regression Analysis Examining the Impact initial levels of Pain-Related Self-Efficacy on SF-36 overall functioning at Follow-up.

Predictor Variable	**B**	**T**	**R^2 change**
Step 1: Predictor Variables			0.01
Time 1 PFCP centered	0.05	0.72	
Time 1 EFCP centered	0.02	0.30	
*p<.05 **p<.01			
*** p<.001 df=236			

Symptoms of depression, as measured by the CES-D, were significantly predicted by rate of change in PFCP and EFCP between Time-one and Time-four indicating increases in pain-related self-efficacy related to lower symptoms of depression at follow-up (Table 20 and Table 21). However, it is not clear when changes in pain-related self-efficacy were most predictive as none of the slopes between consecutive time points was significantly predictive when they were included in one model for EFCP and a separate model for PFCP (**PFCP**: T1-T2 β= -0.08, t= -0.66, p=0.51, df=60; T2-T3 β= 0.16, t=1.21, p=0.23, df=60; T3-T4 β= 0.11, t=0.88, p=0.38, df=60; **EFCP**: T1-T2 β= -0.03, t= -0.25, p=0.80, df=60 T2-T3 β= 0.11, t=0.88, p=0.39, df=60; T3-T4 β= -0.14, t= -1.05, p=0.30, df=60). This is potentially due to decreased sample size. When both PFCP and EFCP were included in the model, neither rate of change in PFCP nor EFCP from Time-one to Time-four remained significant (**PFCP:** β= -0.12, t= -1.68, p=0.10, df=252; **EFCP**: β= -0.08, t= -1.16, p=0.25, df=252). As the CES-D was not included at baseline, the baseline values for the CDI were used in the regression model to control for baseline symptoms of depression.

Table 20: Multiple Regression Analysis Examining the Impact of rate of change of Pain Self-Efficacy on Symptoms of Depression (CES-D) at Follow-up.

Predictor Variable	**B**	**T**	**R^2 change**
Step 1: Predictor Variables			0.08***
CDI sum at Time 1	0.29	4.80***	
Step 2:			0.02*
CDI sum at Time 1	0.32	5.25***	
Slope of change in PFCP Time 1 to Time 4	-0.15	-2.46*	
*p<.05 **p<.01			
*** p<.001 df=252			

Table 21: Multiple Regression Analysis Examining the Impact of rate of change of EFCP on Symptoms of Depression (CES-D) at Follow-up.

Predictor Variable	**B**	**T**	**R^2 change**
Step 1: Predictor Variables			0.08***
CDI sum at Time 1	0.29	4.80***	
Step 2:			0.02*
CDI sum at Time 1	0.34	5.28***	
Slope of change in EFCP Time 1 to Time 4	-0.14	-2.13*	
*p<.05 **p<.01			
*** p<.001 df=252			

In a separate analysis, neither initial levels of PFCP or EFCP were predictive of long-term CES-D (Table 22), indicating that it is the change in PFCP and EFCP, not the initial levels of pain-related self-efficacy that predict depressive symptoms at follow-up.

Table 22: Multiple Regression Analysis Examining the Impact initial levels of Pain-Related Self-Efficacy on Depressive Symptoms at Follow-up.

Predictor Variable	B	T	R^2 change
Step 1: Predictor Variables			0.09***
CDI sum at Time 1 centered	0.29	4.83***	
Step 2:			0.001
CDI sum at Time 1 centered	0.30	4.36***	
Time 1 PFCP centered	0.02	0.26	
Time 1 EFCP centered	0.01	0.17	
*p<.05 **p<.01			
*** p<.001 df=254			

Lower overall abdominal pain, as measured by the API, was significantly predicted by positive slope in PFCP between Time-one and Time-four both when it was entered alone and when entered with EFCP (Table 23). The slope of EFCP between Time-one and Time-four was not predictive of overall pain when entered alone (β= -0.02, t= -0.32, p=0.75, df=235). Additionally, none of the slopes between smaller time intervals predicted overall abdominal pain at follow-up. Baseline API levels were controlled for in each analysis.

Table 23: Multiple Regression Analysis Examining the Impact of rate and timing of change in Pain-Related Self-Efficacy on Abdominal Pain (API) at Follow-up.

Predictor Variable	B	T	R^2 change
Step 1: Predictor Variables			0.04**
API at Time 1 centered	0.21	3.283**	
Step 2:			0.02
API at Time 1 centered	0.22	3.315**	
Slope of change in PFCP Time 1 to Time 4	-0.15	-2.11*	
Slope of change in EFCP Time 1 to Time 4	0.05	0.68	
*p<.05 **p<.01			
*** p<.001 df=235			

In a separate analysis, neither initial levels of PFCP or EFCP were predictive of long-term API (Table 24), indicating that it is the change in PFCP and EFCP, not the initial levels of pain-related self-efficacy that predict overall abdominal pain at follow-up.

Table 24: Multiple Regression Analysis Examining the Impact initial levels of Pain-Related Self-Efficacy on Abdominal Pain at Follow-up.

Predictor Variable	**B**	**T**	**R^2 change**
Step 1: Predictor Variables			0.05**
API sum at Time 1 centered	0.22	3.49**	
Step 2:			0.01
API sum at Time 1 centered	0.20	2.87**	
Time 1 PFCP centered	0.02	0.26	
Time 1 EFCP centered	-0.01	-1.22	
*p<.05 **p<.01			
*** p<.001 df=244			

Somatic symptoms, as measured by the CSI, were significantly predicted by the rate of change in PFCP and EFCP from Time-one to Time-four, such that increases in pain-related self-efficacy predicted lower somatic symptoms both when entered separately and within the same analysis (Table 25). When examining slopes between consecutive intervals in one analysis, slopes of change in PFCP were not predictive of long-term somatization (T1-T2 β= -0.24, t= -1.93, p=0.06, df=58; T2-T3 β= -0.19, t=-1.41, p=0.16, df=58; T3-T4 β= 0.03, t=0.21, p=0.83, df=58). However, the slope between Time-one and Time-two approached significance. Each slope segment of EFCP was predictive of long-term somatization (Table 26).

Table 25: Multiple Regression Analysis Examining the Impact of rate of change of Pain-Related Self-Efficacy on Somatic Symptoms (CSI) at Follow-up.

Predictor Variable	**B**	**T**	**R^2 change**
Step 1: Predictor Variables			0.14***
Somatic Symptoms at Time 1-centered	0.38	6.22***	
Step 2:			0.06***
Somatic Symptoms at Time 1-centered	0.44	7.07***	
Slope of change in PFCP Time 1 to Time 4	-0.14	-2.03*	
Slope of change in EFCP Time 1 to Time 4	-0.16	-2.25*	
*p<.05 **p<.01			
*** p<.001 df=234			

Table 26: Multiple Regression Analysis Examining the Impact of rate and timing of change of Emotion-Focused Coping Potential on Somatic Symptoms (CSI) at Follow-up.

Predictor Variable	**B**	**T**	**R^2 change**
Step 1: Predictor Variables			0.12**
Somatic Symptoms at Time 1-centered	0.35	2.774**	
Step 2:			0.14*
Somatic Symptoms at Time 1-centered	0.49	3.86***	
Slope of change in EFCP Time 1 to Time 2	-0.33	-2.60*	
Slope of change in EFCP Time 2 to Time 3	-0.29	-2.19*	
Slope of change in EFCP Time 3 to Time 4	-0.26	-2.05*	
*p<.05 **p<.01			
*** p<.001 df=58			

In a separate analysis, neither initial levels of PFCP or EFCP were predictive of long-term CSI (Table 27), indicating that it is the change in PFCP and EFCP, not the initial levels of pain-related self-efficacy that predict somatization at the long-term follow-up.

Table 27: Multiple Regression Analysis Examining the Impact initial levels of Pain-Related Self-Efficacy on Somatization at Follow-up.

Predictor Variable	B	T	R^2 change
Step 1: Predictor Variables			0.14***
Somatic Symptoms at Time 1-centered	0.37	6.21***	
Step 2:			0.004
Somatic Symptoms at Time 1-centered	0.40	6.01***	
Time 1 PFCP centered	0.03	0.39	
Time 1 EFCP centered	0.05	0.69	
*p<.05 **p<.01			
*** p<.001 df=240			

Lower Anxiety symptoms, as measured by the STAI, were significantly predicted by increases in PFCP between Time-one and Time-four but not by the slope of EFCP between Time-one and Time-four either when entered alone or when entered with the slope of PFCP (Table 28). However, this increase in PFCP does not account for a significant amount of variance. Analyses assessing where the change in PFCP was most influential showed that the slope between two-weeks and six-months was most predictive of anxiety symptoms as this slope was significantly predictive even with a relatively smaller sample size (Table 29), but it does not account for a significant amount of variance. However, given the number of statistical tests run, the inclusion of participants only from the GICOPE study, and that the direction of the finding indicates increases in PFCP between T2 and T3 relate to increased Anxiety symptoms, it may be a spurious finding. As symptoms of anxiety were not assessed at baseline, no baseline levels of anxiety were controlled in these regression models.

Table 28: Multiple Regression Analysis Examining the Impact of rate of change of Pain-Related Coping Potential on Symptoms of Anxiety (STAI) at Follow-up.

Predictor Variable	B	T	R^2 change
Step 1: Predictor Variables			0.02
Slope of change in PFCP Time 1 to Time 4	-0.14	-2.01*	
Slope of change in EFCP Time 1 to Time 4	0.04	0.55	
*p<0.05 **p<0.01			
*** p<0.001 df=253			

Table 29: Multiple Regression Analysis Examining the Impact of rate and timing of change in PFCP on Symptoms of Anxiety (STAI) at Follow-up.

Predictor Variable	B	T	R^2 change
Step 1: Predictor Variables			0..10
Slope of change in PFCP Time 1 to Time 2	-0.12	-0.96	
Slope of change in PFCP Time 2 to Time 3	0.28	2.09*	
Slope of change in PFCP Time 3 to Time 4	0.07	0.54	
*p<.05 **p<.01			
*** p<.001 df=61			

In a separate analysis, neither initial levels of PFCP nor EFCP were predictive of Anxiety at the long-term follow-up (Table 30), indicating that it is the change in PFCP, not the initial levels of PFCP that predict anxiety at the long-term follow-up.

Table 30: Multiple Regression Analysis Examining the Impact initial levels of Pain-Related Self-Efficacy on Anxiety at Follow-up.

Predictor Variable	B	T	R^2 change
Step 1: Predictor Variables			0.02
Time 1 PFCP centered	-0.01	-0.18	
Time 1 EFCP centered	-0.11	-1.59	
*p<.05 **p<.01			
*** p<.001 df=240			

Using Binary Logistic Regression, the rate of change in PFCP between Time-one and Time-four did not significantly contribute to predicting whether a participant continued to have Chronic abdominal pain (CAP) or the CAP had resolved when it was entered in isolation (Wald=0.97, p=0.33, Exp(B)=0.37). However, increases in EFCP significantly predicted a greater chance of the CAP being unresolved both when it was entered alone and when PFCP was included (Table 31). Increases in PFCP predicted a greater likelihood of CAP being resolved when it was entered with the slope of EFCP. Consecutive PFCP slopes of smaller time intervals did not demonstrate significant ability to predict resolution. However, when consecutive slopes of EFCP were included together in an analysis, it was later increases in EFCP that predicted unresolved CAP (Table 32).

Table 31: Logistic Regression Analysis Examining the Impact of rate of change in Pain-related Self-efficacy on Resolution of CAP.

Predictor Variable	**B**	**Wald**	**Sig.**	**Exp(B)**
Block 1:				
Slope of change in PFCP Time 1 to Time 4	-3.31	7.19	0.01	0.04
Slope of change in EFCP Time 1 to Time 4	5.74	13.54	<0.001	310.20
N=237; Hosmer & Lemeshow p=0.52; % correct=65.6				

Table 32: Logistic Regression Analysis Examining the Impact of the Timing of Change in Emotion-Focused Coping Potential on Resolution of CAP.

Predictor Variable	**B**	**Wald**	**Sig.**	**Exp(B)**
Block 1:				
Slope of change in EFCP Time 1 to Time 2	0.02	1.49	0.22	1.02
Slope of change in EFCP Time 2 to Time 3	0.31	2.60	0.11	1.37
Slope of change in EFCP Time 3 to Time 4	7.05	4.23	0.04	1152.04
N=60; Hosmer & Lemeshow p=0.32; % correct=70				

In an analysis including initial levels of PFCP and EFCP, higher initial levels of EFCP predicted the resolution of CAP (Table 33). Thus, initially high EFCP is protective, but later decreases in EFCP and increases in PFCP predict resolution. This pattern of increasing EFCP predicting unresolved CAP, especially later increases in EFCP, may reflect individuals' accurate beliefs that the pain is not remitting, along with their increasing belief in their capacity to cope and function despite the pain. Increasing PFCP predicting the resolution of CAP may reflect an accurate assessment in individuals' reductions in symptoms.

Table 33: Logistic Regression Analysis Examining the Impact of Initial levels of PFCP and EFCP on Resolution of CAP.

Predictor Variable	B	Wald	Sig.	Exp(B)
Block 1:				
Time 1 PFCP centered	0.05	0.11	0.74	1.05
Time 1 EFCP centered	-0.55	12.08	0.001	0.58
N=273; Hosmer & Lemeshow p=0.80; % correct=68.1				

It was hypothesized that later changes in self-efficacy would have greater influence on outcomes. The data from the current study did not bear this out except in respect to the resolution of CAP. In predicting most outcomes, no particular time period of change was significant in and of itself; this may be due to smaller sample sizes because the smallest sample, only GICOPE, could be used to assess this question. Rate of change in PFCP and EFCP also demonstrated a greater ability to predict psychological and functional outcomes than initial PFCP and EFCP levels.

CHAPTER IV

DISCUSSION

Primary findings: Change in self-efficacy and relation to outcomes

The current study examined pain-related self-efficacy in patients with chronic pain with regard to its change over time and in relation to broad outcomes. As predicted, in the current sample, the greatest change in pain-related self-efficacy occurred early on. After this initial increase, the rate of change tended to level out for both PFCP and EFCP. One explanation for this significant early change may be that seeing the gastroenterologist between the initial assessment and the two-week follow-up acted as an "intervention" for CAP patients. The study did not evaluate or code the content of the appointments with the gastroenterologist, but it is likely that the patients and parents left the visit with a greater understanding of their pain and perhaps with a biopsychosocial understanding of the etiology and maintenance of their pain that enhanced both their PFCP and EFCP. For instance, the clinician may have discussed the patient's pain as real functional pain with biological sensitivities and psychological contributors such as stress, anxiety, and avoidance exacerbating the patient's experience of pain. The clinician may also have provided information including dietary advice that helped the patient to feel more efficacious. Clinicians may have prescribed or recommended medications that led to some symptom alleviation, thereby enabling patients to feel more confident about being able to alleviate their pain and to feel more empowered to cope with their pain. While the exact mechanism by which this change occurred cannot be discerned from the

current data, the greatest increase in self-efficacy appeared to occur in relation to a shift following a visit to the gastroenterology clinic.

It is noteworthy that even in the context of a sizeable initial change with gradual or non-significant change thereafter, it was the rate of change in pain-related self-efficacy, rather than initial self-efficacy values, that predicted several long-term outcomes. Particularly, increase in PFCP was strongly predictive of better physical and overall functioning and less abdominal pain at the long-term follow-up, somewhat predictive of fewer symptoms of depression and anxiety. Patients showing greater increases in PFCP from baseline were also more likely to have experienced resolution of their CAP diagnosis. Greater increase in EFCP was predictive of better physical functioning and less somatization, as well as somewhat predictive of fewer symptoms of depression. Increase in EFCP over time actually predicted greater likelihood that one continues to experience unresolved CAP even though high initial levels of EFCP related to eventual resolution of CAP. The finding that it is the ability to increase one's sense of self-efficacy that predicted outcomes, rather than one's initial self-efficacy level, may indicate that it is individuals' abilities to utilize information and resources—such as those provided in the clinic visit—to increase their self-efficacy that matters more than these individuals' reports of their self-efficacy beliefs prior to access to these resources.

Only one prior study examining self-efficacy's impact on functioning was longitudinal in design. Thus, it is noteworthy that the results from this current longitudinal study did, to a large degree, parallel findings from cross-sectional and lagged design studies showing positive outcomes associated with increases in self-efficacy. The current study found less consistent relation between self-efficacy and depressive

symptoms than prior research in children (Kaminsky, et al., 2006). This may be because the prior cross-sectional finding reflected the relation between low self-worth and low belief in oneself when measured concurrently, whereas pain-related self-efficacy may be too domain specific to predict a purely psychological construct such as depressive symptoms several years later. The relative lack of strength in EFCP predicting functioning parallels a prior study in children that did not find a relation between child reports of functional self-efficacy and physical functioning (Bursch, et al., 2006), but is inconsistent with the adult literature relating functional self-efficacy to physical functioning. The difference in findings may be that the relation between these constructs differs in children and adults and the current study spans from childhood to young adulthood. Additionally, the current study's measure of functional self-efficacy—EFCP—assessed beliefs about coping emotionally, whereas most measures of functional self-efficacy in the pain literature assess beliefs about one's ability to perform tasks. Further clarification of the relative influence of functional self-efficacy—measured with both a focus on emotional coping and on ability to perform tasks—and pain self-efficacy across different developmental stages on psychological and physical functioning outcomes is needed.

Factors influencing levels of self-efficacy

Differences in gender influenced levels of self-efficacy across early time points. Females began with lower self-efficacy levels than males. This parallels results from another study of initial levels of pain-related self-efficacy in children (Vierhaus, et al., 2010) and is consistent with literature reporting lower self-efficacy levels for females

measured in non-pain domains (Larose, et al., 2006). The current results also fit within the findings of a review in the adult pain-related self-efficacy literature (Chong, et al., 2001) that found either higher self-efficacy reported by males or no gender differences. Prior pain research indicates that females experience more recurrent pain (Unruh, 1996), young girls exhibit more overt pain behaviors such as crying (Fearon, McGrath, & Achat, 1996), and pain catastrophizing occurs more in females and mediates the relation between females reporting and exhibiting more pain (Keefe et al., 2000). This suggests that females, on average, experience pain as more distressing and interfering than males, and behave in ways, such as crying, aimed at engendering the support of others. One could surmise that these behaviors result from females' relative lack of belief that they can manage or cope with pain independently; future studies are needed to test this relation directly. In contrast to research findings in other non-pain domains (Larose, et al., 2006; McKellar, et al., 2008), the current study did not find significantly larger increases in self-efficacy for females, versus males, over time. However, the lack of significant gender differences in self-efficacy ratings at later time points does imply females had somewhat greater increases in self-efficacy over time than did males, despite their slopes not being significantly different.

In the current study older children reported lower levels of PFCP across time points, but levels of EFCP were unrelated to age at any time point. Self-efficacy theory proposes that contingencies, such as access to different supports, will vary by age (Cervone, et al., 2006) and will consequently influence levels of self-efficacy, but this was only partially supported by the current study. However, the current study's finding of no difference in age for EFCP, in particular, is consistent with a prior study of

functional self-efficacy in childhood that found no difference by age (Bursch, et al., 2006). Additionally, though one prior study (Chong, et al., 2001) of adults found lower pain-related self-efficacy in younger participants (17-35 year-olds), this finding does not contradict the current finding (i.e. higher levels PFCP in younger participants) because of the differing age ranges across samples. It may be that pain self-efficacy develops in a U shaped pattern such that values are initially higher in childhood, decrease in adolescence and emerging adulthood, then increase again in later adulthood; a study over the entire lifespan would help to clarify this. Findings in the current study of lower levels of pain self-efficacy in adolescents parallels findings from other domains where functioning and well-being decrease during adolescence, such as increased rates of depression (Hankin & Abramson, 1999). Relatively low self-efficacy during adolescence could also reflect adolescents' feelings of uncertainty in themselves given they are likely engaging with the developmental task of identity formation and increased autonomy as they move through adolescence and emerging adulthood.

While initial age influenced PFCP levels, initial age did not influence how predictive baseline self-efficacy levels were on long-term outcomes. These findings did not support prior literature showing self-efficacy in older children is more predictive of behaviors (Davis-Kean, et al., 2008). In general, initial age was not influential on self-efficacy's ability to predict outcomes, implying that it is just as useful to ask children about their self-efficacy as it is to ask adolescents, in terms of how this will affect their future functioning.

Relation between initial coping and disability and change in self-efficacy

Lower initial Passive coping related to greater increase in EFCP. However, the hypothesis regarding initial Accommodative coping predicting increases in EFCP was not supported. Both lower Passive and higher Accommodative coping predicted greater early increase in PFCP. Less Passive coping likely allows one to engage in life and continue to function in valued ways despite the pain, consequently increasing functional self-efficacy. The fear-avoidance model of pain theorizes that individuals who appraise pain as a threat feel anxiety and apprehension about experiencing increased pain through activity and consequently avoid activity; this avoidance leads to disability (Asmundson & Wright, 2004). Passive coping includes isolating oneself and avoidance of activities and this withdrawal from life and experiences likely confirms one's belief that she cannot cope or function with pain and likely leads to real functional disability that further confirms one's beliefs about not being able to function. However, lower initial Passive coping also led to less increases in PFCP from the six-month to long-term follow-up and this may reflect individuals who initially engaged actively to reduce their pain but whose pain did not abate, thus they reported lower levels of PFCP at the long-term follow-up because, despite their best efforts, they could not alleviate pain.

Functioning and pain-related self-efficacy are strongly related throughout the literature (e.g. Arnstein, 2000; Ayre & Tyson, 2001; Buckelew, et al., 1995; Denison, et al., 2004; Estlander, et al., 1994; Kaivanto, et al., 1995), but the direction of causality is unclear given the lack of longitudinal studies. The current study showed that functional impairment at baseline had little impact on changes in long-term PFCP. Less initial

functional disability did predict early increases in EFCP. This relation could indicate that less impairment acts as evidence that bolsters one's confidence in coping and functioning with the demands of life despite the pain. As noted earlier, results from the current study indicated that increases in both PFCP and EFCP predict less long-term functional disability. Given initial functional disability's relative lack of ability to predict changes in PFCP and functional disability's limited ability to predict only early changes in EFCP, it is likely that self-efficacy influences disability, rather than disability influencing pain-related self-efficacy.

Overview

In summary, several overall patterns regarding changes in self-efficacy emerge from the current study. Without specific intervention, the largest increases in pain-related self-efficacy occurred early after a clinic visit. Differences in the rate of change in PFCP and EFCP, rather than initial values, predicted several important long-term outcomes. Self-reports of both children and adolescents' pain-related self-efficacy are likely to be equally informative about their later physical and psychological functioning while initial differences in gender and age can provide some insight into differences in pain-related self-efficacy reports at baseline. Finally, baseline coping strategies, particularly Passive coping, influenced patterns of change in self-efficacy among individuals diagnosed with CAP.

Broadly speaking, the patterns of change were similar for PFCP and EFCP. However, there are some noteworthy differences between the two constructs both in their pattern of change and in their utility in predicting outcomes. In the current study, PFCP

was the more consistent predictor of outcomes, though both have some predictive utility. These differences speak to the value of retaining pain self-efficacy and functional self-efficacy as distinct constructs under the broader construct of pain-related self-efficacy. This is particularly true given the larger self-efficacy literature's emphasis on specificity in self-efficacy (DeVellis & DeVellis, 2001), such that more precise and distinct definitions are valued. Additionally, within the pain-related self-efficacy literature, these two constructs are distinct and are frequently not examined within the same study. Most of the studies examining the relation between pain-related self-efficacy and functioning in the context of pain assess functional self-efficacy rather than pain self-efficacy (e.g., Chong, et al., 2001; Estlander, et al., 1994; Kaivanto, et al., 1995; Nicholas, 2007); thus the current findings speak to the need to increasingly include pain self-efficacy, not only functional self-efficacy, in pain research.

Clinical Implications

As self-efficacy levels did predict several improved functional outcomes, there is likely utility in interventions aimed at increasing pain-related self-efficacy. Marks (2001) reviewed the literature on interventions aimed at improving the management of arthritis and observed that interventions can increase self-efficacy. Given that self-efficacy can be manipulated, it is important to understand the natural variations and course of change in self-efficacy in order to understand how, when, and with whom interventions should be aimed. One study in the review conducted by Marks (2001) found interventions resulted in changes in only pain self-efficacy and not functional self efficacy; however, most studies found changes occurred in overall self-efficacy. In the current study, growth in

PFCP (i.e., pain self-efficacy) was most predictive of long-term outcomes amongst patients with a wide range of initial pain and disability levels. These results suggest that interventions aimed at increasing strategies for increasing one's sense of ability to control and reduce pain would have the greatest impact on long-term outcomes.

In the current sample, the greatest increase in both PFCP and EFCP occurred within the first two-weeks following the initial clinic visit. Thus, a follow-up appointment with a mental health clinician shortly after a patient's initial gastroenterology appointment would likely be the best time to evaluate whether the appointment itself improved the patient's self-efficacy, or whether additional intervention targeting self-efficacy is needed. It may be helpful to assess self-efficacy prior to the initial clinic visit and then two-weeks later to determine if there are changes between that initial visit and the two-week assessment, given change is more predictive of outcomes than initial self-efficacy level. Thus, individuals who do not show much natural increase between these two time points may be those most in need of intervention.

On the whole, the initial clinic visit in the current study appeared to function as an intervention given the significant and largest increase in self-efficacy from Time-one to Time-two. Further research assessing what typically is addressed in a clinic visit and which components most strongly contribute to growth in self-efficacy could be helpful in disseminating helpful strategies to other clinics and emphasizing these points in visits. Health psychologists working in an integrative clinic could meet with the patient on the first clinic visit and provide psychoeducation about the biopsychosocial model of pain as well as introduce beneficial coping strategies. This early and brief psychological

intervention could help to minimize harmful strategies like avoidance and Passive coping and hopefully maximize the gains in self-efficacy provided by the clinic visit.

Females likely have greater need and may benefit more from interventions aimed at increasing self-efficacy given their relatively low initial levels of self-efficacy and failure to show significant compensatory increases thereafter. Socialization may encourage females to express their pain more than males and they also may learn to rely more heavily on the aide of caregivers (Fearon, et al., 1996; Keefe, et al., 2000) rather than to have confidence in their own ability to cope with pain. Interventions with females could focus on building females' abilities to use resources such as social support in ways that build on their own capacities. Helping females to see their power and control, even while using outside supports, may build females' self-efficacy.

Results of the current study indicated that older children and adolescents might need more intervention to increase their pain self-efficacy than do younger children. This may be related to older patients being more likely than younger children to initiate the doctor visit, perhaps reflecting their feeling more distressed or hopeless about their pain and ability to alleviate or function with their pain. Additionally, as depression rates are higher in adolescents than in younger children (Hankin & Abramson, 1999) it may be that adolescents have a more negativistic view of their world. In this case, using Cognitive Behavioral skills to enhance overall sense of control and feelings of self-worth may be beneficial. However, this pattern of older patients reporting lower self-efficacy continues across time points and into adulthood and does not appear to end in adolescence. Further research directed at understanding the cause underlying these developmental differences in self-efficacy ratings would help to best direct interventions.

The pain literature suggests that individuals who report high Passive coping are likely to have poorer psychological and physical functioning (Smith, Wallston, Dwyer, & Dowdy, 1997; L. S. Walker, et al., 1997). The current study demonstrates they are likely to have less growth in pain–related self-efficacy as well. Interventions that increase patients' number of Accommodative and Active coping strategies to replace maladaptive coping strategies are likely to increase self-efficacy levels and may improve other areas of functioning as well. Increasing individual's engagement with the world and with valued activities will help to interrupt the pain cycle by decreasing avoidance (Asmundson & Wright, 2004) and will likely help individuals to experience less pain and feel more efficacious for coping with any pain that does occur.

Depending on the outcome of interest, interventions may differentially emphasize pain or functional self-efficacy. Based on the findings from this study, interventions aimed at decreasing or preventing depressive symptoms should likely focus on increasing both pain self-efficacy and functional self-efficacy. Similarly, those aimed at increasing physical functioning should likely equally emphasize increasing pain self-efficacy and functional self-efficacy. Interventions aimed at reducing anxiety or at decreasing pain should focus primarily on improving pain self-efficacy. In contrast, somatization is likely to be reduced most by focusing on increasing functional self-efficacy. However, it should be noted that the current study examined the influence of natural increases in pain-related self-efficacy and increases based on interventions may have different influences on outcomes.

Limitations and Future Directions

There is disagreement about whether self-efficacy can be assessed only in regard to very precise and specific tasks (DeVellis & DeVellis, 2001) or whether it can be assessed with a more generalized total score (Levin, et al., 1996) as we have done in the above study. Thus, there are those who would argue that what this study labeled self-efficacy is not in fact self-efficacy. Additionally, since the initiation of the initial data collection, Bursch, Tsao et al. (2006) have published a more specific child pain self-efficacy questionnaire focused on a more traditional definition of functional self-efficacy. Their measure assesses beliefs about one's ability to perform specific tasks while in pain, rather than beliefs about one's ability to cope emotionally with having pain as in the PBQ. However, Bursch's measure does not assess beliefs in one's ability to alleviate pain and no other measure exists to assess self-efficacy for pain alleviation in children. It would be interesting to conduct similar research with Bursch's pain self-efficacy measure and see if the results are comparable with the current study.

The extreme unevenness in the time intervals in the current study posed analytical difficulties even though HLM is flexible in terms of dealing with missing data points and variety in the length of time between assessments (Singer & Willett, 2003). The intervals between time points varied from 2-weeks to 15-years, making examination of non-linear changes using HLM difficult because one would need to assume the chosen arc of the nonlinear curve from six-months to long-term follow-up was accurate, though it was based on only a few data points very far from the long-term follow-up. Thus, the current study did not examine changes across more than two time points when using HLM;

however, it represents a significant step forward in our understanding of self-efficacy in CAP, particularly given the dearth of prospective studies on outcomes of CAP. Future research with more frequent assessments and reduced variability in the intervals between them would enable exploration of non-linear patterns of change.

The reviewed literature examined a variety of pain conditions including functional, organic, and pain of unclear etiology. The current study examined one specific type of pain condition (i.e. CAP) and it is unclear whether the findings in this study would generalize to other pain conditions, particularly those with a stronger organic component to their etiology. However, while this may limit this study's generalizability, it is also a strength of the current study in that there is a relatively homogeneous pain population to which these findings pertain. As such, variability in etiology is unlikely to explain null findings, findings counter to a priori hypothesis, or reports in past literature.

The sample was comprised primarily of Caucasians and, while representative of the general CAP population and those seeking treatment at this tertiary care center specifically, the lack of ethnic diversity does limit generalizability. Additionally, this study was conducted at one site in the Southern United States and may not be representative of the development and impact of pain-related self-efficacy in the greater United States or the world. Different strategies or mentalities may be more beneficial to improved outcomes in other cultures including those that are less individualistic or have different typical daily demands on individuals.

Finally, the current study is limited by the lack of assessments related to mechanisms by which self-efficacy improved in individuals. For example, the current study did not assess whether the patients participated in any treatment or interventions to

address their CAP symptoms. Individuals may have attended psychotherapy, taken medications, or pursued alternative therapies in an attempt to alleviate or cope with pain, but these attempts were not recorded and thus, were not included in any analyses. Future research examining the impact of interventions, either randomly assigned or individually chosen as well as those specifically aimed at self-efficacy or generally pain related would be beneficial.

The current study supports a growing literature that pain-related self-efficacy is an important positive psychological construct for protecting and aiding those with chronic pain conditions. It adds to a developmental understanding of changes in self-efficacy, demonstrating that younger and older children's self-efficacy can influence both psychological and physical long-term functioning and that the self-reported self-efficacy of children as young as eight years old has predictive validity. Older children may be those who are in most need of interventions aimed at increasing pain-related self-efficacy. Females are also a subset of CAP patients with an increased need of intervention given their lower pain-related self-efficacy levels across development and time. Further research is needed examining whether interventions aimed at increasing pain self-efficacy actually influence reported levels and lead to improved outcomes. Additionally, more research across even wider developmental time frames and with more frequent assessment would be helpful to elucidate developmental patterns, particularly if the patterns of change are non-linear as the results of this study and Chong (2001) taken together may suggest.

APPENDIX I

Study Measures

Pain Beliefs Questionnaire—Self-Report Version

PBQ

Now I'm going to read some things that people sometimes say when they have stomach aches. Some of these things might be very true for you ***when you have a stomach ache***, and some of them might be mostly true, some true, or just a little true. And some of them might be not at all true for you when you have a stomach ache. Read the sentence, and circle the number indicating how true it is for you when you have a stomach ache.

			Not at all true	A little true	Some true	Mostly true	Very true
	1.	My stomach aches mean I have a serious illness	0	1	2	3	4
	2.	I'll always have stomach aches	0	1	2	3	4
PFCP	3.	When I have a bad stomach ache, I can find ways to feel better	0	1	2	3	4
	4.	When I have a bad stomach ache, it usually lasts a long time	0	1	2	3	4
	5.	I get stomach aches all the time	0	1	2	3	4
EFCP-reverse	6.	When I have a bad stomach ache, I just can't take it	0	1	2	3	4
	7.	My stomach aches hurt a whole lot	0	1	2	3	4
	8.	I'm going to have stomach aches for the rest of my life	0	1	2	3	4
EFCP-excluded	9.	I know I can handle it no matter how bad my stomach hurts	0	1	2	3	4
	10.	Even though I get stomach aches, there's nothing seriously wrong with me	0	1	2	3	4
PFCP-excluded	11.	When I have a bad stomach ache, I can feel better if I decide to	0	1	2	3	4
	12.	I almost always have a stomach ache	0	1	2	3	4
	13.	My stomach aches don't hurt very much	0	1	2	3	4
EFCP-reverse	14.	I don't think I'll be able to stand it if I keep having stomach aches	0	1	2	3	4
	15.	I'll still have stomach aches when I'm older	0	1	2	3	4
	16.	My stomach aches mean that I'm very sick	0	1	2	3	4
	17.	My stomach aches only last a few minutes	0	1	2	3	4
	18.	My stomach aches hurt worse than anything	0	1	2	3	4

		Not at all true	A little true	Some true	Mostly true	Very true
PFCP	19. When I have a bad stomach ache, there are ways I can get it to stop	0	1	2	3	4
	20. My stomach aches go on forever	0	1	2	3	4
PFCP-reverse	21. When I have a bad stomach ache, nothing I try seems to help	0	1	2	3	4
	22. I only get stomach aches once in a while	0	1	2	3	4
EFCP	23. Things will be OK for me even if I keep having stomach aches	0	1	2	3	4
	24. My stomach aches are no big deal	0	1	2	3	4
EFCP-reverse	25. If I keep having stomach aches, my life will be terrible	0	1	2	3	4
	26. My stomach aches go away quickly	0	1	2	3	4
PFCP-reverse	27. When I have a bad stomach ache, there's not much I can do to feel better	0	1	2	3	4
	28. My stomach aches hurt really bad	0	1	2	3	4
EFCP-reverse	29. I can't deal with it when I have a stomach ache	0	1	2	3	4
	30. I always get stomach aches	0	1	2	3	4
PFCP-reverse	31. When I have a bad stomach ache, I can't seem to make it better	0	1	2	3	4
	32. I'll stop having stomach aches soon	0	1	2	3	4

PRI

When you have a bad stomach ache, how often do you:	Never	Once in a while	Some-times	Often	Always
1. try hard to do something about it?	0	1	2	3	4
2. keep your feelings to yourself?	0	1	2	3	4
3. tell yourself that you can't deal with it, and quit trying?	0	1	2	3	4
4. try to get used to it?	0	1	2	3	4
5. get as far away from other people as you can?	0	1	2	3	4
6. lay down and try to feel better?	0	1	2	3	4
7. eat something?	0	1	2	3	4
8. try to do something to make it go away?	0	1	2	3	4
9. tell yourself that it doesn't matter that much to you?	0	1	2	3	4
10. do something you enjoy so you won't think about it?	0	1	2	3	4
11. think to yourself that it's never going to stop?	0	1	2	3	4
12. not let other people see what you're going through?	0	1	2	3	4
13. give up trying to feel better?	0	1	2	3	4
14. try to accept it?	0	1	2	3	4
15. go off by yourself?	0	1	2	3	4
16. try not to move around too much?	0	1	2	3	4
17. drink something?	0	1	2	3	4
18. feel like you can't stand it anymore?	0	1	2	3	4
19. try to think of a way that you could make it better?	0	1	2	3	4
20. tell yourself that it isn't that big a deal?	0	1	2	3	4

When you have a bad stomach ache, how often do you:	Never	Once in a while	Some-times	Often	Always
21. rub your stomach to try to make it better?	0	1	2	3	4
22. not tell anyone how you're feeling?	0	1	2	3	4
23. think to yourself that there's nothing you can do, so you don't even try?	0	1	2	3	4
24. try to learn to live with it?	0	1	2	3	4
25. stay away from people?	0	1	2	3	4
26. try to rest?	0	1	2	3	4
27. try to go to the bathroom?	0	1	2	3	4
28. talk to someone to find out what to do?	0	1	2	3	4
29. bend over or curl up to try to feel better?	0	1	2	3	4
30. think to yourself that it's going to get worse?	0	1	2	3	4
31. tell yourself that you can get over the pain?	0	1	2	3	4
32. try to figure out what to do about it?	0	1	2	3	4
33. tell yourself that it's not that bad?	0	1	2	3	4
34. try to think of something pleasant to take your mind off the pain?	0	1	2	3	4
35. be careful about what you eat?	0	1	2	3	4
36. give up since nothing helps?	0	1	2	3	4
37. tell yourself that's just the way it goes?	0	1	2	3	4
38. try to be alone?	0	1	2	3	4
39. try to keep still?	0	1	2	3	4
40. keep others from knowing how much it hurts?	0	1	2	3	4

When you have a bad stomach ache, how often do you:	Never	Once in a while	Some-times	Often	Always
41. hold your stomach to try to make it better?	0	1	2	3	4
42. think to yourself that you might be really sick?	0	1	2	3	4
43. tell yourself to keep going even though it hurts?	0	1	2	3	4
44. try not to think about it?	0	1	2	3	4
45. ask someone for help?	0	1	2	3	4
46. talk to someone who will understand how you feel?	0	1	2	3	4
47. think hard about what to do?	0	1	2	3	4
48. think of things to keep your mind off the pain?	0	1	2	3	4
49. stay close to someone who cares about you?	0	1	2	3	4
50. keep quiet about it?	0	1	2	3	4
51. ask someone for ideas about what you can do?	0	1	2	3	4
52. not even try to do anything about it because it won't help?	0	1	2	3	4
53. tell yourself, "That's life."?	0	1	2	3	4
54. try to get away from everyone?	0	1	2	3	4
55. stop what you're doing to see if it will help?	0	1	2	3	4
56. take some medicine?	0	1	2	3	4
57. think to yourself that something might be really wrong with you?	0	1	2	3	4
58. talk to someone so that you'll feel better?	0	1	2	3	4
59. tell yourself you can deal with the pain?	0	1	2	3	4
60. try to forget about it?	0	1	2	3	4

Walker, L.S., Smith, C.A., Garber, J., & Van Slyke, D.A. (1997). Development and validation of the Pain Response Inventory for children. *Psychological Assessment, 9,* 392-405.

FDI—Adult

When people are sick or not feeling well it is sometimes difficult for them to do their regular activities. Now, I'm going to read you a list of activities. I want to know if you would have had any physical trouble or difficulty doing these activities during the past two weeks. You will have five answers to choose from (no trouble, a little trouble, some trouble, a lot of trouble, and impossible).

In the *past two weeks*, would you have had any physical trouble or difficulty…?

	No Trouble	A Little Trouble	Some Trouble	A Lot of Trouble	Impossible
1. Walking to the bathroom.	0	1	2	3	4
2. Walking up stairs.	0	1	2	3	4
3. Doing something with friends.	0	1	2	3	4
4. Doing chores at home.	0	1	2	3	4
5. Eating regular meals.	0	1	2	3	4
6. Being up all day without a nap or rest.	0	1	2	3	4
7. Traveling in a car or other vehicle.	0	1	2	3	4
Remember, you are being asked about difficulty due to physical health.					
8. Being at school or work all day.	0	1	2	3	4
9. Playing sports, going to the gym or exercising.	0	1	2	3	4
10. Reading or concentrating.	0	1	2	3	4
11. Watching TV.	0	1	2	3	4
12. Walking the length of a football field.	0	1	2	3	4
13. Running the length of a football field.	0	1	2	3	4
14. Going shopping.	0	1	2	3	4
15. Getting to sleep at night and staying asleep.	0	1	2	3	4

SF-36 Health Survey

Now, I want to ask you some questions bout your health now and in the past. Each questions asks about a specific time frame and has answer choices that are specific to that particular question, so please listen carefully to each question. I want to know about your views about your health. This information will help us keep track of how you feel and how well you are able to do your usual activities.

If you are unsure about how to answer a question, please give the best answer you can.

1. ***In general***, would you say your health is:
   □Excellent □Very Good □Good □Fair □Poor

2. *Compared to one year ago*, how would you rate your health ***in general now***?
   □Much better now than one year ago
   □Somewhat better now than one year ago
   □About the same as one year ago
   □Somewhat worse now than one year ago
   □Much worse than one year ago

3. The following items are about activities you might do during a typical day. Does your health ***now*** limit you in these activities? If so, how much?

(circle one number on each line)

ACTIVITIES	**Yes, Limited A Lot**	**Yes, Limited A Little**	**No, Not Limited At All**
a. **Vigorous activities,** such as running, lifting heavy objects, participating in strenuous sports	1	2	3
b. **Moderate activities,** such as moving a table, pushing a vacuum cleaner, bowling, or playing golf	1	2	3
c. Lifting or carrying groceries	1	2	3
d. Climbing **several** flights of stairs	1	2	3
e. Climbing **one** flight of stairs	1	2	3
f. Bending, kneeling, or stooping	1	2	3
g. Walking **more than a mile**	1	2	3
h. Walking **several blocks**	1	2	3
i. Walking **one block**	1	2	3
j. Bathing or dressing yourself	1	2	3

4. During the ***past 4 weeks***, have you had any of the following problems with your work or other regular daily activities as a result of your physical health?

(circle one number on each line)

	YES	NO
a. Cut down on the **amount of time** you spent on work or other activities	1	2
b. **Accomplished less** than you would like	1	2
c. Were limited in the **kind** of work or other activities	1	2
d. Had **difficulty** performing the work or other activities (for example, it took extra effort)	1	2

5. During the ***past 4 weeks***, have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)?

(circle one number on each line)

	YES	NO
a. Cut down on the **amount of time** you spent on work or other activities	1	2
b. **Accomplished less** than you would like	1	2
c. Didn't do work or other activities as **carefully** as usual	1	2

6. During the ***past 4 weeks***, to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbors, or groups?

□Not at All □Slightly □Moderately □Quite a Bit □Extremely

7. How much bodily pain have you had during the ***past 4 weeks***?

□None □Very Mild □Mild □Moderate □Severe □Very Severe

8. During the ***past 4 weeks***, how much did *pain* interfere with your normal work (including both work outside the home and housework)?

□Not at All □Slightly □Moderately □Quite a Bit □Extremely

9. These questions are about how you feel and how things have been with you during the ***past 4 weeks***. For each question, please give the one answer that comes closest to the way you have been feeling. How much of the time during the ***past 4 weeks*** ---

(circle a number on each line)

	All of the Time	Most of the Time	A Good Bit of the Time	Some of the Time	A Little of the Time	None of the Time
a. Did you feel full of pep?	1	2	3	4	5	6
b. Have you been a very nervous person?	1	2	3	4	5	6
c. Have you felt so down in the dumps that nothing could cheer you up?	1	2	3	4	5	6
d. Have you felt calm and peaceful?	1	2	3	4	5	6
e. Did you have a lot of energy?	1	2	3	4	5	6
f. Have you felt downhearted and blue?	1	2	3	4	5	6
g. Did you feel worn out?	1	2	3	4	5	6
h. Have you been a happy person?	1	2	3	4	5	6
i. Did you feel tired?	1	2	3	4	5	6

10. During the ***past 4 weeks***, how much of the time has your *physical health or emotional problems* interfered with your social activities (like visiting with friends, relatives, etc.)?

□All of the Time
□Most of the Time
□Some of the Time
□A Little of the Time
□None of the Time

11. How TRUE or FALSE is each of the following statements for you?

(circle one number on each line)

	Definitely True	Mostly True	Don't Know	Mostly False	Definitely False
a. I seem to get sick a little easier than other people	1	2	3	4	5
b. I am as healthy as anybody I know	1	2	3	4	5
c. I expect my health to get worse	1	2	3	4	5
d. My health is excellent	1	2	3	4	5

CSI

Now, I am going to read off a list of symptoms. I would like for you to tell me how much you were bothered by each symptom during the *past two weeks*; you will have five answers to choose from (*not at all*, *a little*, *some*, *a lot*, and *a whole lot*).

In the last 2 weeks, how much were you bothered by…?

	Not at all	A little	Some	A lot	A whole lot
1. Headaches	0	1	2	3	4
2. Faintness or dizziness (feeling faint or dizzy)	0	1	2	3	4
3. Pain in your heart or chest	0	1	2	3	4
4. Feeling low in energy or slowed down	0	1	2	3	4
5. Pains in your lower back	0	1	2	3	4
6. Sore muscles	0	1	2	3	4
7. Trouble getting your breath (when you're not exercising)	0	1	2	3	4
8. Hot or cold spells (suddenly feeling hot or cold for no reason)	0	1	2	3	4
9. Numbness or tingling in parts of your body	0	1	2	3	4
10. A lump in your throat	0	1	2	3	4
11. Weakness (feeling weak) in parts of your body	0	1	2	3	4
12. Heavy feelings in your arms or legs (when they feel too heavy to move)	0	1	2	3	4
13. Nausea or upset stomach (feeling like you might throw up, or having an upset stomach)	0	1	2	3	4
14. Constipation (when it's hard to have a B.M. or go poop)	0	1	2	3	4
15. Loose (runny) BM's or diarrhea	0	1	2	3	4
16. Pain in your stomach or abdomen (stomach aches)	0	1	2	3	4
17. Your heart beating too fast (even when you're not exercising)	0	1	2	3	4

In the last 2 weeks, how much were you bothered by…?

	Not at all	A little	Some	A lot	A whole lot
18. Difficulty swallowing	0	1	2	3	4
19. Losing your voice	0	1	2	3	4
20. Deafness (when you can't hear)	0	1	2	3	4
21. Double vision (when you see two of everything, even with glasses on)	0	1	2	3	4
22. Blurred vision (when things look blurry, even with glasses on)	0	1	2	3	4
23. Blindness (when you can't see at all)	0	1	2	3	4
24. Fainting or passing out	0	1	2	3	4
25. Memory loss or amnesia (losing your memory, not being able to remember anything)	0	1	2	3	4
26. Seizures or convulsions (your body moving or shaking and you can't control it)	0	1	2	3	4
27. Trouble walking	0	1	2	3	4
28. Paralysis or muscle weakness (your muscles are too weak to move, like you can't move your arms or legs at all)	0	1	2	3	4
29. Difficulty urinating (peeing)	0	1	2	3	4
30. Vomiting (or throwing up)	0	1	2	3	4
31. Feeling bloated or gassy	0	1	2	3	4
32. Food making you sick	0	1	2	3	4
33. Pain in your knees, elbows or other joints	0	1	2	3	4
34. Pain in your arms or legs	0	1	2	3	4
35. Pain when you urinate or pee	0	1	2	3	4

Rome III Modular Questionnaire

Now, I would like to ask you some questions about health problems that adults sometimes have with their stomach and intestines.

1. ***In the ***last 3 months***, how often did you have discomfort or pain anywhere in your abdomen?
   - ☐ 0. Never----------->**SKIP TO QUESTION 10**
   - ☐ 1. Less than one day a month
   - ☐ 2. One day a month
   - ☐ 3. Two to three days a month
   - ☐ 4. One day a week
   - ☐ 5. More than one day a week
   - ☐ 6. Every day

2. **For women only:** Did this discomfort or pain occur only during your menstrual bleeding and not at other times?
   ☐ 0. No ☐ 1. Yes ☐ 2. Does not apply

3. When you had this pain, how often did it limit or restrict your daily activities (for example, work, household activities, and social events)?
   - ☐ 0. Never or rarely (0 % of the time)
   - ☐ 1. Sometimes (25 % of the time)
   - ☐ 2. Often (50 % of the time)
   - ☐ 3. Most of the time (75 % of the time)
   - ☐ 4. Always (100 % of the time)

4. How long have you had this discomfort or pain?
   - ☐ 0. Less than 2 months
   - ☐ 1. 2 months
   - ☐ 2. 3-5 months
   - ☐ 3. 6 months or longer

5. How often did this discomfort or pain get better or stop after you had a bowel movement?
   - ☐ 0. Never or rarely (0 % of the time)
   - ☐ 1. Sometimes (25 % of the time)
   - ☐ 2. Often (50 % of the time)
   - ☐ 3. Most of the time (75 % of the time)
   - ☐ 4. Always (100 % of the time)

When this discomfort or pain started, how often…	**Never** 0 %	**Sometimes** 25 %	**Often** 50 %	**Most of the time** 75 %	**Always** 100%
6. Did you have more frequent bowel movements?	0	1	2	3	4
7. Did you have less frequent bowel movements?	0	1	2	3	4
8. Were your stools (bowel movements) looser?	0	1	2	3	4
9. Did you have harder stools?	0	1	2	3	4

10. ***In the ***last 3 months***, how often did you have pain or burning in the middle of your abdomen, above your belly button but not in your chest?
    - ☐ 0. Never----------->**SKIP TO QUESTION 12**
    - ☐ 1. Less than one day a month
    - ☐ 2. One day a month
    - ☐ 3. Two to three days a month
    - ☐ 4. One day a week
    - ☐ 5. More than one day a week
    - ☐ 6. Every day

11. How long have you had this pain or burning?
- ☐ 0. Less than 2 months
- ☐ 1. 2 months
- ☐ 2. 3-5 months
- ☐ 3. 6 months or longer

12. ***In the ***last 3 months***, how often did you feel uncomfortably full after a regular-sized meal?
- ☐ 0. Never----------**>SKIP TO QUESTION 14**
- ☐ 1. Less than one day a month
- ☐ 2. One day a month
- ☐ 3. Two to three days a month
- ☐ 4. One day a week
- ☐ 5. More than one day a week
- ☐ 6. Every day

13. How long have you had this uncomfortable fullness after meals?
- ☐ 0. Less than 2 months
- ☐ 1. 2 months
- ☐ 2. 3-5 months
- ☐ 3. 6 months or longer

14. ***In the ***last 3 months*** how often were you unable to finish a regular-sized meal?
- ☐ 0. Never----------**>SKIP TO QUESTION 16**
- ☐ 1. Less than one day a month
- ☐ 2. One day a month
- ☐ 3. Two to three days a month
- ☐ 4. One day a week
- ☐ 5. More than one day a week
- ☐ 6. Every day

15. How long have you had this inability to finish regular-sized meals?
- ☐ 0. Less than 2 months
- ☐ 1. 2 months
- ☐ 2. 3-5 months
- ☐ 3. 6 months or longer

In the ***last 3 months***, how often…	**Never** 0 %	**Sometimes** 25 %	**Often** 50 %	**Most of the time** 75 %	**Always** 100%
16. ***Did you have fewer than three bowel movements (0-2) a week?	0	1	2	3	4
17. Did you have hard or lumpy stools?	0	1	2	3	4
18. Did you have 4 or more bowel movements a day?	0	1	2	3	4
19. Did you have loose, mushy or watery stools?	0	1	2	3	4
20. Did you have to rush to the toilet to have a bowel movement?	0	1	2	3	4

21. In the ***last 3 months***, how often did you feel bloated in your abdomen?
- ☐ 0. Never
- ☐ 1. Less than one day a month
- ☐ 2. One day a month
- ☐ 3. Two to three days a month
- ☐ 4. One day a week
- ☐ 5. More than one day a week
- ☐ 6. Every day

22. *********_**In the last year**_, how many times did you have an episode of severe intense pain ***around the belly button*** that lasted 2 hours or longer and made you stop everything that you were doing?

☐ 0. Never----------**>End Rome III Q**
☐ 1. 1 time
☐ 2. 2 times
☐ 3. 3 to 5 times
☐ 4. 6 or more times

23. ***During the episode*** of severe intense pain did you have…?	0. No	1. Yes
a. No appetite?		
b. Feeling sick to your stomach?		
c. Vomiting (throwing up)?		
d. Pale skin?		
e. Headache?		
f. Eyes sensitive to light?		

24. ***Between episodes*** of severe intense pain, do you return to your usual health for several weeks or longer?

☐ 0. No ☐ 1. Yes

STAI Form Y-2

I'm going to read to you a number of statements that people use to describe themselves. Please tell me how you ***generally*** feel. Do you almost never, sometimes, often, or almost always feel this way? There is no right or wrong answer. Do not spend too much time on any one statement but give the answer which seems to describe how you generally feel.

	Almost Never	Sometimes	Often	Almost Always
1. I feel pleasant	1	2	3	4
2. I feel nervous and restless	1	2	3	4
3. I feel satisfied with myself	1	2	3	4
4. I wish I could be as happy as others seem to be	1	2	3	4
5. I feel like a failure	1	2	3	4
6. I feel rested	1	2	3	4
7. I am "calm, cool, and collected"	1	2	3	4
8. I feel that difficulties are piling up so that I cannot overcome them	1	2	3	4
9. I worry too much over something that really doesn't matter	1	2	3	4
10. I am happy	1	2	3	4
11. I have disturbing thoughts	1	2	3	4
12. I lack self-confidence	1	2	3	4
13. I feel secure	1	2	3	4
14. I make decisions easily	1	2	3	4
15. I feel inadequate	1	2	3	4
16. I am okay with the way things are	1	2	3	4
17. Some unimportant thought runs through my mind and bothers me	1	2	3	4
18. When I get disappointed, I can't get it out my mind	1	2	3	4
19. I keep my cool	1	2	3	4
20. I get tense as I think about my recent concerns and interests	1	2	3	4

API

Self-Report Version

Abdominal Pain Index
(Walker & Greene, 1989)

Your Abdominal Pain in the Past 2 Weeks

In the last 2 weeks, how often have you had abdominal pain (stomach aches)?

_____ 0. not at all
_____ 1. one or two days
_____ 2. three or four days
_____ 3. five or six days
_____ 4. most days
_____ 5. every day

Was this pain related to your menstrual period?
___ no ___yes ___ n/a

In the last 2 weeks, how many times a day did you usually have the pain?

_____ 0. none
_____ 1. once a day
_____ 2. two or three times a day
_____ 3. four or five times a day
_____ 4. six or more times during the day
_____ 5. constant during the day

In the last 2 weeks, when your stomach hurt, how long did the pain last?

_____ 0. no pain
_____ 1. a few minutes
_____ 2. about half an hour
_____ 3. about an hour
_____ 4. between one and two hours
_____ 5. three or four hours
_____ 6. five or six hours
_____ 7. most of the day
_____ 8. all day (it never completely stops)

In the last 2 weeks, when your stomach hurt, how much did it usually hurt?

The MOST pain Possible

10
9
8
7
6
5
4
3
2
1
0

NO PAIN

What is the most that your stomach hurt In the past two weeks?

The MOST pain possible

10
9
8
7
6
5
4
3
2
1
0

NO PAIN

Children's Depression Inventory

CDI

This next section is about thoughts and feelings. There are no right or wrong answers. We just want to know about the thoughts and feelings that you have had in the last two weeks. Pick the sentence that best describes the way you have felt in the past 2 weeks.

Example:

_____ I read books all the time.
_____ I read books once in a while.
_____ I never read books.

1.
_____ 0) I am sad once in a while.
_____ 1) I am sad many times.
_____ 2) I am sad all the time.

2.
_____ 2) Nothing will ever work out for me.
_____ 1) I am not sure if things will work out for me.
_____ 0) Things will work out o.k. for me.

3.
_____ 0) I do most things o.k.
_____ 1) I do many things wrong.
_____ 2) I do everything wrong.

4.
_____ 0) I have fun in many things.
_____ 1) I have fun in some things.
_____ 2) Nothing is fun at all.

5.
_____ 2) I am bad all the time.
_____ 1) I am bad many times.
_____ 0) I am bad once in a while.

6.
_____ 0) I think about bad things happening to me once in a while.
_____ 1) I worry that bad things will happen to me.
_____ 2) I am sure that terrible things will happen to me.

7.
_____ 2) I hate myself.
_____ 1) I do not like myself.
_____ 0) I like myself.

8.
_____ 2) All bad things are my fault.
_____ 1) Many bad things are my fault.
_____ 0) Bad things are not usually my fault.

9.
_____ 2) I feel like crying everyday.
_____ 1) I feel like crying many days.
_____ 0) I feel like crying once in a while.

10. _____ 2) Things bother me all the time.
_____ 1) Things bother me many times.
_____ 0) Things bother me once in a while.

11. _____ 0) I like being with people.
_____ 1) I do not like being with people many times.
_____ 2) I do not want to be with people at all.

12. _____ 2) I cannot make up my mind about things.
_____ 1) It is hard to make up my mind about things.
_____ 0) I make up my mind about things easily.

13. _____ 0) I look o.k.
_____ 1) There are some bad things about my looks.
_____ 2) I look ugly.

14. _____ 2) I have to push myself all the time to do my schoolwork.
_____ 1) I have to push myself many times to do my schoolwork.
_____ 0) Doing schoolwork is not a big problem.

15. _____ 2) I have trouble sleeping every night.
_____ 1) I have trouble sleeping many nights.
_____ 0) I sleep pretty well.

16. _____ 0) I am tired once in a while.
_____ 1) I am tired many days.
_____ 2) I am tired all the time.

17. _____ 2) Most days I do not feel like eating.
_____ 1) Many days I do not feel like eating.
_____ 0) I eat pretty well.

18. _____ 0) I do not worry about aches and pains.
_____ 1) I worry about aches and pains many times.
_____ 2) I worry about aches and pains all the time.

19. _____ 0) I do not feel alone.
_____ 1) I feel alone many times.
_____ 2) I feel alone all the time.

20. _____ 2) I never have fun at school.
_____ 1) I have fun at school only once in a while.
_____ 0) I have fun at school many times.

21. _____ 0) I have plenty of friends.
_____ 1) I have some friends but I wish I had more.
_____ 2) I do not have any friends.

22. _____ 0) My schoolwork is alright.
_____ 1) My schoolwork is not as good as before.
_____ 2) I do very badly in subjects I used to be good in.

23. _____ 2) I can never be as good as other kids.
_____ 1) I can be as good as other kids if I want to.
_____ 0) I am just as good as other kids.

24. _____ 2) Nobody really loves me.
_____ 1) I am not sure if anybody loves me.
_____ 0) I am sure that somebody loves me.

25. _____ 0) I usually do what I am told.
_____ 1) I do not do what I am told most times.
_____ 2) I never do what I am told.

26. _____ 0) I get along with people.
_____ 1) I get into fights many times.
_____ 2) I get into fights all the time.

Center for Epidemiologic Studies Depression Scale

CES-D

Now, I want to know about the ***past two weeks.*** Please tell me how often you have felt or behaved the following ways DURING THE ***PAST TWO WEEKS***. Were you bothered none of the time, 1 to 2 days a week, 3 to 4 days a week, or 5 to 7 days a week?

1 = less than 1 day a week (rarely or none of the time)
2 = 1-2 days a week (some or a little of the time)
3 = 3-4 days a week (a moderate amount of the time)
4 = 5-7 days a week (most or all of the time)

DURING THE ***PAST TWO WEEKS***:	Rarely or None of the Time	Some or a Little of the Time	A Moderate Amount of the Time	Most or All of the Time
1. I was bothered by things that usually don't bother me.	1	2	3	4
2. I did not feel like eating; I was not very hungry.	1	2	3	4
3. I could not stop feeling sad or down, even when family or friends tried to help me feel better.	1	2	3	4
4. I felt that I was just as good as other people.	1	2	3	4
5. I had trouble keeping my mind on what I was doing.	1	2	3	4
6. I felt depressed.	1	2	3	4
7. I felt that everything I did was an effort (i.e., took a lot of energy to do).	1	2	3	4
8. I felt hopeful about the future.	1	2	3	4
9. I felt lonely.	1	2	3	4
10. I felt scared.	1	2	3	4
11. I did not sleep well (i.e., as well as usual).	1	2	3	4
12. I was happy.	1	2	3	4
13. I talked less than usual.	1	2	3	4
14. I felt that I had been a failure.	1	2	3	4
15. I felt that people were not friendly or that they did not want to be with me.	1	2	3	4
16. I had a good time.	1	2	3	4
17. I cried and it was hard to stop.	1	2	3	4
18. I felt sad.	1	2	3	4
19. I felt that people did not like me.	1	2	3	4
20. It was hard to "get going" (to get started doing things).	1	2	3	4
21. Things were not much fun to do.	1	2	3	4

REFERENCES

Anderson, K. O., Dowds, B. N., Pelletz, R. E., Edwards, W. T., & Peeters-Asdourian, C. (1995). Development and initial validation of a scale to measure self-efficacy beliefs in patients with chronic pain. *Pain, 63*, 77-84.

Annesi, J. J. (2007). Relations of age with changes in self-efficacy physical self-concept in preadolescents participanting in a physical activity intervention during afterschool care. *Perceptual and Motor Skills, 105,* 221-226.

Apley, J. (1975). *The child with abdominal pain* (2nd ed.). London: Blackwell Scientific Publications.

Arnstein, P. (2000). The mediation of disability by self-efficacy in different samples of chronic pain patients. *Disability and Rehabilitation, 22*(17), 794-801.

Arnstein, P., Caudill, M., Mandle, C. L., Norris, A., & Beasley, R. (1999). Self-efficacy as a mediator of the relationship between pain intensity, disability, and depression in chronic pain patients. *Pain, 80,* 483-491.

Ashburn, M. A., & Staats, P. S. (1999). Management of chronic pain. *Lancet, 353,* 1865-1869.

Asmundson, G. J. G., & Wright, K. D. (2004). Biopsychosocial approaches to pain. In T. Hadjistavropoulos & K. D. Craig (Eds.), *Pain: Psychological Perspectives* (pp. 35-57). Mahwah, New Jersey: Lawrence Erlbaum Associates.

Ayre, M., & Tyson, G. A. (2001). The role of self-efficacy and fear-avoidance beliefs in the prediction of disability. *Australian Psychologist, 36*(3), 250-253.

Bandura, A. (1977a). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*(2), 191-218.

Bandura, A. (1977b). *Social learning theory*. Englewood Cliffs, NJ: Prentice-Hall.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: Freeman.

Bandura, A. (2004). Health Promotion by Social Cognitive Means. *Health Education and Behavior, 31*(2), 143-164.

Bandura, A., O'Leary, A., Taylor, C. B., Gauthier, J., & Gossar, D. (1987). Perceived self-efficacy and pain control: Opioid and nonopioid mechanisms. *Journal of Personality and Social Psychology, 33*(3), 563-571.

Bandura, A., Pastorelli, C., Barbaranelli, C., & Caprara, G. V. (1999). Self-efficayc pathways to childhood depression. *Journal of Personality and Social Psychology, 76*(2), 258-269.

Barlow, J. H., Cullen, L. A., & Rowe, I. F. (2002). Educational preferences, psychological well-being and self-efficacy among people with rheumatoid arthritis. *Patient Education and Counseling, 46*, 11-19.

Barry, L. C., Guo, Z., Kerns, R. D., Duong, B. D., & Reid, M. C. (2003). Functional self-efficacy and pain-related disability among older veterans with chronic pain in a primary care setting *Pain, 104*, 131-137.

Berg, C. A., Meegan, S. P., & Deviney, F. P. (1998). A social-contextual model of coping with everyday problems across the lifespan. *International Journal of Behavioral Development, 22*(239-261).

Borsbo, B., Gerdle, B., & Peolsson, M. (2010). Impact of the interaction between self-efficacy, symptoms and catastrophising on disability, quality of life and health in with chronic pain patients *Disability and Rehabilitation, 32*(17), 1387-1396.

Brazier, J. E., Harper, R., Jones, N. M. B., O'Cathain, A., Thomas, K. J., Usherwood, T., et al. (1992). Validating the SF-36 health survey questionnaire: New outcome measure for primary care. *British Medical Journal, 305*, 160-164.

Buckelew, S. P., Murray, S. E., Hewett, J. E., Johnson, J., & Huyser, B. (1995). Self-efficacy, pain, and physical activity among fibromyalgia subjects. *Arthritis Care and Research, 8*(1), 43-50.

Bursch, B., Tsao, J. C. I., Meldrum, M., & Zeltzer, L. (2006). Preliminary Validation of a self-efficacy scale for child functioning despite chronic pain (child and parent versions). *Pain, 125*, 35-42.

Bush, J. P., & DeLuca, C. (2001). Developmental biopsychosocial construct of pain. *Journal of Psychological Practice, 7*(2), 57-76.

Caprara, G. V., Vecchione, M., Bove, G. D., Vecchio, G. M., Barbaranelli, C., & Bandura, A. (2008). Longitudinal analysis of the role of perceived self-efficacy for self-regulated learningn in academic continuance and achievement. *Journal of Educational Psychology, 100*(3), 525-534.

Carey, K. B., & Carey, M. P. (1993). Changes in self-efficacy resulting from unaided attempts to quit smoking. *Psychology of Addictive Behaviors, 7*(4), 219-224.

Cervone, D., Artistico, D., & Berry, J. M. (2006). Self-efficacy and adult development. In C. H. Hoare (Ed.), *Handbook of Adult Development and Learning* New York: Oxford University Press.

Chong, G. S., Cogan, D., Randolph, P., & Racz, G. (2001). Chronic pain and self-efficacy: The effects of age, sex, and chronicity. *Pain Practice, 1*(4), 338-343.

Chronbach, L. J., & Meehl, P. E. (1955). Construct validity in psychological tests. *Psychological Bulletin, 52,* 281-302.

Claar, R. L., & Walker, L. S. (2006). Functional assessment of pediatric pain patients: Psychometric properties of the Functional Disability Inventory. *Pain, 121*, 77-84.

Claar, R. L., Walker, L. S., & Smith, C. A. (1999). Functional disability in adolescents and young adults with symptoms of irritable bowel syndrome: The role of academic, social, and athletic competence. *Journal of Pediatric Psychology, 24*(3), 271-280.

Cohen, J. (1992). A Power Primer. *Psychological Bulletin, 112*(1), 155-159.

Costa, L. d. C. M., Maher, C. G., McAuley, J. H., Hancock, M. J., & Smeets, R. J. E. M. (2011). Self-efficacy is more important than fear of movement in mediating the relationship between pain and disability in chronic low back pain. *European Journal of Pain, 15,* 213-219.

Davis-Kean, P. E., Huesmann, L. R., Jager, J., Collins, W. A., Bates, J. E., & Lansfor, J. E. (2008). Changes in the relation of self-efficacy beliefs and behaviors across development. *Child Development, 79*(5), 1257-1269.

Denison, E., Asenlof, P., & Lindberg, P. (2004). Self-efficacy, fear avoidance, and pain intensity as predictors of disability in subacute and chronic musculoskeletal pain patients in primary health care. *Pain, 111,* 245-252.

Denison, E., Asenlof, P., Sandborgh, M., & Lindberg, P. (2007). Musculoskeletal pain in primary health care: Subgroups based on pain intensity, disability, self-efficacy and fear-avoidace variables. *The Journal of Pain, 8*(1), 67-74.

DeVellis, B. M., & DeVellis, R. F. (2001). Self-efficacy and health. In A. Baum, T. A. Revenson & J. E. Singer (Eds.), *Handbook of health psychology* (pp. 235-247). Mahwah, New Jersey: Lawrence Erlbaum Associates, Publishers.

Diggle, P. J., Liang, K.-Y., & Zeger, S. L. (1994). *Analysis of longitudinal data*. Oxford: Clarendon Press.

Dorn, L. D., Campo, J. C., Thato, S., Dahl, R. E., Lewin, D., Chandra, R., et al. (2003). Psychological comorbidity and stress reactivity in children and adolescents with recurrent abdominal pain and anxiety disorders. *Journal of the American Academy of Child and Adolescent Psychiatry, 42*(66-75).

Drossman, D. A. (2006). The functional gastrointestinal disorders and the Rome III process. *Gastroenterology, 130,* 1377-1390.

Estlander, A.-M., Vanharanta, H., Moneta, G. B., & Kaivanto, K. (1994). Anthropometric variables, self-efficacy beliefs, and pain and disability ratings on the isokinetic performance of low back pain patients. *Spine, 19*(8), 941-947.

Ewart, C. K. (2004). Self-efficacy. In A. J. Christensen, R. Martin & J. M. Smyth (Eds.), *Encyclopedia of Health Psychology* (pp. 260-262). New York: Kluwer/Plenum.

Fearon, I., McGrath, P. J., & Achat, H. (1996). 'Booboos': The study of everyday pain among young children. *Pain, 68,* 55-62.

Fitzmaurice, G. M., Laird, N. M., & Ware, J. H. (2004). *Applied Longitudinal Analysis.* Hoboken, NJ: John Wiley & Sons, Inc.

Garber, J., & Strassberg, Z. (1991). Construct validity: History and application ot developmental psychopathology. In W. Grawe & D. Ciachetti (Eds.), *Personality and psychopathology* (pp. 219-258). Minneapolis: University of Minnesota Press.

Garber, J., Walker, L. S., & Zeman, J. (1991). Somatization symptom in a community sample of children and adolescents: Further validation of the Children's Somatization Inventory. *Psychological Assessment, 3,* 588-595.

Garber, J., Zeman, J., & Walker, L. S. (1990). Recurrent Abdominal Pain in Children: Psychiatric Diagnoses and Parental Psychopathology. *Journal of the American Academy of Child and Adolescent Psychiatry, 29*(4), 648-656.

Geisser, M. E., Robinson, M. E., Miller, Q. L., & Bade, S. M. (2003). Psychosocial factors and functional capacity evaluation among persons with chronic pain. *Journal of Occupational Rehabilitation, 13*(4), 259-276.

Grant, L. D., Long, B. C., & Willms, J. D. (2003). Women's adaptation to chronic back pain: Daily appraisals and coping strategies, personal characteristics and perceived spousal responses. *Journal of Health Psychology, 7*, 545-563.

Hadjistravropoulos, T., & Craig, K. D. (2004). An introduction to pain: Psycholigal perspectives. In T. Hadjistravropoulos & K. D. Craig (Eds.), *Pain: Psychological perspectives* (pp. 1-12). Mahwah, New Jersey: Lawrence Erlbaum Associates.

Hankin, B. L., & Abramson, L. Y. (1999). Development of gender differences in depression: Description and possible explanations. *Annals of Medicine, 31*(6), 372-379. doi: 10.3109/07853899908998794

Hopkins, W. G. (2002, Aug. 7, 2006). A new view of statistics: Summarizing data Retrieved Jan. 20, 2009, 2009, from http://www.sportsci.org/resource/stats/effectmag.html

. IASP Pain Terminology: Pain. (2008) Retrieved 5-13-2008, 2008, from http://www.iasp-pain.org/AM/Template.cfm?Section=General_Resource_Links&Template=/CM/HTMLDisplay.cfm&ContentID=3058#Pain

Jensen, M. P., Turner, J. A., & Romano, J. M. (1991). Self-efficacy and outcome expectancies: Relationship to chronic pain coping strategies and adjustment. *Pain, 44*, 263-269.

Kaivanto, K. K., Estlander, A.-M., Moneta, G. B., & H., V. (1995). Isokinetic performance in low back pain patients: The predictive power of the self-efficacy scale. *Journal of Occupational Rehabilitation, 5*(2), 87-99.

Kaminsky, L., Robertson, M., & Dewey, D. (2006). Psychological correlates of depression in children with recurrent abdominal pain. *Journal of Pediatric Psychology*, *31*(9), 956-966.

Kang, S.-Y., Deren, S., Andia, J., Colon, H., & Robles, R. (2004). Effects of changes in perceived self-efficacy on HIV risk behaviors over time. *Addictive Behaviors, 29*, 567-574.

Keefe, F. J., Lefebvre, J. C., Egert, J. R., Affleck, G., Sullivan, M. J., & Caldwell, D. S. (2000). The relationship of gender to pain, pain behavior, and disability in oestoarthritis patients: The role of catastrophizing. *Pain, 87*, 325-334.

Keefe, F. J., Rumble, M. E., Scipio, C. D., Giordano, L. A., & Perri, L. M. (2004). Psychological aspects of persistent pain: Current state of the science. *The Journal of Pain, 5*(4), 195-211.

Kirsch, I. (1985). Self-efficacy and expectancy: Old wine with new labels. *Journal of Personality and Social Psychology, 49*(3), 824-830.

Kovacs, M. (1981). Rating scales to assess depression in school-aged children. *Acta Paedopsychiatrica, 46*(Suppl. 5-6), 305-315.

Kovacs, M., & Beck, A. T. (Eds.). (1977). *An empirical-clinical approach toward a definition of childhood depression*. New York: Raven Press.

Lackner, J. M., & Carosella, A. M. (1999). The relative influence of perceived pain control, anxiety, and functional self efficacy on spinal function among patients with chronic low back pain. *Spine, 24*(21), 2254-2261.

Lackner, J. M., Carosella, A. M., & Feuerstein, M. (1996). Pain expectancies, pain, and functional self-efficacy expectancies as determinants of disability in patients with chronic low back disorders. *Journal of Consulting and Clinical Psychology 64*(1), 212-220.

Larose, S., Ratelle, C. F., Guay, F., Senecal, C., & Harvey, M. (2006). Beliefs during the college transition and academic and vocational adjustment in science and technology programs. *Educational Research and Evaluation, 12*(4), 373-393.

Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping*. New York: Springer Publishing Company.

Lent, R., Sheu, H.-B., Singley, D., Schmidt, J. A., Schmidt, L. C., & Gloster, C. S. (2008). Longitudinal relations of self-efficacy to outcome expectations, interests,

and major choice goals in engineering students. *Journal of Vocational Behavior, 73*, 328-335.

Levin, J. B., Lofland, K. R., Cassisi, J. E., Poreh, A. M., & Blonsky, R. E. (1996). The relationship between self-efficacy and disability in chronic low back pain patients. *International Journal of Rehabilitation and Health, 2*(1), 19-28.

Lipani, T. A., & Walker, L. S. (2006). Children's appraisal and coping with pain: Relation to maternal ratings of worry and restrictions in family activities. *Journal of Pediatric Psychology, 31*, 667-673.

Litt, M. D., Shafer, D., & Napolitano, C. (2004). Momentary mood and coping processes in TMD patients. *Health Psychology, 23*, 354-362.

Marks, R. (2001). Efficacy theory and its utility in arthritis rehabilitation: Review and recommendations. *Disability and Rehabilitation, 23*(7), 271-280.

Masedo, A. I., & Esteve, M. R. (2007). Effects of suppression, acceptance and spontaneous coping on pain tolerance, pain intensity and distress. *Behaviour Research and Therapy, 45*, 199-209.

McGrath, P. (1990). *Pain in children: Nature, assessment, and treatment*. New York: Guilford Press.

McKellar, J., Ilgen, M., Moos, B. S., & Moos, R. (2008). Predictors of changes in alcohol-related self-efficacy over 16 years. *Journal of Substance Abuse Treatment, 35*, 148-155.

Melzack, R., & Katz, J. (2004). The gate control theory: Reaching for the brain. In T. Hadjistavropoulos & K. D. Craig (Eds.), *Pain: Psychological Perspectives* (pp. 13-34). Mahwah, New Jersey: Lawrence Erlbaum Associates.

Melzack, R., & Wall, P. D. (1965). Pain mechanisms: A new theory. *Science, 150*(3699), 971-979.

Meredith, P., Strong, J., & Feeney, J. A. (2006). Adult attachment, anxiety, and pain self-efficacy as predictors of pain intensity and disability. *Pain, 123*, 146-154.

Mulvaney, S., Lambert, E. W., Garber, J., & Walker, L. S. (2006). Trajectories of symptoms and impairment for pediatric patients with functional abdominal pain: a 5-year longitudinal study. *Journal of American Academy of Child and Adolescent Psychiatry, 45*(6), 737-744.

Nicholas, M. K. (2007). The pain self-efficacy questionnaire: Taking pain into account. *European Journal of Pain, 11*, 153-163.

Novy, D. M., Nelson, D. V., Francis, D. J., & Turk, D. (1995). Perspectives of chronic pain: An evaluative comparison of restrictive and comprehensive models. *Psychological Bulletin, 118*(2), 238-247.

O'Leary, A. (1985). Self-efficacy and health. *Behaviour Research and Therapy, 23*(4), 437-451.

Radloff, L. S. (1977). A CESD scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement, 1*, 385-401.

Rahman, A., Reed, E., Underwood, M., Shipley, M. E., & Omar, R. Z. (2008). Factors affecting self-efficacy and pain intensity in patients with chronic musculoskeletal pain seen in a specialist rheumatology pain clinic. *Rheumatology, 47*, 1803-1808.

Raudenbush, S. W., & Xiaofeng, L. (2000). Statistical power and optimal design for multisite randomized trials. *Psychological Methods, 5*(2), 199-213.

Reid, G. J., Dubrow, E. F., & Carey, T. C. (1995). Developmental and situational differences in coping among children and adolescents with diabetes. *Journal of Applied Developmental Psychology, 16*, 529-554.

Singer, J. D., & Willett, J. B. (2003). *Applied longitudinal data analysis: Modeling change and event occurrence*. New York: Oxford University Press.

Smith, C. A., Wallston, K. A., & Dwyer, K. A. (2003). Coping and adjustment to rheumatoid arthritis. In J. Suls & K. A. Wallston (Eds.), *Social Psychological Foundation of Health and Illness* (pp. 458-494). London: Blackwell.

Smith, C. A., Wallston, K. A., Dwyer, K. A., & Dowdy, S. W. (1997). Beyond good and bad coping: A multisimensional examination of coping with pain in persons with rheumatoid arthritis. *Annals of Behavioral Medicine, 19*, 11-21.

Spielberger, C. D. (1983). *Manual for the state-Trait Anxiety Inventory (STAI)*. PaloAlto, CA: Consulting Psychologists Press.

Starfield, B., Gross, E., Wood, M., Pantell, R., Allen, C., Gordon, B., et al. (1980). Psychosocial and psychosomaticdiagnoses in primary care of children. *Pediatrics, 66*(2), 159-167.

Trouillet, R., Gana, K., Lourel, M., & Fort, I. (2009). Predictive value of age for coping: The role of self-efficacy, social support satisfaction and perceived stress. *Aging and Mental Health, 13*(3), 357-366.

Turk, D. C., Dworkin, R. H., Allen, R. R., Bellamy, N., Brandenburg, N., Carr, D. B., et al. (2003). Core outcome domains for chronic pain clinical trials: IMMPACT recommendations. *Pain, 106*, 337-345.

Unruh, A. (1996). Gender variations in clinical pain experience. *Pain, 65*, 123-167.

van Slyke, D. A. (2001). *Parent influences on children's pain behavior. Unpublished Doctoral Dissertation.* Vanderbilt University.

Vierhaus, M., Lohaus, A., & Schmitz, A.-K. (2010). Sex, gender, coping, and self-efficacy: Mediation of sex differences in pain perception in children and adolescents. *European Journal of Pain*. doi: 10.1016/j.ejpain.2010.11.003

von Baeyer, C. L., & Walker, L. S. (1999). Children with recurrent abdominal pain: Issues in the selection and description of research participants. *Journal of Developmental and Behavioral Pediatrics, 20*, 307-313.

Walker, J. (2001). *Control and the psychology of health: Theory, measurement, and applications*. Buckingham: Open University Press.

Walker, L. S., Beck, J. E., Garber, J., & Lambert, W. (2009). Children's Somatization Inventory: Psychometric Properties of the Revised Form (CSI-24). *Journal of Pediatric Psychology, 34*(4), 430-440.

Walker, L. S., Garber, J., & Greene, J. W. (1991). Somatization symptoms in pediatric abdominal pain patients: Relation to chronicity of abdominal pain and parent somatization. *Journal of Abnormal Child Psychology, 19*, 379-394.

Walker, L. S., Garber, J., Smith, C. A., van Slyke, D. A., & Claar, R. L. (2001). The relation of daily stressors to somatic and emotional symptoms in children with and without recurrent abdominal pain. *Journal of Consulting and Clinical Psychology, 69*, 85-91.

Walker, L. S., Garber, J., van Slyke, D. A., & Greene, J. W. (1995). Long-term health outcomes in patients with recurrent abdominal pain. *Journal of Pediatric Psychology, 20*(2), 233-245.

Walker, L. S., & Greene, J. W. (1991). The Functional Disability Inventory: Measuring a neglected dimension of child health status. *Journal of Pediatric Psychology, 16*(1), 39-58.

Walker, L. S., Guite, J. W., Duke, M., Barnard, J. A., & Greene, J. W. (1998). Recurrent abdominal pain: A potential precursor of irritable bowel syndrome in adolescents and young adults. *The Journal of Pediatrics, 132,* 1010-1015.

Walker, L. S., & Heflinger, C. A. (1998). Quality of life predictors of outcome in pediatric abdominal pain patients: Findings at initial assessment and 5-year follow-up. In D. Drotar (Ed.), *Measuring health-related quality of life in children and adolescents: Implications for research and practice.* (pp. 237-252). Mahwah, NJ: Lawrence Erlbaum Associates Publishers.

Walker, L. S., Smith, C. A., Garber, J., & Claar, R. L. (2005). Testing a model of pain appraisal and coping in children with chronic abdominal pain. *Health Psychol, 24*(4), 364-374.

Walker, L. S., Smith, C. A., Garber, J., & Van Slyke, D. A. (1997). Development and validation of the pain response inventory for children. *Psychological Assessment, 9*, 392-495.

Ware, J. E., & Sherbourne, C. D. (1992). The MOS 36-item short form health survey (SF-36). *Medical Care, 30*(6), 473-483.

Zeltzer, L. K., Tsao, J. C. I., Bursch, B., & Myers, C. D. (2006). Introduction to the special issue on pain: From pain to pain associated disability syndrome. *Journal of Pediatric Psychology, 31*(7), 661-666.