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Anxiety Symptoms, Parent Anxiety and Functional Impairment in Pediatric Cardiology

Patients with Noncardiac Chest Pain and Benign Cardiac Complaints

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partial fulfillment of the requirements for the degree.

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Abstract

Chest pain is regularly encountered in pediatric medical settings. Because of the popular association of chest pain with coronary artery disease and myocardial infarction adults, it is often frightening for both patients and parents. However, up to 88% of pediatric chest pain patients receive no medical explanation for their pain. Chest discomfort in the absence of medical explanation that is characterized by no more than one typical angina symptom is classified as non-cardiac chest pain (NCCP). This study examined parent anxiety, child anxiety and chest pain related functional impairment in a sample of pediatric patients with NCCP in comparison to a sample of pediatric patients with benign cardiac complaints (BCC). Analyses did not indicate significant differences between groups on any variables ($p > .05$). Among patients with NCCP, there was a positive correlation between parent anxiety and functional impairment. These findings suggest the importance of considering family factors during future research and intervention with this population.

Non-cardiac Chest Pain in Children and Adolescents

Pain in Childhood and Adolescence

Researchers, healthcare providers, and members of the general public consider somatic pain complaints (which may colloquially be referred to as “growing pains”) a normal experience during childhood and adolescence. These complaints are typically bodily pain symptoms that occur in the absence of an identifiable medical cause. Clinical reports and research studies alike indicate that it is not uncommon for healthy children and adolescents to occasionally experience some type of idiopathic pain (Eminson, Benjamin, Shortall, Woods, & Faragher, 1996; Goodman & McGrath, 1991; Perquin et al., 2000). Growing pains are generally considered transitory occurrences that are associated with minimal impairment and have an uncomplicated clinical course.

In contrast to popular perception, some children and adolescents report reoccurring idiopathic pain associated with emotional distress and functional impairment equivalent to that of pediatric patients¹ with medically explained physical difficulties (Malleon, 1991; Malleon & Clinch, 2003; Malleon, Connell, Bennett, & Eccleston, 2001). Additionally, children and adolescents with chronic, medically unexplained physical complaints may be at risk for the physical and psychosocial developmental delays that can correspond with long-term illness during childhood or adolescence (Kislal, Kutluk, Cetin, Derman, & Kanbur, 2005). Recent medical and psychological research documents these impairments and is

¹ Please note that for this paper, the term “pediatric” may be understood as including both children and adolescents; studies in which all participants are from one age group will be designated as such

creating a growing evidence base on many of the medically unexplained pain complaints that present during childhood or adolescence. There remain a number of unanswered questions within this domain, and one pain complaint that has yet to be explored in detail is medically unexplained pediatric chest pain.

Pediatric Chest Pain

Because it is popularly associated with coronary artery disease, angina pectoris, and myocardial infarction, chest pain is one of the most frightening medical complaints for pediatric patients and their parents. Broad-based community studies suggest that chest pain is a prevalent and recurrent complaint among children and adolescents. Ten percent of students grades 2 – 12 report being bothered by chest pain over the past two weeks (Garber, Walker, & Zeman, 1991) and 4% of high school students report experiencing chest pain at least weekly throughout the past 12 months (Rhee, Miles, Halpern, & Holditch-Davis, 2005). Although cardiac problems are relatively rare in children, a complaint of chest pain or discomfort by a pediatric patient raises the possibility of serious medical pathology and often precipitates a comprehensive medical evaluation, possibly accompanied by a referral for more extensive diagnostic testing (Thull-Freedman, 2010). Chest pain or discomfort is the primary complaint of 0.3% of total pediatric primary care patients (Asnes, Santulli, & Bemporad, 1981), 0.14% to 0.6% of emergency department patients (Massin et al., 2004; Rowe, Dulberg, Peterson, Vlad, & Li, 1990; Selbst, 1985; Zavaras-Angelidou, Weinhouse, & Nelson, 1992), and 5% of referrals to cardiology consultation services (Geggel, 2004).

Even after accounting for non-cardiac related medical ailments, most cases of pediatric chest pain are not identified as associated with a specific organic ailment. Chest pain without causal organic pathology may be classified as non-cardiac chest pain (NCCP). NCCP has been defined as chest discomfort characterized by no more than one typical angina symptom (Fraker, Fihn, & Gibbons, 2009).² Epidemiological studies suggest that 17% - 88% of chest pain cases across pediatric settings may represent cases of NCCP (Diehl, 1983; Hambrook, Kimball, Khoury, & Cnota, 2010; Kashani, Lababidi, & Jones, 1982; Pantell & Goodman, 1983; Rowe et al., 1990; Selbst, 1985; Tunaoglu et al., 1995; Yildirim et al., 2004).

NCCP has been characterized as a poorly understood condition with variable presentation and myriad potential underlying mechanisms (Fass & Eslick, 2007). Accordingly, its prevalence is ultimately difficult to determine. It may be that the prevalence of NCCP among pediatric patients is in actuality higher than reported rates, as chest pain characterized descriptively and rather vaguely in medical charts as “musculoskeletal” may in fact be NCCP (Lam & Tobias, 2001).

Non-cardiac chest pain is by definition a medically benign diagnosis and most physicians consider the prognosis of pediatric NCCP patients to be medically unremarkable (Kocis, 1999). No current evidence indicates that pediatric NCCP patients are at greater risk for adverse medical outcomes pre-adulthood than are typical children and adolescents (Rowland & Richards, 1986). Despite its apparent

² Typical angina (e.g., cardiac-related chest pain) is characterized by chest discomfort that 1) worsens with increased myocardial oxygen consumption 2) lasts approximately 15 minutes and 3) is relieved by rest or nitroglycerin (Fraker et al., 2009)

lack of medical morbidity, a small but consistent body of empirical evidence indicates that pediatric NCCP is nonetheless associated with notable individual distress (*Table 1*). Preliminary evidence indicates that pediatric patients with NCCP may experience physical pain that is frequent, severe, and reoccurs across extended time periods (Driscoll, Glicklich, & Gallen, 1976; Lipsitz et al., 2004; Rowland & Richards, 1986; Selbst, 1985).

Because of its association with serious cardiac illness in adults, chest pain in general is worrisome to family members as well as to the patients themselves, and research suggests that pediatric patients and family members alike may perceive chest pain as “heart pain” (Diehl, 1983; Evangelista, Parsons, & Renneburg, 2000; Gutgesell, Barst, Humes, Franklin, & Shaddy, 1997; Kaden, Shenker, & Gootman, 1991). Indeed, many children and adolescents with chest pain who receive medical attention fear that their own chest pain is a symptom of a serious medical problem such as a heart attack, heart disease, or cancer (Kaden et al., 1991; Rowe et al., 1990). Given that most patients report intermittent episodes of chest pain that re-occur over an extended period of time, any fear experienced by patients has the potential to become pre-occupying and may provoke increasingly high levels of persistent worry.

Functional impairment

Recent research suggests that pediatric NCCP may interfere with a child’s ability to carry out typical activities. Patients with pediatric NCCP ($N = 32$) presenting at an emergency department reported that NCCP interfered with their ability to

participate in activities such as climbing stairs (34%), falling and staying asleep (34%), participating in sports (28%) and staying at school the whole day (22%), with approximately 1/3 reporting impairments in multiple domains of functioning (Lipsitz, Gur, Albano, & Sherman, 2010). Functional impairment due to chest pain has also been examined in studies with samples that included children with chest pain associated with a variety of diagnoses (including, but not limited to, NCCP). Among such patients, 90% reported that their pain “sometimes” or “frequently” interfered with their normal activity (Rowe et al., 1990), and 44% report changing their behavior because of chest pain (Kaden et al., 1991). Patients report restricting both moderate physical activities, such as carrying a heavy backpack or walking quickly, and more intense activities, such as participating in organized athletics (Pantell & Goodman, 1983), and 27% - 50% reported missing school because of chest pain (Pantell & Goodman, 1983; Selbst, 1985; Selbst, Ruddy, Clark, Henretig, & Santulli, 1988). Because these findings, with the exception of Lipsitz et al (2010), are derived from studies with samples containing patients with medically-related chest pain in addition to patients with NCCP, significant caution is called for when generalizing these findings to patients with NCCP. Examination of chest-pain related impairment in a representative sample of pediatric NCCP patients specifically is necessary to ensure accurate characterization of the experiences of this particular population.

Theoretical conceptualization of NCCP

The absence of a satisfactory medical explanation for pediatric NCCP suggests that it may be necessary to consider this complaint from an integrative

biopsychosocial perspective. The importance of non-organic factors in the etiology and maintenance of pediatric NCCP is suggested by pilot data indicating that brief psychological intervention may decrease NCCP symptoms, including pain intensity and frequency (Lipsitz, Gur, Albano, et al., 2010). It has been proposed that pediatric NCCP is currently best conceptualized using a diathesis-stress model in which multiple elements independently or in combination confer a degree of risk for NCCP, which may then be triggered by various instigating factors (McDonnell, White, & Grady, in press). This conceptualization is based on an empirically supported theoretical conceptualization of NCCP in adults that builds on the multidisciplinary nature of NCCP (White & Raffa, 2004). The experiences associated with child and adult patients NCCP are likely to differ because of both developmental differences and vastly different level of medical risk associated with child and adult chest pain. However, this adult model was extended to pediatric NCCP based on three key similarities between the presentation of NCCP in children and adults (McDonnell et al., in press): 1) NCCP in both adults and children may be characterized by significant pain 2) NCCP is often accompanied by pain-related fear and worry and 3) Both NCCP and related emotional distress may persist across time (Evangelista et al., 2000; Fass & Eslick, 2007; Lipsitz et al., 2004; Rowe et al., 1990)

Within this model, pre-existing vulnerabilities (broadly described as psychological vulnerability, learning history and biological vulnerability) combine with situational factors (such as a stressful situation, illness, or physical strain) to instigate problematic physiological, cognitive and behavioral responses resulting in a

cycle of chest pain accompanied by anxious arousal (White & Raffa, 2004). In addition to the three categories of underlying vulnerabilities explicated by White and Raffa (2004), to account for normative developmental variables which are unique to children and adolescents the model was expanded to include familial and social environmental vulnerabilities (McDonnell et al., in press).

Within these five categories are a number of specific risk factors, and it may be that different individuals are potentially impacted by myriad combinations of the numerous specific influential factors that may exist within each of these broad categories. Reviews of developmental psychology research literature indicate good support for the postulates of multideterminism, multifinality, and equifinality (Cicchetti & Rogosch, 2002; Cicchetti & Toth, 1995). It may be that pediatric NCCP, like many other childhood phenomena, is most likely the outcome of multiple influences. It is unlikely that pediatric NCCP is the product of any single variable, and equally unlikely that any single, isolated variable is necessary to cause pediatric NCCP. It is also unlikely that there are any singular variables that will always result in pediatric NCCP regardless of the presence or absence of other influential variables. It is more plausible that an individual case of pediatric NCCP may be the end result of any one of a variety of multiple and diverse potential etiological pathways. These pathways themselves are likely influenced by the interactions of any relevant specific risk factors. It is therefore worthwhile to consider how singular variables within the five sets of underlying vulnerabilities suggested by White and Raffa (2004)

might combine and interact to place an individual child or adolescent at risk for developing NCCP.

Anxiety

Research suggests that anxiety is one psychological variable that may be relevant to pediatric NCCP. Pediatric patients with NCCP reported more anxiety symptoms on a self-report questionnaire than patients with benign heart murmurs (Lipsitz et al., 2004). Unstructured interviews conducted with pediatric patients and their parents presenting to a cardiology department indicate that 74% of patients ($N = 74$) demonstrate psychiatric symptoms, with anxiety being the most common (Tunaoglu et al., 1995). Semi-structured interviews indicated that 81% of NCCP patients met DSM-IV diagnostic criteria for a current anxiety disorder (Lipsitz, Gur, Sonnet, et al., 2010). Interviews using a structured protocol (the Anxiety Disorder Interview Schedule for DSM-IV: Child and Parent Versions ADIS-IV:C-P) that assesses anxiety, mood, somatoform and behavioral disorders (Silverman, Saavedra, & Pina, 2001), found that 59% of patients met criteria for a current anxiety disorder, and 30% met criteria for two or more current anxiety disorders (Lipsitz et al., 2005). Preliminary evidence suggests that the anxiety reported by pediatric patients with NCCP may extend to areas unrelated to physical health. These patients report significantly more concern than patients with benign heart conditions about mental incapacity and losing control, indicating that their increased sensitivity to anxiety symptoms may not be limited to specific worry about chest pain symptoms (Lipsitz et al., 2004).

These recent empirical studies represent a crucial first step towards understanding the role of anxiety in this ailment, the patient samples on which this research is based that indicate a need for replication with larger, more ethnically and socioeconomically diverse samples recruited from multiple sites (Lipsitz et al., 2004; Lipsitz et al., 2005). An important area for expansion of this research is into between anxiety and outcome variables such as chest pain related functional impairment. Anxiety has been noted to predict greater functional impairment for pediatric patients suffering from recurrent medically unexplained conditions such as headache, musculoskeletal, and abdominal pain (Claar, Simons, & Logan, 2008; Kashikar-Zuck et al., 2008; Martin, McGrath, Brown, & Katz, 2007; Mulvaney, Lambert, Garber, & Walker, 2006). Thus far, no research has examined the potential relationship between anxiety and functional impairment in pediatric patients with NCCP.

Parent anxiety

Given that anxiety appears relevant to children with NCCP, it could also be important to examine anxiety in the parents of pediatric NCCP patients. Strong associations exist between parent and child anxiety. Children who have parents with anxiety disorders are at higher risk for a wide range of anxiety disorders in general (Beidel & Turner, 1997; Biederman et al., 2004; Biederman et al., 2005; Biederman, Rosenbaum, Bolduc, Faraone, & Hirshfeld, 1991). This risk tends to be even higher for a child whose parent has co-morbid anxiety disorders or an anxiety disorder co-

morbid with another psychiatric disorder, and for a child who has two parents with an anxiety disorder (Biederman et al., 2005).

Findings from experimental, observational and treatment research also indicate a close relationship between parent and child anxiety. Current research indicates that certain types of parent/child interactions, which are more likely to occur when the parent suffers from clinically relevant anxiety, increase anxious behaviors in children during experimental tasks (Dadds, Barrett, Rapee, & Ryan, 1996; Shortt, Barrett, Dadds, & Fox, 2001). Treatment studies indicate that psychotherapeutic treatment for anxious children may be more successful when it includes a component targeting parent/child communication or addressing parent anxiety management (Barrett, Dadds, & Rapee, 1996; Shortt, Barrett, & Fox, 2001).

Although no research has directly examined anxiety in parents of NCCP patients, maternal somatization is positively associated with parent-reported child somatization in this population (Gilleland et al., 2009), indicating a relationship between child and parent psychological factors in this patient population. Furthermore, a growing body of evidence indicates an association between parental anxiety and other recurrent, medically unexplained pain conditions. Higher levels of anxiety have consistently been demonstrated in mothers (Campo, 2007; Garber, Zeman, & Walker, 1990; Hodges, Kline, Barbero, & Woodruff, 1985; Walker & Greene, 1989) and fathers (Hodges et al., 1985) of pediatric patients with medically unexplained abdominal pain than in the parents of well children. Higher parental anxiety is also positively associated with the amount of pain that children report

during laboratory pain tasks (Tsao et al., 2006). Specific anxiety-related parent behaviors that promote child anxiety are associated with child reports of physical symptoms (Muris, Hovee, Meesters, & Mayer, 2004).

The examination of anxiety in parents has proved a valuable contribution to the child anxiety evidence base, and is increasingly contributing similarly to the current literature on childhood pain. As anxiety is demonstrably relevant to NCCP etiology and maintenance in adults, and appears to be important in pediatric NCCP as well, such an examination may similarly benefit the emerging literature regarding this ailment. Indeed, the relationship of parent and child anxiety may well be even more relevant to pediatric NCCP than to other medically unexplained pain symptoms. Because of its association with heart disease and myocardial infarction in adults, chest pain is potentially a more alarming symptom than pain complaints that are typically less associated with serious illness and morbidity.

This association of chest pain with major cardiac disease and sudden death in adult patients is well known, and it is therefore understandable that pediatric chest pain is often quite anxiety provoking for parents. Although cardiac related medical conditions are relatively rare in childhood and adolescence, clinicians overwhelmingly report that chest pain is usually frightening to both pediatric patients and their parents (Cava & Sayger, 2004; Diehl, 1983; Evangelista et al., 2000; Kocis, 1999). This fear may be increased by the fact that medical care providers themselves are commonly, and appropriately, more concerned by a complaint of chest pain than by a complaint of pain in a different part of the body

(Kocis, 1999). On the rare occasions when pediatric chest is associated with serious illness, prompt recognition, evaluation and intervention are essential to protect against an adverse outcome; conversely, diagnostic error may lead to morbidity or mortality (Kaden et al., 1991). Unfortunately, undergoing an extensive medical evaluation for chest pain may be anxiety provoking for pediatric patients and their families, and any parent of a child receiving evaluation for chest pain might be expected to demonstrate elevated anxiety.

Nonetheless, clinicians have observed that parents of a child whose chest pain is not found to have a medical cause present with more anxiety than patients with organic chest pain prior to an exam (Cava & Sayger, 2004). Additionally, medical care providers express concern that parental anxiety may drive a certain amount of healthcare utilization by pediatric NCCP patients, and observe that such anxiety may potentially result in more testing than is diagnostically necessary (Rowe et al., 1990). These reports support the necessity of comparative research on the relationship between parental anxiety and pediatric NCCP. It is impossible to infer from these reports whether the anxiety seen in parents of children with chest pain is most accurately characterized as state anxiety, which is specific to a stressful situation, or trait anxiety, which is characterized by continuity across time and situation. Anxiety exhibited by some parents during cardiology appointments could well be a response to a stressful situation, and may not indicate an enduring anxious condition.

Some clinicians suggest that parental anxiety may contribute to any impairment experienced by pediatric NCCP patients, in that parents with anxiety may be more likely to curtail activities in response to a child's complaint of chest pain (Cava & Sayger, 2004; Selbst, Ruddy, & Clark, 1990). Indeed, worry about child physical health is associated with greater functional disability (Guite, Logan, McCue, Sherry, & Rose, 2009) and activity limitation (Lipani & Walker, 2006) in pediatric patients with RAP. However, to date no study has explored anxiety in the parents of patients with NCCP.

Hypotheses

The present study seeks to address gaps in the literature by examining parent anxiety, child anxiety, and chest pain related functional impairment in pediatric patients with NCCP. These variables are explored within a sample of pediatric NCCP patients and a control group of patients with benign cardiac complaints (BCC) (e.g., palpitations, heart murmur, syncope). This study hypothesized that pediatric patients with NCCP would report more anxiety symptoms than patients with BCC. It was further hypothesized that parents of patients with NCCP would report more symptoms of both state anxiety and trait anxiety, suggesting both higher situational anxiety related to their child's appointment and higher levels of general anxiety. Within the group of patients with NCCP, it was anticipated that child anxiety would be positively associated with parent anxiety, and that child and parent anxiety would each predict unique variance in chest-pain related functional impairment. In addition to these main

hypotheses, this study seeks to expand general knowledge of pediatric NCCP by examining pain characteristics and functional impairment within a relatively large sample composed solely of patients with NCCP (as opposed to previous studies that included patients with a variety of organic ailments in addition).

Method

Participants

Data were collected as part of a broader longitudinal examination of the course and correlates of pediatric NCCP. Patients were recruited from those seeking cardiac evaluation at one of two sites. The first site was a large, urban, university-affiliated pediatric cardiology department located within a children's hospital, and the second site was a suburban satellite office affiliated with the same department. Patients were eligible based on the following inclusion criteria: a) presentation with chief complaint of chest discomfort or other cardiac symptom, b) determined to have conclusively negative medical findings by a board-certified pediatric cardiologist, c) between 7 and 17 years of age, d) English fluency, and e) accompanied by a parent/guardian (caregiver) who has legal authority to provide consent for patients participation. To ensure adequate generalizability, patients were excluded from the study only if they reported current or recent (last 6 months) presence of any one of the following exclusion criteria: a) any uncontrolled serious medical illness or b) any uncontrolled severe mental illness (e.g., acute psychosis, substance dependence). These patients with NCCP and benign cardiac complaints

(BCC) were invited to participate in the. This study is based on the final sample of 91 patients with NCCP and 69 patients with BCC.

Patients with NCCP ranged in age from 7 to 17 years with a mean age of 13.00 ($SD = 3.09$) and were in grades 1 through 12. Parents of children with NCCP ranged in age from 26 to 75 with a mean age of 41.22 ($SD = 7.96$) Patients with BCC also ranged in age from 7 to 17 years with a similar mean age of 13.55 ($SD = 2.80$). Parents in this group ranged in age from 27 to 56 with a nearly equivalent mean age of 41.84 ($SD = 7.46$). Parametric and non-parametric tests indicated no significant group differences in child and parent age, child and parent ethnicity, income, or parent employment status ($p >.05$) (*Table 2*).

Measures

Demographic and medical history. Participant demographics and medical history of patients with NCCP were assessed using a parent-report questionnaire developed by the experimenters. This questionnaire assessed general demographic variables (age, sex, race, marital status and socioeconomic status), general medical history (personal history, family history, and current medication use) and chest-pain related medical history (Appendix A). A similar questionnaire was used to collect equivalent data from the parents of patients with BCC (Appendix B).

Chest pain characteristics. Currently, there are few published multidimensional measures of pediatric pain (Eccleston, Jordan, & Crombez, 2006) and fewer still that have demonstrated sound psychometric properties in both children and adolescents (Hermann, Hohmeister, Zohsel, Tuttas, & Flor, 2008). There

are no published self-report questionnaires for the multidimensional assessment of recurring chest pain in children. Previous studies of pediatric chest pain have reported chest pain characteristics based on unstructured physician interviews (Evangelista et al., 2000; Massin et al., 2004; Pantell & Goodman, 1983), or based on single items embedded in broader measures of anxiety (Lipsitz et al., 2004) or somatic (Gilleland et al., 2009) symptoms. The history and characteristics of participants' chest pain were therefore be assessed by a self-report questionnaire developed by the experimenters. This self-report questionnaire assessed frequency, duration, and nature of chest pain, as well as a qualitative description of chest pain (Appendix C).

Benign cardiac complaint characteristics. The history and characteristics of patients' benign cardiac complaints was similarly assessed by a self-report questionnaire developed by the experimenters. This self-report questionnaire assessed frequency, duration, and nature of the complaint, as well as a qualitative description of the complaint (Appendix D).

Functional impairment. Functional impairment was assessed using the Functional Disability Inventory, Parent form (FDI – Parent), a 15-item parent report measure that involves rating on a 0 – 4 point scale a child's difficulty doing various tasks of daily living over the past two weeks due to physical complaints (Walker & Greene, 1991). Parents of patients with NCCP were asked to rate their child's difficulty doing various tasks of daily living over the past two weeks due to chest pain. Parents of patients with BCC were asked to rate their child's difficulty doing

various tasks of daily living over the past two weeks due to the child's benign cardiac complaint. The FDI-parent is one of the most widely used measures of the degree to which children experience difficulty in physical and psychosocial function due to health status pain-related impairment in children (Claar & Walker, 2006). It has demonstrated good reliability for female ($\alpha = 0.91$) and male ($\alpha = 0.91$) pediatric pain patients ages 8 – 17, and its validity is supported by correlations with measures of school-related disability, pain, and somatic symptoms (Claar & Walker, 2006). Cronbach's alpha in this study was .86 for the NCCP patient group and .91 for the BCC patient group.

Child anxiety symptoms. Child anxiety symptoms were assessed using the Multidimensional Anxiety Scale for Children (MASC), an empirically derived self-report measure (March, Parker, Sullivan, Stallings, & Conners, 1997). The MASC involves rating agreement to each of 39 items on a 0-3 point scale; points are then summed to produce a total score, which is adjusted for respondent age and gender to produce a final T-score (March et al., 1997). The MASC consists of four factors, the first three of which have two subfactors: 1) social anxiety (subfactors humiliation/rejection and performance), 2) physical symptoms (subfactors tense/restless and somatic/autonomic), 3) harm avoidance (subfactors anxious coping and perfectionism), and 4) separation/panic. These factors can be combined to yield a total anxiety score, as well as a separate anxiety disorder index score. T-scores of 65 or above are considered indicative of clinically significant anxiety symptoms (March et al., 1997). The MASC has previously been utilized in research

with pediatric chronic pain patients and demonstrated adequate convergent validity (Martin et al., 2007). The MASC has demonstrated good reliability (α 's ranged = 0.87 – 0.93) and adequate convergent validity and divergent validity in outpatient psychiatric patients ages 7 to 17 years (Grills-Taquechel, Ollendick, & Fisak, 2008; Rynn et al., 2006). Cronbach's alpha in this study was .91 for the NCCP patient group and .82 for the BCC patient group.

Parent Anxiety Symptoms. Parent anxiety symptoms were measured using the State Trait Anxiety Inventory (STAI), a self-report measure composed of two 20-item subscales constructed to measure "state" and "trait" anxiety (Spielberger, 1983). The STAI is one of the most widely used self-report measures of anxiety. Respondents are asked to indicate either "how (s/he) feels right now" (state) or "how s/he generally feels" (trait) by rating agreement to items using a 4-point scale. Metanalysis of 52 published studies indicates adequate to very good reliability for both the STAI-trait (α 's ranged from 0.65 – 0.96, $M = 0.91$) and STAI-state (α 's ranged from 0.72 – 0.96, $M = 0.89$) across a wide variety of populations (Barnes, Harp, & Jung, 2002). For the STAI-State, Crondbach's alpha for this study was .88 for the NCCP patient group and .89 for the BCC patient group. For the STAI-Trait, Crondbach's alpha for this study was .93 for the NCCP patient group and .94 for the BCC patient group.

Procedures

Eligible patients with a chief complaint of chest pain or cardiac symptoms who were evaluated in the Cardiology Division and received a negative (e.g., within

normal limits) medical evaluation, and their accompanying caregivers, were invited to participate. Patients were invited to participate after receiving their test results and discussing the results with the cardiologist. The cardiologist introduced the study to patients and asked if they would be interested in discussing participation with a research assistant. The research assistant offered eligible patients the option to participate in the study by completing a self-report questionnaire at baseline and at 3 month follow-up.

Patients and caregivers who both indicated interest in participating were taken to a nearby room and provided with more information about the study. The research assistant obtained verbal informed consent from the patients and caregivers, and provided written consent forms and the questionnaire packet to the participants. Informed consent was discussed with the patient and caregiver, and the caregiver were asked to read, sign, and date the consent form indicating that they themselves consent to participate in the study. Caregivers then provided a second signature on the informed consent form indicating that they consented to their children's participation in the study. The research assistant then elicited and answered patient questions, and willing patients were asked to read and sign an assent form. The research assistant provided copies of the informed consent and assent forms to the study participants. Participants were informed about the confidentiality of the research study data including the protection of study data with identifying information.

Participants were instructed to complete the packet after consenting to the

study. After the questionnaires were completed, the research assistant provided each parent and child with a \$10 gift card to Target. Four parent-child dyads left the hospital before completing their questionnaire and returned the questionnaire by mail within that week. Gift-cards were mailed to these parent-child dyads upon receipt of questionnaires.

Data Analysis

Item-level data was entered for all variables. Prior to analyses, frequencies and descriptive statistics were calculated to detect data-entry errors in categorical and continuous variables. Mean substitution was used to estimate missing values for cases with < 20% missing data per variable. A total of 34 individual data points were replaced using mean substitution (approximately 0.3% of total data points). All analyses were conducted using SPSS v. 19.0. For data management and checks on data quality control, all original data were stored as batches of paper forms (questionnaires) associated with a given subject number.

Results

Characteristics of NCCP

Pain Occurrence. Among patients with NCCP, 20% reported that they were experiencing chest pain at the time that they completed the questionnaire. Most (93%) had experienced at least one occurrence of chest pain in the month prior to their appointment. The majority of patient (80%) reported experiencing episodes of chest pain at least weekly, with pain occurring once a week to several times per day. Sixty-nine percent reported pain episodes having re-occurred for 1 month or longer.

Most (76%) of patients described a sudden chest pain onset. Pain was largely characterized as episodic, with 74% reporting pain occurrences lasting from less than 5 minutes to 20 minutes; 9% of patients reported that their chest pain episodes typically lasted a half day or longer.

Chest pain was slightly more likely to occur at rest, as 67% of patients reported that their pain occurred while they were at rest, while 60% of patients reported that their pain occurred while they were moving or physically active. Sixty-seven percent of patients reported chest pain associated with one or more specific instigators. Among these patients ($n = 59$), 84% reported pain triggered by physical exercise or sports. Other pain instigators experienced by 24% to 34% of patients included bending or other local movement, breathing in, coughing, and strong emotion or stress.

Pain intensity. Patients were asked to rate the usual and most severe intensity of their pain on a scale ranging from 0 (does not hurt at all) to 10 (hurts a whole lot). The mean rating for most severe pain intensity was 6.51 ($SD = 2.67$) and the mean rating for usual pain intensity was 6.15 ($SD = 2.50$). This is comparable to the usual pain intensity rating ($M = 6.2$, $SD = 2.14$) previously endorsed by children with NCCP on a 1 – 10 scale (Gilleland et al., 2009). Most patients indicated that the chest pain was moderate intensity or greater usually (77%) and at its worse (80%).

Characteristics of benign cardiac complaints

Patients in this group ($n = 69$) were identified by a cardiologist as presenting with varied complaints including syncope (38%), heart murmur (29%), palpitations

(9%), arrhythmia (9%), high blood pressure (6%), tachycardia (3%), ASD/VSD (3%) and shortness of breath (3%). Patients were identified as within normal limits after undergoing a comprehensive medical evaluation. Among this group, most (67%) indicated that their presenting complaint was unaccompanied by chest pain.

Study variables

Child Anxiety. Total MASC scores for NCCP patients ranged from 4 – 88 with a mean of 37.07 ($SD = 18.19$), and anxiety scores for patients with benign cardiac complaints ranged from 5 – 73 with a mean of 33.30 ($SD = 13.60$). These scores are lower than those obtained in a previous comparative study of patients with NCCP and patients with benign heart murmurs (Lipsitz et al., 2004) and are similar to those reported for community children and adolescents (March et al., 1997).

Seven percent of patients with NCCP and 2% of patients with benign cardiac conditions obtained total MASC scores indicating clinically significant anxiety (T-scores of 65 or above). Again, these percentages are lower than the 11% of patients with NCCP and 7% of patients with benign heart murmurs that obtained clinically significant MASC scores in a previous sample (Lipsitz et al., 2004).

Parent Trait Anxiety. Parent trait anxiety scores for NCCP patients ranged from 20 – 72 with a mean of 35.64 ($SD = 11.67$); scores for parents of BCC patients ranged from 21-73, with a mean of 34.99 ($SD = 11.70$). These scores are similar to those reported for adults on the original normative community sample (Spielberger, 1983) and for parents accompanying children to general practitioner appointments for minor illnesses (Richtsmeier & Hatcher, 1994).

Parent State Anxiety. Parent state anxiety scores for NCCP patients ranged from 23 – 63 with a mean of 33.40 ($SD = 9.33$); scores for parents of BCC patients ranged from 23 – 67, with a mean of 33.86 ($SD = 10.07$). These scores are similar to those reported for adults on the original normative community sample (Spielberger, 1983) and for parents accompanying children to general practitioner appointments for minor illnesses (Richtsmeier & Hatcher, 1994).

Functional Disability. Parent-reported functional disability scores for NCCP patients ranged from 0 – 30 with a mean of 4.51 ($SD = 6.14$); scores for BCC patients ranged from 0 – 28 with a mean of 3.19 ($SD = 6.25$). Both scores were lower than the scores obtained by parents of children with recurrent abdominal pain (Claar & Walker, 2006).

Item-level data were examined for patients with NCCP in order to examine the different domains in which these patients may experience chest pain-related functional disability (*Table 3*). Across the domains assessed, parents were most likely to report difficulties within the realm of physical activity. Forty-seven percent of patients with NCCP reportedly experienced at least a little trouble doing activities in gym class or playing sports. Forty-six percent of parents indicated that their child would have trouble running the length of a football field, and 17 % walking the length of a football field.

Furthermore, 21% of parents indicated that chest pain to some degree interfered with their child's ability to fall and/or stay asleep. Eighteen percent reported that their children would have trouble being at school all day because of

chest pain. Overall, the majority (62%) of parents of NCCP patients reported that their child experienced some degree of chest-pain related functional disability in at least one domain.

Study variables and demographic variables

A one-way ANOVA was conducted to examine whether scores on the MASC, STAI-S, STAI-T, and FDI varied by across different ethnic groups. No differences were indicated across ethnic groups for scores on any variables. A Pearson-product correlation coefficient was conducted to examine the strength and direction of the linear relationships between income, age, and scores on the MASC, STAI-S, STAI-T, and FDI. There were negative correlations between income and scores on the STAI-T ($r = -.32, n = 141, p < .001$), scores on the STAI-S ($r = -.26, n = 143, p = .002$), and scores on the FDI ($r = -.22, n = 153, p = .007$). There were no significant correlations between income and scores on the MASC. There was a negative correlation between child age and scores on the MASC ($r = -.21, n = 155, p = .01$). There were no significant correlations between child age and other variables, or between parent age and any variables. Parents with lower incomes reported higher levels of trait and state anxiety, and reported that their children experienced more functional impairment. Younger children tended to report more anxiety than older children.

Main analyses

A series of one-way ANOVAs were conducted to compare mean group scores on the MASC³, STAI-S, STAI-T, and FDI (*Table 4*). No differences were indicated between groups for scores on the STAI-S and STAI-T. Parents of patients with NCCP and BCC reported equivalent levels of state and trait anxiety. Very small (Cohen 1988) group effect sizes were found for MASC scores ($d = .01$) and FDI ($d = .01$), with the NCCP group obtaining higher scores on both measures; however, these differences were not statistically significant. Although NCCP patients as a group did report more anxiety and experienced more functional disability, these differences were very small and are not greater than those that might be found by chance in this size sample. With regard to MASC factor scores, no differences were indicated between groups on factors assessing symptoms associated with separation anxiety, social anxiety, or harm avoidance. Patients with NCCP obtained higher scores, with a moderate effect size, on a MASC factor assessing physical anxiety symptoms [$F(1, 152)=9.75, p=.002, d=.06$]. Analysis of subfactor physical anxiety scores indicated that patients with NCCP reported significantly higher levels of somatic symptoms [$F(1, 151)=19.79, p=.00, d= 0.11$]⁴ but did not report significantly higher levels of tense/restless symptoms.

Chi-square tests were conducted to make between-group comparisons of the percentage of MASC scores considered clinically significant based on published

³ Because the assumption of homogeneity of variance between the two groups was found to be violated for scores on the MASC, a Welch test was also conducted to compare mean group scores on this measure (Tomarken & Serlin, 1986). This test also failed to indicate that MASC scores differed significantly across groups ($p > .05$).

⁴ Because chest pain itself is a symptom assessed by the MASC and included in the physical anxiety and somatic subscales, these analyses were repeated omitting the item (question 18) assessing chest pain. In these analyses, group differences were no longer significant for physical anxiety ($p > .05, d = .02$) or somatic symptoms ($p > .05, d = .02$).

norms (T-scores of 65 or above). No differences in percentage of clinically significant scores were indicated between groups. Patients with NCCP were not more likely to report clinically significant anxiety than patients with BCC.

A Pearson-product correlation coefficient was conducted to examine the strength and direction of the linear relationships between child anxiety symptoms (MASC), parent trait anxiety (STAI – T) and functional disability (FDI) in NCCP patients (Table 5). STAI-T score was moderately associated with FDI score ($r = .40, n = 82, p < .001$). The positive correlation between the STAI-T and FDI scores remained significant for girls ($r = .40, n = 51, p = .03$). However, this correlation became less strong and approached, but did not attain, significance for boys ($r = .33, n = 31, p = .07$). Parents with higher anxiety reported that their children experienced more functional impairment due to chest pain. This relationship was stronger for girls than for boys. MASC score was not associated with either STAI-T or FDI.

Exploratory analyses

Because of the lack of association between parent and child anxiety, and child anxiety and functional disability, the originally proposed hierarchical regression analysis was not conducted. As such, a series of exploratory analyses was conducted. These analyses were intended to more closely examine the relationships between child anxiety and both parent anxiety and functional disability.

Gender

One-way ANOVAs indicated that girls obtained higher MASC scores than boys [$F(1, 87) = 5.722, p = .02, d = .06$]. Although mothers' STAI-T scores were slightly higher

than fathers' scores on this measure ($d = .02$), the difference was not statistically significant. FDI scores were somewhat higher for girls ($d=.03$), but this difference was not statistically significant. Associations between MASC and FDI scores, and between MASC and STAI-T scores, remained non-significant when Pearson-product correlation coefficients were limited, respectively, to girls, boys mothers, fathers, mother/daughter dyads, and father/son dyads.

Most impaired activities

To examine the relationship between child anxiety and the activities that may be especially likely to be impacted by chest pain, a new variable, FDI-5, was computed by summing the five most frequently endorsed items on the FDI (e.g. items assessing sleep difficulties, walking the length of a football field, running the length of a football field, participating in sports, and being at school all day). Chronbach's alpha for these items was .78.

Pearson-product correlation coefficients were calculated using FDI-5, MASC, and STAI-T. There continued to be a strong positive correlation between STAI-T and FDI-5 ($r = .43, n = 82, p = .00$). There was a small but significant correlation between MASC and FDI-5 ($r = .22, n = 87, p = .04$). When correlations were calculated separately for boys and girls, there was a small correlation between MASC and FDI-5 scores for girls ($r = .30, n = 52, p = .03$). There was no correlation between MASC and FDI-5 scores for boys. There was a moderate correlation between FDI-5 and STAI-T scores for both girls ($r = .41, n = 51, p = .00$) and boys ($r = .43, n = 31, p = .02$). Girls, but not boys, who reported more anxiety symptoms were more likely to

experience chest-pain related impairment in some activity domains. Both boys and girls were more likely to experience impairment in these domains if their parents reported higher levels of anxiety.

Discussion

This study examined child anxiety, parent state and trait anxiety and functional impairment in outpatient pediatric cardiology patients with noncardiac chest pain (NCCP) and benign cardiac complaints (BCC). Contrary to expectations, there were no differences in state and trait anxiety across groups. Although there were small group differences in child anxiety and functional impairment, with NCCP patients having slightly higher anxiety and impairment, neither of these differences was statistically significant. Similarly, although 7% of patients with NCCP and 2% of patients with BCC reported clinically significant levels of anxiety, the difference between these groups was not significant. However, patients with NCCP did report higher levels of physical anxiety symptoms, due mostly to somatic anxiety symptoms (such as chest pain, dyspnea, palpitations, and abdominal pain). Relationships between study variables and demographic variables were examined, and small but significant negative associations were found between lower income and higher levels of trait and state anxiety, and functional impairment. A small but significant negative relationship was also found between children's age and the level of anxiety that they reported. However, it is not likely that these relationships influenced the findings described here because no demographic differences were found across groups.

In addition to group differences, relationships among these variables were examined in the group of participants with NCCP. Contrary to expectations, child anxiety was not associated with either parent anxiety or functional impairment. As anticipated, higher trait anxiety in parents was associated with greater functional impairment in patients with NCCP. However, when analyses were conducted separately for girls and boys, the relationship between parent anxiety and boys' functional impairment became less strong and approached, but no longer obtained, statistical significance.

Child anxiety

NCCP patients' reports of more somatic anxiety symptoms than patients with BCC is consistent with previous research (Lipsitz et al., 2004). However, in this study the group difference was no longer significant when analyses were repeated omitting an item on this measure that specifically assesses chest pain. Chest pain may be a symptom of anxiety, and this finding does not necessarily suggest that there were no differences in somatic anxiety symptoms across the two groups in this study. However, because pediatric NCCP is thought to be the product of a variety of factors that may include but are not limited to anxiety, it does indicate that our finding of group differences in somatic anxiety symptoms should be interpreted extremely cautiously. Previous research suggests that somatic complaints such as headaches, abdominal pain, fatigue, and dizziness, are not common in pediatric NCCP patients, occurring in approximately 30% of cases (Rowland & Richards, 1986).

It may be that pediatric patients with NCCP are not more likely than other patients to experience non-chest pain somatic complaints.

The lack of difference between overall child anxiety in these two groups in this study stands in contrast to a previous study in which patients with NCCP reported more anxiety than patients with benign heart murmurs (Lipsitz et al., 2004). This may in part reflect the relative heterogeneity of the complaints represented within this study's comparison group, which included syncope, palpitations, arrhythmias and other benign cardiac complaints in addition to murmurs. Although the recruitment of children with a range of complaints substantially increased the size of our comparison sample, it reduces the extent to which this study can be considered a replication of previous research. However, in addition to decreased group differences, mean anxiety scores in this study were lower, and somewhat fewer patients indicated clinically significant levels of anxiety (Lipsitz et al., 2004).

This inconsistency may reflect other differences between these studies. Previous self-report research relied on questionnaires completed an average of 24.4 months after a negative cardiac evaluation (Lipsitz et al., 2004), while participants in this current study completed questionnaires immediately following their evaluation. This raises the concerning question of whether patient's anxiety symptoms might increase in severity over time following a negative medical evaluation. NCCP itself persists in some cases following negative evaluation (Lipsitz et al., 2004; Malleon & Clinch, 2003; Rowland & Richards, 1986), and it is reasonable to speculate that

persistent unexplained chest pain might be accompanied by increased anxiety in some patients.

Our results are also inconsistent with research based on patient interviews indicating that anxiety disorders are prevalent within this population (Lipsitz et al., 2005). This may suggest that anxiety symptoms in pediatric patients with NCCP, especially symptoms associated with specific anxiety disorders, are more likely to be identified through interview rather than self-report. Another potentially important distinction between this study and previous research concerns sample demographics. Lipsitz and colleagues (2004, 2005) noted that this previous research relied on data from a suburban medical practice and that participants were predominantly white and of upper socioeconomic status. These differences may in part reflect the more ethnically and socioeconomically diverse patient sample of this study. These mixed results suggest that further investigation is needed, and that it is important to consider the possibility that pediatric patients with NCCP in many settings might not be expected to report more general anxiety than reported by children and adolescents in the community.

Contrary to expectations, child anxiety was not associated with overall functional disability. This stands in contrast to previous research indicating a positive association between these two factors in pediatric patients with conditions such as headache, musculoskeletal, and abdominal pain (Claar et al., 2008; Kashikar-Zuck et al., 2008; Martin et al., 2007; Mulvaney et al., 2006). Our findings are more consistent with a minority of studies, in which anxiety was associated with functional

disability in girls but not in boys (Kaczynski, Claar, & Logan, 2009) or was not associated with functional disability (Eccleston, Crombez, Scotford, Clinch, & Connell, 2004). The lack of association in our study may be attributable to NCCP's differential impact across domains of functioning. In this study, NCCP appeared to be most impairing of patients' ability to participate in physical activity or remain at school for an entire day, and less impairing in other areas (*Table 2*). Any relationship between child anxiety and functional disability might be expected to be most evident in the domains in which patients experience the most impairment. Exploratory analyses did indeed indicate a moderate positive association between anxiety and impairment in the most endorsed domains of functioning for girls, although no such association was found for boys. It may be that factors other than anxiety are more relevant to any functional impairment that boys with NCCP might experience.

Parent anxiety

This study was the first to examine anxiety in both patients with NCCP and their parents. The lack of association between parent and child anxiety in our study most likely reflects the non-clinical rates of anxiety symptoms reported by our participants. Although parent and child anxiety are often associated within the child anxiety literature, research regarding parent and child anxiety in adolescents with chronic pain also failed to find a significant relationship between these two variables (Eccleston et al., 2004). The lack of group differences in either parent group on measures of state and trait anxiety suggests the possibility that as a group, parents

of patients with NCCP may not be more prone to anxiety in general than most adults. In this way, they may differ from parents of children with other recurrent medical pain conditions, such as abdominal pain (Campo, 2007; Garber et al., 1990; Hodges et al., 1985; Walker & Greene, 1989). Additionally, they do not report especially high levels of current state anxiety following a child's negative medical evaluation. It is possible that clinical observations of higher anxiety in parents of NCCP patients prior to an exam (Cava & Sayger, 2004) are accurate but reflect temporary, situational anxiety that is relieved by learning that their child's chest pain is not indicative of a heart problem. Future research in this area should examine parent anxiety both before and after child medical evaluation.

Although parents with pediatric NCCP as a group may not report more anxiety symptoms than other parents, our results nonetheless indicate that parent anxiety may nonetheless be relevant to this ailment, particularly for girls. Higher trait anxiety in parents was associated with greater functional impairment in patients with NCCP for both boys and girls, although this relationship was less strong in boys. These results suggest that high parent anxiety may increase the potential for NCCP to impair a child's participation in typical childhood activities. This finding is consistent with previous research indicating that parent mental health is relevant to this specific patient population (Gilleland et al., 2009). The fact that parent anxiety, but not child anxiety, was associated with chest pain related impairment may reflect that for many children, participation or nonparticipation in typical activities is a function of parental permission. This also underscores that parent anxiety is likely

relevant to functional impairment in cases of pediatric NCCP in girls, and perhaps, to a lesser extent, in boys, regardless of the anxiety level of the child.

This finding provides some empirical support for clinician's suggestion that parents with anxiety may be more likely to curtail activities in response to a child's complaint of chest pain (Cava & Sayger, 2004; Selbst, 1990). It may be that parents with higher levels of anxiety worry more about child's chest pain, and parent's general worry about child health is associated with greater activity limitation and functional disability (Lipani & Walker, 2006). Even if parents do not directly forbid their child from participating a specific activity, they may nonetheless communicate to the child that certain activities should be avoided by protective or concerned reactions.

A number of factors may account for the somewhat stronger association between parent anxiety and functional impairment in girls. Parents may perceive girls as somewhat weaker than boys and may be more protective, enacting more activity limitations. Girls may be somewhat more sensitive to protective or concerned reactions by anxious parents. Much of the functional impairment reported by these patients involved sports or strenuous activity, and it may be that boys feel more societal pressure to continue such activity even when experiencing pain, lessening the influence of parent anxiety on the likelihood that they will continue in these activities.

Pediatric NCCP characteristics

In addition to examining our main hypotheses, a secondary aim of this study was to provide more details about the nature of pediatric NCCP and its potential impact on the lives of children. This study provides clear empirical evidence supporting the characterization of NCCP as a persistent, frequent, and intensely painful complaint for many of the children and adolescents who experience this complaint. A substantial majority (80%) of pediatric patients with NCCP experience their pain at least weekly, and a notable minority (35%) report pain that occurs at least once every day. At the time of cardiac evaluation, most patients are likely to have been experiencing their pain for at least a month, with one-fourth reporting pain that has persisted for over a year. Over three-fourths of these patients indicate that their pain is usually of at least moderate intensity.

This study also confirms the characterization of NCCP as interfering in typical childhood activities. Previous support for NCCP's potential to cause functional impairment was based on findings from a relatively small, ethnically homogenous sample (Lipsitz, Gur, Sonnet, et al., 2010) and samples that included children with chest pain associated with a variety of diagnoses (including, but not limited to, NCCP) (Pantell & Goodman, 1983; Rowe et al., 1990; Selbst, 1985). Most parents in this study reported that NCCP interfered with activities in at least one domain of functioning. NCCP most greatly interfered with a child's participation in gym class, sports, or other strenuous activity (e.g. equivalent to running the length of a football field). This finding is particularly concerning as it suggests that pediatric NCCP may potentially have an indirect impact on a child's physical health. Because pediatric

NCCP may persist across time periods, associated impairment may also persist for significant periods of time. Children and adolescents who avoid or are prohibited from participating in physical exercise for a period of time may be at higher risk for the adverse health factors associated with deconditioning.

In addition to interfering with physical activity, NCCP may also, though less frequently, interfere in other domains of a child's life. Nearly 1 in 5 parents reported that chest pain made it harder for their child to stay in school all day. This finding is also troubling, as school absenteeism may negatively impact a child or adolescent both academically and socially. The finding that 1 in 5 parents also reported that chest pain interfered with their child's sleep illustrates the level of pain intensity experienced by some patients with NCCP. By disrupting sleep, NCCP may also indirectly negatively impact numerous other physiological and cognitive areas that are vulnerable to poor sleep quality in children and adolescents.

Limitations

In considering the implications of these findings, it is necessary to note a few important limitations of this study. Because this study is cross-sectional, neither causality nor directionality can be assumed about the association between parent anxiety and chest pain related functional impairment. Additionally, the study relies upon data generated entirely by self-report and parent-report questionnaire measures that do not generate specific diagnoses of psychiatric disorders. Although this study is more ethnically diverse than previous samples of NCCP patients in which these constructs were examined, very few participants identified their

ethnicity as Asian/Asian-American, Hispanic or Latino, or American Indian or Alaskan native. This may impact the generalizability of these results to populations that do not identify their ethnicity as White or African American.

Theoretical implications

Psychological research on pediatric NCCP is in its infancy, and theoretical conceptualizations of this phenomenon are in the earliest stage of development (McDonnell et al., in press). Our findings have some implications that should be considered when developing and expanding these conceptualizations. Of particular importance are the questions our results raise about the prevalence of self-reported anxiety and somatic symptoms that might be expected in pediatric NCCP patients presenting for cardiac evaluation. Although these findings are preliminary and require further examination, our results indicate that pediatric patients with NCCP may not be especially likely to report higher than normal levels of somatic symptoms. Our findings also suggest that general anxiety symptoms in this population may be lower than indicated by previous research.

Because chest pain itself may be a symptom of anxiety, and because pediatric NCCP is a relatively new topic of psychological research, some researchers and clinicians may question the meaningfulness of a categorical distinction between NCCP and anxiety. Similarly, it has been suggested that pediatric NCCP can be conceptualized as one symptom indicative of a larger grouping of somatic health complaints (Gilleland et al., 2009). However, half of pediatric NCCP patients *do not* meet clinical criteria for a specific anxiety disorder (Lipsitz et al., 2005), and

approximately 70% report singular chest pain in the absence of other physical complaints (Rowland & Richards, 1986). These two findings have been cited as support for a conceptualization of NCCP as a complaint that is distinct from, though possibly co-morbid with, the broad class of anxiety disorders or a more comprehensive underlying somatization disorder (McDonnell & White, 2010).

This study, in which the anxiety symptoms reported by patients with NCCP were comparable to those reported in normal samples, illustrates that some cases of NCCP may occur in the absence of even sub-clinical elevations in more general symptoms of anxiety. Likewise, the lack of group differences in somatic symptoms other than chest pain does not support a conceptualization of pediatric NCCP as a single symptom of a broader underlying somatization disorder. Although there remains a need for comparative research, particularly using more comprehensive measures of somatic symptoms and multimodal methods of anxiety assessment, these findings provide current support for the a conceptualization of NCCP as a distinct and potentially singular entity.

Research implications

These findings have a number of implications for future research in this area and clinical work with this population. Perhaps most importantly, this study confirms using a relatively large, ethnically and socioeconomically diverse multi-site sample that pediatric NCCP has the potential to interfere with multiple childhood activities. These findings speak to the potential of NCCP to negatively impact children's and adolescents' overall quality of life. This provides increased justification for devoting

more resources to examining this pain complaint that, with a few notable exceptions, has historically not been a target for psychological research or intervention.

In addition to providing general support for more research in this area, these findings indicate some specific areas that could benefit from more investigation. Although this study did not demonstrate higher than average general anxiety in these patients as a group, the inconsistency between this and previous evidence regarding the relevance of anxiety to pediatric NCCP indicates that anxiety should not be dismissed as an area of investigation. The disparity between our findings and findings from assessments completed longer time periods after negative evaluation (Lipsitz et al., 2004) and findings derived from interview data (Lipsitz, Gur, Sonnet, et al., 2010; Lipsitz et al., 2005; Tunaoglu et al., 1995) suggest a need for multimodal, longitudinal assessment of anxiety symptoms in future research.

Our findings also demonstrate that the impact of chest pain itself should be considered when examining pediatric NCCP patients' scores on standardized measures. In future comparative research, it may be useful to assess anxiety symptoms using validated measures that do not contain items assessing chest pain. Alternatively, when utilizing measures of internalizing symptoms in future studies of NCCP patients, it may be useful to consider whether potentially helpful information might be provided by repeating analyses omitting items that specifically assess chest pain.

This study was the first to examine the potential impact of anxiety on variables related to NCCP severity. Although anxiety was not associated with functional impairment in this sample, it may be that patient's report of their own anxiety would be more likely to be associated with more subjective, patient-reported variables such as symptom severity. Additionally, even though the parent report measure of functional impairment utilized in this study demonstrates moderate to strong correlations with children's own impairment ratings (Claar & Walker, 2006), in future research it will be important to examine the impact of anxiety symptoms on child-reported functional impairment. Future research should also consider the relationship between anxiety and other indicators of NCCP severity such as pain intensity and frequency. Additionally, the distribution of scores on the measure of functional impairment suggest that pediatric patients with NCCP may be more likely to experience impairment in certain domains, particularly those related to physical activity. It may be helpful for future studies to examine this possibility empirically through factor analysis. It may also be worthwhile to examine the impact of NCCP on physical activity more specifically through more targeted assessment of this domain.

The relationship demonstrated here between parent anxiety and functional impairment is the first empirical evidence to suggest that family factors may influence the severity and negative impact of NCCP on children and adolescents. Further longitudinal research is necessary in order to determine the directionality and causality of this relationship. Additionally, future research should explore

mechanisms by which parent anxiety might impact functional impairment in this population. Of particular interest will be whether parents with higher anxiety are especially likely to exhibit certain patterns of behavioral responses to their children's chest pain.

The results of this study indicate that future studies should consider the possibility of gender differences in when examining the psychosocial correlates of pediatric NCCP. This may be particularly important when examining anxiety or perhaps other internalizing psychiatric symptoms. It may also be important to examine whether there are differences between parents' and clinicians' responses to NCCP in girls and boys. Finally, it will be important to consider demographic variables of income and age when considering variables such as anxiety and functional disability in future studies.

Clinical Implications

As research examining pediatric NCCP from a psychological perspective has progressed, researchers and clinicians have suggested that psychosocial treatment may be helpful in alleviating pain and suffering in this population (Lipsitz et al., 2004; McDonnell & White, 2010). A recent pilot trial of a brief (4-session) cognitive behavioral therapy-based psychological intervention for pediatric NCCP resulted in notably decreased ratings of pain intensity, discomfort, worry and frequency that were maintained 6-months post-treatment, but did not have significant impact on pain-related impairment (Lipsitz, Gur, Albano, et al., 2010). The results of this study indicate that parent anxiety may be relevant to functional impairment. Although this

brief intervention devoted half of one session to parent psychoeducation, focused on decreasing positive reinforcement of illness behaviors and increasing positive coping/non-illness behaviors, parent anxiety was not a target of assessment or treatment (Lipsitz, Gur, Albano, et al., 2010). Future treatment trials for pediatric NCCP may benefit from assessing parent anxiety and perhaps targeting this as part of treatment in cases where parent anxiety is high.

Based on these results, clinicians working with pediatric patients with NCCP should be particularly mindful of anxiety in both the child and parent when working with girls, although parent anxiety may impact functional impairment to a lesser extent in boys as well. Clinicians may need to be particularly mindful of anxiety when working with younger children. Parent anxiety may be higher in families of lower socioeconomic status, and children from these families may also be at risk for greater functional impairment. Addressing parent anxiety may be important even in cases where the patient does not report elevated anxiety symptoms. During an initial psychosocial interview with the parent of a pediatric patient with NCCP, it may be helpful to be vigilant to signs of general anxiety or anxiety about NCCP specifically. In cases where a patient is experiencing functional impairment due to NCCP, it may be worthwhile to directly assess a parent's anxiety level through standardized assessment measures.

In a clinical setting, it may be helpful to introduce parent measures after a discussion of how the patient's NCCP is or is not impacting other family members in order to provide a context for querying a parent about their own mental health.

Clinicians should avoid implying that the parent is to blame for the child's condition when exploring parent mental health factors. It is important to be sensitive to the possibility that parents seeking psychological services for a child's NCCP are likely to have already met with many medical care providers about the problem and may have at some point experienced critical or blaming reactions from a care provider. If a parent does report high levels of anxiety, it may be worthwhile to include a treatment component addressing this anxiety, particularly if the parent is not able to seek out their own individual treatment.

Training parents in contingency management strategies is often an important component of family intervention for recurrent pediatric pain conditions (Gerber et al., 2010; Lipsitz, Gur, Albano, et al., 2010; Palermo, Wilson, Peters, Lewandowski, & Somhegyi, 2009; Sanders, Shepherd, Cleghorn, & Woolford, 1994). Assisting parents in understanding behavioral reinforcement, and identifying and modifying reinforcement of illness behaviors, may be an important component of psychological intervention with pediatric NCCP patients (Lipsitz, Gur, Albano, et al., 2010). This will likely be particularly important in cases where a patient's NCCP is resulting in reinforcing consequences from a parent, such as permission to avoid attending school or not participate in disliked elements of physical education classes. In addition to decreasing reinforcement of pain behaviors, increasing reinforcement of positive coping behaviors will likely be helpful (Lipsitz, Gur, Albano, et al., 2010). Techniques such as psychoeducation and identifying and recording target behaviors may help parents in implementing contingency management plans (Mulvaney et

al., 2006). Because children's behavior is often monitored by other adults as well, such as teachers, coaches, childcare providers, and other family members, it may be important to assist a parent in preparing to explicate relevant portions of any new contingency management plan to others who are in a position to influence a child's pain-related behaviors.

When working with parents who are highly anxious, it will likely be helpful for clinicians to review the broader child anxiety family treatment literature and selectively apply relevant intervention techniques based on the individual needs of their patients and families. This will be particularly important if anxiety impairs a parent's ability to initiate or maintain a contingency management plan for the child. Important areas of intervention with these parents may be emotional regulation, modifying dysfunctional cognitions, and improving family communication (Creswell & Cartwright-Hatton, 2007). For example, a parent who exhibits anxiety and distress in response to a child's NCCP episodes may benefit from assistance with self-monitoring and brief relaxation techniques. Anxious behavioral responses such as frequently seeking emergency medical care or limiting normal activities for a child whose pain has been identified as NCCP may also be a target of intervention. In cases where parents remain very anxious that a child with NCCP has a heart problem, it may be necessary to liaise with medical care providers to facilitate clear communication prior to beginning any necessary cognitive restructuring.

Conclusion

This study represents the largest sample of pediatric NCCP patients examined within psychological literature. The findings presented here build on and expand the relatively sparse psychological literature regarding pediatric NCCP. Findings provide broad support for a biopsychosocial conceptualization of NCCP that reflects the relevance of non-organic factors to the etiology and maintenance of this ailment. Specifically, this study supports the inclusion of family factors within this conceptualization and provides the first evidence that family factors may influence the severity of NCCP in children. It is anticipated that this evidence regarding parent anxiety may have research and clinical implications that will ultimately advance the alleviation of pain and suffering in this population. More broadly, this study contributes to a growing evidence base regarding parent and child anxiety in pediatric pain patients, and extends research regarding parent and child anxiety and pain-related functional impairment.

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Table 1

Major findings from empirical studies of chest pain in pediatric medical settings (McDonnell et al., in press)

Authors	Patient Sample	N	Ages (M)	Design	Measures	Major Findings	Study Limitations
Asnes et al., 1981	Primary care	36*	4 – 14 (†)	Cross-sectional	Interview	Patients with NCCP may perceive typical childhood events as stressful	Appears to have excluded chest pain patients without obvious “personality conflict”; Did not utilize DSM criteria in determining “psychogenic” basis of pain; No standardized psychological assessment
Driscoll et al., 1976	Outpatient, emergency dept, and cardiology	43 (13*)	5 – 19 (12.9 boys, 11.8 girls)	Comparative longitudinal	Medical exam, telephone follow-up survey	Patients with NCCP attend more follow-up appointments; 70% report continued pain	Questions asked during the follow up survey are not described
Evangelista et al., 2000	Cardiology	50	5-21	Cross-sectional	Medical evaluation	Chest pain often perceived as “heart pain”	Sample included mixed diagnoses
Fyfe &	Cardiology	67 (34*)	8 – 19	Longitudinal	Records	30% of patients with NCCP	Questions asked during the follow up

Moodie, 1984			(13.8)		review, telephone follow-up survey	reported continued chest pain	survey are not described
Gilleland et al., 2009	Cardiology	35*	8-18 (12.5)	Cross-sectional	Self-report	Anxiety sensitivity (physical) and general somatization associated with pain severity; Maternal somatization associated with child somatization	Pain severity assessed with single item; No comparison group
Kaden et al., 1991	Cardiology; Healthy community controls	59	10-21 (†)	Comparative cross-sectional	Self-report	44% reported that chest pain changed behavior; patients report more concern about heart than controls	Sample included mixed diagnoses
Kashani et al., 1982	Cardiology	100 (4*)	6-18 (10.64)	Cross-sectional	Psychiatric interview	All NCCP patients met DSM-III criteria for depression	Very small NCCP sample size; nature of interview unclear

Lam & Tobias, 2001	Cardiology	103 (55**)	6-20 (14.2)	Longitudinal	Telephone survey	Pain may continue past initial evaluation	Sample included mixed diagnoses
Lipsitz et al., 2004	Cardiology	110*	7-18 (†)	Comparative cross-sectional	Self-report	Patients with NCCP report more anxiety than patients with benign heart murmurs	Patients completed measures an average of 25 months after medical exam
Lipsitz et al., 2005	Cardiology	27*	8-17 (12.7)	Cross-sectional	Structured interviews	59% met DSM-IV-TR criteria for psychiatric disorder; Anxiety most prevalent disorder	No comparison group
Lipsitz et al., 2010	Cardiology, emergency dept	9*	10-18 (15.0)	Longitudinal	Self-report	Brief intervention reduced pain intensity, worry and frequency; no change in anxiety or functional impairment	No comparison group
Lipsitz et al., 2010	Emergency dept	32*	8-17 (12.8)	Cross-sectional	Structured interviews	84% met DSM-IV-TR criteria for psychiatric disorder; Anxiety most	No comparison group

prevalent disorder

Pantell & Goodman, 1983	Primary care	100	† (16.8)	Cross-sectional	Medical evaluation	> 2/3 report activity restriction due to chest pain	Sample included mixed diagnoses
Rowe et al., 1990	Emergency dept	325	2 – 18 (11.6)	Cross-sectional	Self-report	90% report chest pain interferes with activity	Sample included mixed diagnoses
Rowland & Richards, 1986	Cardiology	31*	8 – 18 (12.2)	Longitudinal	Telephone follow-up survey	92% report pain reoccurs after NCCP dx	Questions asked during the follow up survey are not described
Selbst, 1985	Emergency dept	267(114**)	1-19 (†)	Longitudinal	Self-report	Child/parent worry continues with continued pain	Sample included mixed diagnoses
Selbst et al., 1988	Emergency department	407	2-18.9 (11.9)	Cross-sectional	Medical evaluation	Adolescents more likely than children to report chest pain	Sample included mixed diagnoses

precipitated by stressful event

Tunaoglu et al., 1995	Cardiology patients	100* (74***)	3-16 (11.3 girls, 9.9 boys)	Cross-sectional	Psychiatric interview	74% report psychiatric symptoms; Anxiety most prevalent DSM-III-R diagnosis	Patients who followed-up on psychiatric referrals may have been more symptomatic; Nature of interview unclear
Yildirim et al., 2004	Cardiology	300	3 – 17 (9.6 girls 10.4 boys)	Cross-sectional	Psychiatric interview	Depression most prevalent DSM-IV-TR diagnosis	Interviewed only if significant psychiatric history; Number of patients participating in interview not reported; Nature of interview unclear

* NCCP patients only (all patients achieved negative medical evaluations)

** Patients who returned follow-up contact

*** Patients who participated in unstructured interviews

† Specific age range or mean not reported

Table 2

Demographic characteristics of the sample

	NCCP		BCC		Statistical Difference Test	<i>p</i>
	%	(<i>n</i>)	%	(<i>n</i>)		
Child gender					$\chi^2 (1, N = 160) = 0.94$.33
Male	41.8	(38)	50.7	(35)		
Female	58.2	(53)	49.3	(34)		
Parent gender					$\chi^2 (1, N = 157) = 0.11$.74
Male	16.7	(15)	13.4	(9)		
Female	83.3	(75)	86.6	(58)		
Child ethnicity					$\chi^2 (1, N = 152) = 03.12^*$.08
American Indian or Alaskan Native	1.1	(1)	1.4	(1)		
Asian or Asian American	1.1	(1)	1.4	(1)		
Black or African American	39.6	(36)	24.6	(17)		
White not Hispanic or Latino	56.0	(51)	69.6	(48)		
Hispanic or Latino	1.1	(1)	2.9	(2)		
Other	1.1	(1)	--	--		
Parent ethnicity					$\chi^2 (1, N = 153) = 2.51^*$.11
American Indian or Alaskan Native	1.1	(1)	1.4	(1)		
Asian or Asian American	--	--	1.4	(1)		
Black or African American	38.5	(35)	24.6	(17)		
White not Hispanic or Latino	58.2	(53)	69.6	(48)		
Hispanic or Latino	1.1	(1)	2.9	(2)		
Other	1.1	(1)	--	--		
Family income					$F(1, 153)=0.54, d=.00$.46
less than \$15,000	12.4	(11)	10.6	(7)		
\$15,001 to \$30,000	12.4	(11)	13.6	(9)		
\$30,001 to \$45,000	24.7	(22)	19.7	(13)		
\$45,001 to \$60,000	13.5	(12)	9.1	(6)		

\$60,001 to \$75,000	10.1	(9)	16.7	(11)
more than \$75,001	27.0	(24)	30.3	(20)
Relationship to child				**
Biological parent	91.2	(83)	92.8	(64)
Adoptive parent	2.2	(2)	4.3	(3)
Step-parent	3.3	(3)	2.9	(2)
Grandparent	2.2	(2)	--	--
Other	1.1	(1)	--	--

*Calculated for White and Black or African American only due to few participants of other ethnicities

**Not calculated due to sample distribution

Table 3

Functional disability inventory scores

	No Trouble	A Little Trouble	Some Trouble	A Lot of Trouble	Impossible
Walking to the bathroom	97 (86)	2 (2)	1(1)	0	0
Walking up stairs	87 (77)	6 (5)	7 (6)	1 (1)	0
Doing something with a friend	88 (78)	5 (4)	5 (4)	3 (3)	0
Doing chores at home	89 (78)	5 (4)	6 (5)	1 (1)	0
Eating regular meals	93 (83)	2 (2)	5 (4)	0	0
Being up all day without a nap or rest	89 (79)	5 (4)	6 (5)	1 (1)	0
Riding the school bus or traveling in the car	96 (85)	2 (2)	2(2)	0	0
Being at school all day	82 (73)	10 (9)	6 (1)	2 (2)	0
Doing the activities in gym class (or playing sports)	53 (47)	17 (15)	21 (19)	9 (8)	0
Reading or doing homework	92 (82)	5 (4)	2 (2)	1 (1)	0
Watching TV	98 (86)	1 (1)	1(1)	0	0
Walking the length of a football field	73 (65)	11 (10)	14 (12)	2 (2)	0
Running the length of a football field	54 (48)	12 (11)	18 (16)	16 (14)	0
Going shopping	86 (76)	8 (7)	6 (5)	1 (1)	0
Getting to and staying asleep	79 (70)	9 (8)	9 (8)	2 (2)	1 (1)

Table 4

ANOVA comparing patients with NCCP and BCC

	NCCP	BCC	<i>F</i>	<i>p</i>	<i>d</i>
	<i>M (SD)</i>	<i>M (SD)</i>			
MASC total	37.1 (18.2)	33.3 (13.6)	(1, 156) = 2.0	.16	.01
Physical symptoms	9.71 (7.0)	6.4 (5.7)	(1, 153) = 9.7	.00**	.06
Somatic	6.3 (4.0)	3.6 (3.2)	(1, 151) = 19.8	.00**	.11
Tense	3.5 (3.6)	2.9 (3.1)	(1, 153) = 0.9	.36	.01
Harm Avoidance	14.0 (5.7)	13.8 (5.4)	(1, 153) = 0.0	.88	.00
Perfectionism	6.8 (2.6)	6.8 (2.8)	(1, 151) = 0.0	.98	.00
Anxious coping	7.2 (3.5)	7.0 (3.5)	(1,153) = 0.2	.68	.00
Social	7.2 (6.4)	7.6 (5.4)	(1, 153) = 0.2	.67	.00
Humiliation	4.0 (4.23)	4.21 (3.9)	(1,153) = 0.1	.72	.00
Performance	3.3 (2.9)	3.4 (2.6)	(1, 150) = 0.1	.82	.00
Separation/panic	5.8 (5.3)	4.9 (4.4)	(1, 153) = 1.2	.28	.00
STAI-S	33.4 (9.3)	33.9 (10.1)	(1, 146) = 0.1	.77	.00
STAI-T	35.6 (11.7)	35.0 (11.7)	(1, 144) = 0.1	.74	.00
FDI	4.4 (6.1)	3.1 (6.2)	(1, 156) = 1.8	.19	.01

**significant at $p < .01$

Table 5

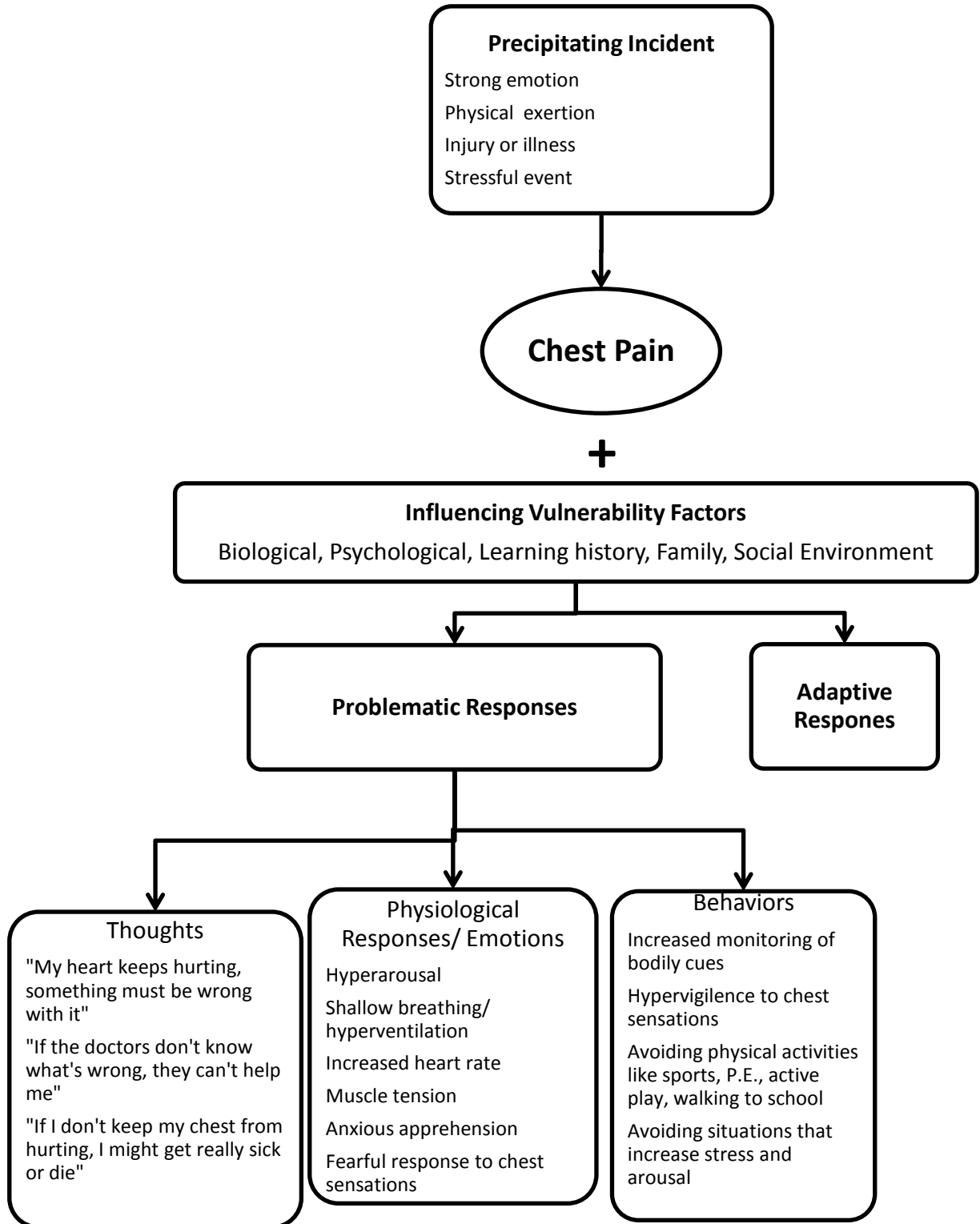
Correlations among NCCP patients

	MASC	FDI
STAI-T <i>r</i>	.12	.39**
<i>p</i>	.28	.00
<i>N</i>	82	82
MASC <i>r</i>		.15
<i>p</i>		.17
<i>N</i>		87

**significant at $p < .05$

Figure 1. Diathesis-stress model of pediatric noncardiac chest pain (NCCP)

adapted from (McDonnell et al., in press)



Appendix A

Parent-Report Demographic and Medical History

(for patients with NCCP)

Many patients visit our department for testing because of symptoms of chest pain, discomfort, or heaviness. We are trying to better understand the symptoms you felt that brought your child for testing.

As such, the terminology of “chest pain” used in this questionnaire refers to the broad range of symptoms that prompted your visit. “Chest pain” can refer to feelings of pain, discomfort, heaviness, cramping, stinging, or other symptoms your child may feel or have felt in his or her chest.

DEMOGRAPHIC INFORMATION1. Today's Date (MM/DD/YY):2a. Child's Date of Birth (MM/DD/YY):2b. Your Date of Birth(MM/DD/YY):3a. Child's Gender Male¹ Female²3b. Your Gender Male¹

Female²

4a. Child's Current Weight_____

4b. Child's Current Height_____

5a. Mother's Current Weight_____

6a. Child's Current Grade_____

6b. Your Education:

(Highest level of school completed)

Less than high school¹

12th grade or GED²

Some college³

5b. Mother's Current Height_____

7a. Your Religion

Jewish¹

Catholic²

Protestant³

Muslim⁴

No affiliation⁵

Other⁶_____

7b. Child's Religion

- Jewish¹
- Catholic²
- Protestant³
- Muslim⁴
- No affiliation⁵
- Other⁶ _____

8. Annual Household Income

- Less than \$15,000¹
- \$15,001 - \$30,000²
- \$30,001 - \$45,000³
- \$45,001 - \$60,000⁴
- \$60,001 - \$75,000⁵
- Over \$75,001⁶

9. Your Employment status

- Full-time¹
- Part-time²
- Full-time Homemaker³
- Unemployed⁴
- Disability⁵
- Retired⁶

10. Your Marital Status

Never married¹
ANXIETY PEDIATRIC NONCARDIAC CHEST PAIN

75

- Married²
- Divorced³
- Widowed⁴
- Separated⁵
- Cohabiting/Living together

11. Your relationship to child:

- Biological Parent¹
- Adoptive Parent²
- Step-parent³
- Foster Parent⁴
- Grandparent⁵
- Other(s): _____⁶

12a. Child's Ethnicity:

- American Indian or
Alaskan Native¹
- Asian or Asian American²
- Black or African American³
- Native Hawaiian or other
Pacific Islander⁴
- White, not Hispanic or Latino⁵
- Hispanic or Latino⁶
- Other:⁷ _____

Student⁷

13a. Does your child have any siblings? Yes No

(If "Yes", please specify the following information about each sibling)

<u>Sex</u>		<u>Age</u>	<u>Birth Date</u>	<u>Living at home?</u>	
Male	Female	_____	___/___/_____	Yes	No
Male	Female	_____	___/___/_____	Yes	No
Male	Female	_____	___/___/_____	Yes	No
Male	Female	_____	___/___/_____	Yes	No
Male	Female	_____	___/___/_____	Yes	No

13b. Does your child have any step-siblings? Yes No

(If "Yes", please specify the following information about each step-sibling)

<u>Sex</u>	<u>Age</u>	<u>Birth Date</u>	<u>Living at home?</u>
------------	------------	-------------------	------------------------

Male Female _____ / / _____ Yes No

Male Female _____ / / _____ Yes No

Male Female _____ / / _____ Yes No

Male Female _____ / / _____ Yes No

Male Female _____ / / _____ Yes No

14a. People who live with your child:

Household 1 (where your child spends *most* of his/her time)

- Mother¹
- Step-mother²
- Father³
- Step-father⁴
- Sibling(s) (how many): _____⁵
- Step-siblings (how many): _____⁶
- Grandparents⁷
- Other(s): _____⁸

14b. Household 2 (if applicable)

- Mother¹
- Step-mother²
- Father³
- Step-father⁴
- Sibling(s) (how many): _____⁵
- Step-siblings (how many): _____⁶
- Grandparents⁷
- Other(s): _____⁸

15a. Has your child ever been **diagnosed** with any of the following?

- Heart murmur or heartbeat irregularity
- Mitral valve prolapse
- Coronary artery disease or other heart condition
- Heart attack
- Stroke
- Thyroid disorder or goiter
- Seizure disorder, epilepsy, or other disorder of the brain or nervous system
- High blood pressure
- Hypoglycemia or Low blood pressure
- Esophagitis, gastritis, or pancreatitis
- Alcohol or drug abuse or dependence
- Asthma or other breathing disorder (e.g., chronic bronchitis)
- Any other medical problem
- Diabetes
- Ulcers or other Gastrointestinal problems (e.g., GERD, acid reflux)
- Migraine headaches
- HIV/AIDS
- Cancer

If you answered “Yes” to any of these questions, please give details below (e.g., when diagnosed, any treatment your child is currently receiving)

15b. Does your child have a **FAMILY HISTORY** of any of the above? If “Yes,” please place an asterisk * next to those disorders that have been diagnosed in your child’s immediate, biological family (i.e., **You**, siblings).

16. Has your child ever...?

- Experienced chest pain that did not lessen within 30 minutes?
- Fainted, passed out, or lost consciousness?
- Had neck surgery or irradiation to the neck?
- Suffered a head injury?
- Had a seizure or convulsion?
- Seen or heard things other people couldn’t see or hear?
- Had stomach surgery?
- Used any illicit or recreational drugs or substances?
- If you answered “Yes” to any of these questions, please give details below

17. Did your child ever experience spells of...?

- Heart racing or palpitations
- Confusion, weakness, or blindness
- Not being able to talk properly
- Anxiety preceded by characteristic sensations or awareness
- Making involuntary or unconscious repetitive movements

- Headaches accompanied by heart pounding, sweating, flushing, nausea, or any empty feeling in your stomach
- Anxiety consistently related to meal times or hunger

If you answered "Yes" to any of these questions, please give details below

18. Does your child generally...?

- Sweat a lot more than other people, or find he or she is too warm when others are comfortable
- Feel tired most of the time
- Get short of breath during mild exertion
- Have a hard time keeping his or her weight up

19. When was your child's last general physical exam?

What were the results? (Normal, Abnormal, Not sure)

Who conducted the exam?

20. Is child taking any medicine (including non-prescription, herbal, and/or homeopathic remedies)?

If yes, please list below all medications your child is currently taking (Please indicate if your child takes the medication regularly and include non-prescription, herbal, homeopathic remedies)

Medication	Dose	Reason for taking
------------	------	-------------------

21. Has your child had any of the following tests in the last year?

- ECG (Electrocardiogram: A non-invasive reading of the heart's activity)
- Chest X-Ray
- Blood tests
- CAT/MRI scan
- Angiography (An invasive test when a tube is inserted into a blood vessel to the heart).
- Exercise stress test (sometimes done on a treadmill)
- Any heart surgery (e.g., CABG, valve repair, aneurysm repair)

22. Has your child had any major illnesses? If yes, what illnesses has your child had?

23. Has your child **ever** been treated for an emotional or psychological problem? (If "Yes", please describe below)

24. Has your child been treated for an emotional or psychological problem **in the past year** (If "Yes", please describe below)

25. In the **past year**, how many times has your child gone to see a doctor because of chest pain?

_____ Times This Year (including the most recent visit)

- Never¹
- Once or twice²
- Several times a year³
- About once a month⁴
- Several times a month⁵

26a. How many medical visits has your child had in the past year? _____ *times (approx)*

26b. What percentage of these visits was related to chest pain? _____ % (0-100)

27. What has your child's *doctor* told you about why your child's chest hurts? (*Check all that apply*)

- Heart attack¹
- Allergic reaction²
- Anxiety³
- Gastro-Intestinal related⁴
- Nervous breakdown⁵
- Mitral valve prolapse⁶
- Panic attack⁷

28. At the time of your child's doctor visit, how confident were you in the physician's diagnosis?

0 1 2 3 4 5 6 7 8 9 10
Not at all confident Moderately confident Extremely
confident

29. How reassured were you by the physician's diagnosis?

0 1 2 3 4 5 6 7 8 9 10
Not at all reassured Moderately reassured Extremely reassured

30. What do YOU think caused your child's chest pain? (*Check all that apply*)

- Heart attack¹
- Allergic reaction²
- Anxiety³
- Gastro-Intestinal related⁴
- Nervous breakdown⁵
- Mitral valve prolapse⁶
- Panic attack⁷

31. Do you think your child has any type of heart condition or heart disease?

- Yes¹
- No²

If "Yes," how severe do you think it is?

0 1 2 3 4 5 6 7 8 9 10

Not at all severe

Moderately severe

Extremely

severe

32. Is there anything you think is important for you to know that we did not ask about in this questionnaire?

Appendix B

Parent-Report Demographic and Medical History

(for patients with benign cardiac complaints)

1. Today's Date (MM/DD/YY):

2a. Child's Date of Birth (MM/DD/YY):

2b. Your Date of Birth(MM/DD/YY):

3a. Child's Gender

Male¹

Female²

3b. Your Gender

Male¹

Female²

4a. Child's Current Weight_____

4b. Child's Current Height_____

5a. Mother's Current Weight_____

6a. Child's Current Grade _____

6b. Your Education:

(Highest level of school completed)

Less than high school¹

12th grade or GED²

Some college³

5b. Mother's Current Height _____

7a. Your Religion

Jewish¹

Catholic²

Protestant³

Muslim⁴

No affiliation⁵

Other⁶ _____

7b. Child's Religion

- Jewish¹
- Catholic²
- Protestant³
- Muslim⁴
- No affiliation⁵
- Other⁶ _____

8. Annual Household Income

- Less than \$15,000¹
- \$15,001 - \$30,000²
- \$30,001 – \$45,000³
- \$45,001 - \$60,000⁴
- \$60,001 - \$75,000⁵
- Over \$75,001⁶

9. Your Employment status

- Full-time¹
- Part-time²
- Full-time Homemaker³
- Unemployed⁴
- Disability⁵
- Retired⁶
- Student⁷

10. Your Marital Status

Never married¹
ANXIETY PEDIATRIC NONCARDIAC CHEST PAIN

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- Married²
- Divorced³
- Widowed⁴
- Separated⁵
- Cohabiting/Living together

11. Your relationship to child:

- Biological Parent¹
- Adoptive Parent²
- Step-parent³
- Foster Parent⁴
- Grandparent⁵
- Other(s): _____⁶

12a. Child's Ethnicity:

- American Indian or
Alaskan Native¹
- Asian or Asian American²
- Black or African American³
- Native Hawaiian or other
Pacific Islander⁴
- White, not Hispanic or Latino⁵
- Hispanic or Latino⁶
- Other:⁷ _____

13a. Does your child have any siblings? Yes No

(If "Yes", please specify the following information about each sibling)

<u>Sex</u>		<u>Age</u>	<u>Birth Date</u>	<u>Living at home?</u>	
Male	Female	_____	___/___/_____	Yes	No
Male	Female	_____	___/___/_____	Yes	No
Male	Female	_____	___/___/_____	Yes	No
Male	Female	_____	___/___/_____	Yes	No
Male	Female	_____	___/___/_____	Yes	No

13b. Does your child have any step-siblings? Yes No

(If "Yes", please specify the following information about each step-sibling)

<u>Sex</u>	<u>Age</u>	<u>Birth Date</u>	<u>Living at home?</u>
------------	------------	-------------------	------------------------

Male Female _____ / / _____ Yes No

Male Female _____ / / _____ Yes No

Male Female _____ / / _____ Yes No

Male Female _____ / / _____ Yes No

Male Female _____ / / _____ Yes No

14a. People who live with your child::

Household 1 (where your child spends *most* of his/her time)

- Mother¹
- Step-mother²
- Father³
- Step-father⁴
- Sibling(s) (how many): _____⁵
- Step-siblings (how many): _____⁶
- Grandparents⁷
- Other(s): _____⁸

14b. Household 2 (if applicable)

- Mother¹
- Step-mother²
- Father³
- Step-father⁴
- Sibling(s) (how many): _____⁵
- Step-siblings (how many): _____⁶
- Grandparents⁷
- Other(s): _____⁸

15a. Has your child ever been **diagnosed** with any of the following?

- Heart murmur or heartbeat irregularity
- Mitral valve prolapse
- Coronary artery disease or other heart condition
- Heart attack
- Stroke
- Thyroid disorder or goiter
- Seizure disorder, epilepsy, or other disorder of the brain or nervous system
- High blood pressure
- Hypoglycemia or Low blood pressure
- Esophagitis, gastritis, or pancreatitis
- Alcohol or drug abuse or dependence
- Asthma or other breathing disorder (e.g., chronic bronchitis)
- Any other medical problem
- Diabetes
- Ulcers or other Gastrointestinal problems (e.g., GERD, acid reflux)
- Migraine headaches
- HIV/AIDS
- Cancer

If you answered “Yes” to any of these questions, please give details below (e.g., when diagnosed, any treatment your child is currently receiving)

15b. Does your child have a **FAMILY HISTORY** of any of the above? If “Yes,” please place an asterisk * next to those disorders that have been diagnosed in your child’s immediate, biological family (i.e., **You**, siblings).

16. Has your child ever...?

- Experienced chest pain that did not lessen within 30 minutes?
- Fainted, passed out, or lost consciousness?
- Had neck surgery or irradiation to the neck?
- Suffered a head injury?
- Had a seizure or convulsion?
- Seen or heard things other people couldn’t see or hear?
- Had stomach surgery?
- Used any illicit or recreational drugs or substances?
- If you answered “Yes” to any of these questions, please give details below

17. Did your child ever experience spells of...?

- Heart racing or palpitations
- Confusion, weakness, or blindness
- Not being able to talk properly
- Anxiety preceded by characteristic sensations or awareness
- Making involuntary or unconscious repetitive movements

- Headaches accompanied by heart pounding, sweating, flushing, nausea, or any empty feeling in your stomach
- Anxiety consistently related to meal times or hunger

If you answered "Yes" to any of these questions, please give details below

18. Does your child generally...?

- Sweat a lot more than other people, or find he or she is too warm when others are comfortable
- Feel tired most of the time
- Get short of breath during mild exertion
- Have a hard time keeping his or her weight up

19. When was your child's last general physical exam?

What were the results? (Normal, Abnormal, Not sure)

Who conducted the exam?

20. Is child taking any medicine (including non-prescription, herbal, and/or homeopathic remedies)?

If yes, please list below all medications your child is currently taking (Please indicate if your child takes the medication regularly and include non-prescription, herbal, homeopathic remedies)

Medication	Dose	Reason for taking
------------	------	-------------------

21. Has your child had any of the following tests in the last year?

- ECG (Electrocardiogram: A non-invasive reading of the heart's activity)
- Chest X-Ray
- Blood tests
- CAT/MRI scan
- Angiography (An invasive test when a tube is inserted into a blood vessel to the heart).
- Exercise stress test (sometimes done on a treadmill)
- Any heart surgery (e.g., CABG, valve repair, aneurysm repair)

22. Has your child had any major illnesses? If yes, what illnesses has your child had?

23. Has your child **ever** been treated for an emotional or psychological problem? (If "Yes", please describe below)

24. Has your child been treated for an emotional or psychological problem **in the past year** (If "Yes", please describe below)

25. In the **past year**, how many times has your child gone to see a doctor for the health problem that has brought them here today?

_____ Times This Year (including the most recent visit)

- Never¹
- Once or twice²
- Several times a year³
- About once a month⁴
- Several times a month⁵

26a. How many medical visits has your child had in the past year? _____ *times (approx)*

26b. What percentage of these visits were related to the same problem that brought you here today? _____ % (0-100)

27. What has your child's *doctor* told you about why your child's chest hurts? (*Check all that apply*)

- Heart attack¹
- Allergic reaction²
- Anxiety³
- Gastro-Intestinal related⁴
- Nervous breakdown⁵
- Mitral valve prolapse⁶
- Panic attack⁷

28. At the time of your child's doctor visit, how confident were you in the physician's diagnosis?

0 1 2 3 4 5 6 7 8 9 10

Not at all confident
confident

Moderately confident

Extremely

29. How reassured were you by the physician's diagnosis?

0 1 2 3 4 5 6 7 8 9 10

Not at all reassured

Moderately reassured

Extremely reassured

30. What do YOU think caused your child's health problem? (*Check all that apply*)

- Heart attack¹
- Allergic reaction²
- Anxiety³
- Gastro-Intestinal related⁴
- Nervous breakdown⁵
- Mitral valve prolapse⁶
- Panic attack⁷

31. Do you think your child has any type of heart condition or heart disease?

- Yes¹

No²

If "Yes," how severe do you think it is?

0 1 2 3 4 5 6 7 8 9 10

Not at all severe

Moderately severe

Extremely

severe

32. Is there anything you think is important for you to know that we did not ask about in this questionnaire?

Appendix C

Chest Pain Characteristics Questionnaire

Many kids and teens visit our hospital for testing because their chest hurts, or feels uncomfortable or “heavy.” We are trying to better understand the symptoms you felt that brought you for testing.

The words “chest pain” used here can mean feelings of pain, feeling like something heavy is pressing on your chest, feeling like there is a tight rubber band around your chest, feeling like your chest stings or aches, or other feelings in your chest that are uncomfortable.

1. Are you experiencing chest pain right now?

Yes¹

No²

2. What does your chest pain usually feel like? (*Check the **ONE** that describes the pain best*)

Aching¹

Like a rubber-band around your chest²

Burning³

Cramping⁴

Dull⁵

Sharp⁶

- Stabbing⁷
- Stinging⁸
- Tight or Squeezing
- Fluttering¹⁰
- Bumping¹¹
- My pain usually feels like...¹²: (Please tell us in your own words)

3. How much does your chest pain hurt *at its worst?* (when it hurts the most)

0 1 2 3 4 5 6 7 8 9 10

Does not hurt

Hurts Some

Hurts A Whole

Lot

4. Where in your body do you feel the pain? *If you feel the pain in more than one area, please mark the ONE area where you feel the pain **MOST** or **USUALLY***

- In the Center of my Chest¹
- On the Left side of my Chest²
- On the Right side of my Chest³
- In my Left Arm⁴
- In my Right Arm⁵

- In Both Arms⁶
- In my Neck (or Throat)⁷
- In my Jaw⁸
- In my Stomach⁹
- In my Legs¹⁰
- In my Back¹¹

4. How often do you experience the chest pain?

- Several times during a day¹
- About every day²
- Less than every day (every other day)³
- About once a week⁴
- About once a month⁵
- Never or almost never⁶

6. How long does your chest pain usually last?

- A few seconds¹
- Less than 5 minutes²
- 5-20 minutes³
- 21-60 minutes⁴

- More than one hour⁵
- About half the day⁶
- All day or longer⁷
- The pain is all the time, it does not stop⁸

7. In the past month, about how many times have you experienced chest pain?

- None¹
- 1-2 times²
- 3-5 times³
- 6-10 times⁴
- 11-20 times⁵
- More than 20 times⁶

8. Does the pain come on all of the sudden, within a second or two? So, do you go from having no pain, to having pain, in only one or two seconds?

- Yes¹
- No²

9. How badly does your chest pain usually hurt?

0 1 2 3 4 5 6 7 8 9 10

Does not hurt at all
lot

Hurts some

Hurts a whole

10. How long have you had the pain?

- Seven days or less¹
- More than 7 days but less than one month²
- Between 1 month and 6 months³
- Between 6 months and one year⁴
- More than one year⁵

11. Does your chest hurt when you do certain activities?

- No²
- Yes¹..... If "Yes," when does it hurt? *(Check all the things that make your chest hurt, even if it doesn't hurt every time that you do that activity)*
- Bending over¹
- Coughing²
- Eating food³

- Swallowing⁴
- Being hungry⁵
- Breathing in⁶
- Certain situations (like school, crowds, stores)⁷
- Exercising or moving quickly (such as walking fast or running)⁸
- Strong feelings (like being mad or scared)⁹
- Coughing¹⁰
- Feeling worried or nervous about things you need to do¹¹
- Moving one part of your body (such as twisting your waist, turning head)¹²
- Something else (please tell us)¹³

12. Has your chest started hurting when you are moving around or doing something active? (such as climbing stairs, running, riding a bike, gym class, playing sports, playing outside, carrying a book bag)

- Yes¹
- No²

13. Has your chest hurt when you are sitting or lying down?

- Yes¹
- No²

14. Below is a list of other pains and complaints that kids and teenagers with chest pain

or discomfort sometimes have. Please check the box that best describes how much that thing has bothered or distressed you (made you upset) *in the past week...*

	Not at all	A little bit	Some	A lot	A whole lot
Pains in your heart ¹	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Back pain ²	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fear of losing control (being afraid you might faint or pass out) ³	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fear of dying ⁴	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A pounding or fast heart beat ⁵	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Soreness in your muscles ⁶	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sweating ⁷	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Feelings of choking ⁸	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pains in your arms ⁹	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fear of going crazy ¹⁰	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Trembling or shaking ¹¹	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Feeling like you can't move ¹²	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Feeling like it is hard to breath or	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

having trouble breathing¹³

Chills or hot flushes (suddenly feeling
very hot or cold)¹⁴

	0	0	0	0	0
--	---	---	---	---	---

Feeling weak in parts of your body (like
it is hard to move some body parts)¹⁵

	0	0	0	0	0
--	---	---	---	---	---

Feeling unreal or separate from
yourself¹⁶

	0	0	0	0	0
--	---	---	---	---	---

A lump in your throat¹⁷

	0	0	0	0	0
--	---	---	---	---	---

Heavy feeling in your arms or legs¹⁸

	0	0	0	0	0
--	---	---	---	---	---

15. How sure are you that your doctor is right about why your chest hurts?

0 1 2 3 4 5 6 7 8 9 10

Not sure at all

Pretty sure

Very sure

16. What do YOU think caused your chest pain? *(Please tell us in your own words)*

17. Do you think that there is anything wrong with your heart?

Yes¹

No²

If "Yes," how bad do you think the heart problem is?

0 1 2 3 4 5 6 7 8 9 10

Not bad at all

Sort of bad

Really bad

18. Please rate the following other feelings that you may have when your chest feel uncomfortable

a. Heart beats faster

0 1 2 3

Not at all

Very much, could not have been worse

b. Racing heart

0	1	2	3
Not at all			Very much, could not have been worse

c. Chest pain

0	1	2	3
Not at all			Very much, could not have been worse

d. Chest tightness

0	1	2	3
Not at all			Very much, could not have been worse

e. Pain down one or both arms

0	1	2	3
Not at all			Very much, could not have been worse

Appendix D

Benign Cardiac Complaints Characteristics Questionnaire

1. What is the health problem that you came to see the doctor about? (*Please tell us in your own words*)

2. Are you having this problem right now?

Yes¹

No²

3. How badly does your health problem hurt?

0 1 2 3 4 5 6 7 8 9 10

Does not hurt

Hurts Some

Hurts A Whole

Lot

4. How often do you experience your health problem?

Several times during a day¹

About every day²

Less than every day (every other day)³

About once a week⁴

About once a month⁵

Never or almost never⁶

5. How long does your health problem usually last?

- A few seconds¹
- Less than 5 minutes²
- 5-20 minutes³
- 21-60 minutes⁴
- More than one hour⁵
- About half the day⁶
- All day or longer⁷
- The pain is all the time, it does not stop⁸

6. In the past month, about how many times have you experienced your health problem?

- None¹
- 1-2 times²
- 3-5 times³
- 6-10 times⁴
- 11-20 times⁵
- More than 20 times⁶

7. How long have you had this health problem?

- Seven days or less¹
- More than 7 days but less than one month²
- Between 1 month and 6 months³
- Between 6 months and one year⁴
- More than one year⁵

8. Does your health problem come on all of the sudden, within a second or two? So, do you go from feeling fine, to experiencing your health problem, in only one or two seconds?

- Yes¹
- No²

9. If your health problem hurts, how badly does it usually hurt?

0 1 2 3 4 5 6 7 8 9 10

Does not hurt at all

Hurts some

Hurts a whole lot

10. Does your health problem when you do certain activities?

- No²
- Yes¹..... If “Yes,” when does it hurt? *(Check all the things that make your chest hurt, even if it doesn’t hurt every time that you do that activity)*
- Bending over¹
- Coughing²
- Eating food³
- Swallowing⁴
- Being hungry⁵
- Breathing in⁶
- Certain situations (like school, crowds, stores)⁷
- Exercising or moving quickly (such as walking fast or running)⁸
- Strong feelings (like being mad or scared)⁹
- Coughing¹⁰
- Feeling worried or nervous about things you need to do¹¹
- Moving one part of your body (such as twisting your waist, turning head)¹²
- Something else (please tell us)¹³

11. Has your health problem become worse when you are moving around or doing something active? (such as climbing stairs, running, riding a bike, gym class, playing sports, playing outside, carrying a book bag)

Yes¹

No²

12. Has your health problem become worse when you are sitting or lying down?

Yes¹

No²

13. Below is a list of other pains and complaints that kids and teenagers with health problems sometimes have. Please check the box that best describes how much that thing has bothered or distressed you (made you upset) *in the past week...*

	Not at all	A little bit	Some	A lot	A whole lot
Pains in your heart ¹	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Back pain ²	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fear of losing control (being afraid you might faint or pass out) ³	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fear of dying ⁴	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A pounding or fast heart beat ⁵	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Soreness in your muscles ⁶	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sweating ⁷	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Feelings of choking ⁸	0	0	0	0	0
Pains in your arms ⁹	0	0	0	0	0
Fear of going crazy ¹⁰	0	0	0	0	0
Trembling or shaking ¹¹	0	0	0	0	0
Feeling like you can't move ¹²	0	0	0	0	0
Feeling like it is hard to breath or having trouble breathing ¹³	0	0	0	0	0
Chills or hot flushes (suddenly feeling very hot or cold) ¹⁴	0	0	0	0	0
Feeling weak in parts of your body (like it is hard to move some body parts) ¹⁵	0	0	0	0	0
Feeling unreal or separate from yourself ¹⁶	0	0	0	0	0
A lump in your throat ¹⁷	0	0	0	0	0
Heavy feeling in your arms or legs ¹⁸	0	0	0	0	0

14. How sure are you that your doctor is right about what caused your health problem?

0 1 2 3 4 5 6 7 8 9 10

Not sure at all

Pretty sure

Very sure

15. What do YOU think caused your health problem? *(Please tell us in your own words)*

16. Do you think that there is anything wrong with your heart?

Yes¹

No²

If “Yes,” how bad do you think the heart problem is?

0 1 2 3 4 5 6 7 8 9 10

Not bad at all

Sort of bad

Really bad

17. Please rate the following other feelings that you may have when your chest feel uncomfortable

a. Heart beats faster

0 1 2 3

Not at all

Very much, could not have been worse

b. Racing heart

0 1 2 3

Not at all

Very much, could not have been worse

e. Chest pain

0 1 2 3

Not at all

Very much, could not have been worse

f. Chest tightness

0 1 2 3

Not at all

Very much, could not have been worse

e. Pain down one or both arms

0 1 2 3

Not at all

Very much, could not have been worse