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Quality of Life in Patients with Non-Cardiac Chest Pain: The Impact of Psychiatric Disorder Severity, Fear of Pain, and Pain Catastrophizing

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Quality of Life in Patients with Non-Cardiac Chest Pain: The Impact of Psychiatric Disorder Severity, Fear of Pain, and Pain Catastrophizing

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Abstract

Patients who present in medical settings with persistent chest pain in the absence of identifiable cardiac cause (Fleet & Beitman, 1997) may be diagnosed with non-cardiac chest pain (NCCP). NCCP is a common, costly condition that may result in impaired quality of life (e.g., Eslick et al. 2003; Wong et al., 2002). Theories of NCCP (Mayou, 1998; White & Raffa, 2004) suggest that patients who react to NCCP with fear and thoughts of catastrophic consequences may avoid activities that elicit cardiac sensations. The daily behavioral impact of avoiding cardiorespiratory cues may limit quality of life due to activity avoidance. The current study aimed to examine the psychological mechanisms, fear of pain and pain catastrophizing, in patients with NCCP to investigate whether these factors relate to lower quality of life even after controlling for psychiatric disorder severity. Patients with NCCP were recruited from cardiology clinics (*N* = 29). Findings indicate both fear of pain and pain catastrophizing relate to quality of life. This is one of the first studies to investigate the impact of pain catastrophizing and fear of pain on quality of life in patients with NCCP. It is unclear, however, due to underpowered analyses, whether fear of pain and catastrophizing explain a significant amount of variance in quality of life, after accounting for psychiatric disorder severity. In sum, this research adds understanding to contributory factors to impairment in quality of life of patients with NCCP.

Keywords: non-cardiac chest pain, quality of life, fear of pain, catastrophizing

Quality of Life in Patients with Non-Cardiac Chest Pain: The Impact of Psychiatric Disorder Severity, Fear of Pain, and Pain Catastrophizing

In medical settings, assessing patient functioning can prove a useful addition to assessing symptoms, diagnosis, and prognosis. As such, the goal of medical care often extends beyond addressing mortality and morbidity to general aspects of functioning and well-being (Ware & Sherbourne, 1992). One way to assess patient functioning in medical settings is to assess the construct "quality of life", which covers multiple aspects of the patient's experience including physical and social functioning, bodily pain, and fatigue (Ware & Sherbourne, 1992). Quality of life is useful to measure because it indexes patient functioning across a wide range of domains. This may be a particularly important construct to measure in medically unexplained illnesses, such as non-cardiac chest pain (NCCP), where patients may be offered little beyond reassurance that there is not an identified organic cause to their pain, but they may continue to exhibit poor functional outcomes (Eslick & Talley, 2004; Wong, Lai, Lau, Hu, Chen, Wong, et al., 2002). Quality of life research is emerging in NCCP; however, the factors that contribute to impairment require further investigation.

Non-Cardiac Chest Pain

The majority of patients who present to medical settings with chest pain have normal coronary angiograms (Fleet & Beitman, 1997) and receive a NCCP diagnosis. NCCP is prevalent; community sample estimates place rates of NCCP at 23-33% of the general population (Eslick, Talley, Young, & Jones, 1999; Lampe et al., 1998; Locke, Talley, Fett, Zinsmeister, & Melton, 1997; Mitchell, Hazuda, Haffner, Patterson, & Stern, 1991), indicating that it is a widespread concern. NCCP is diagnosed in cardiology clinics via clinical interviews and diagnostic tests to rule out identifiable cardiac etiology (Bugiardini & Bairey Merz, 2005). Chest pain is categorized by clinical interview as "typical" (pain experienced under the chest bone, often described as a heavy or squeezing sensation, radiation to the arm or jaw, exacerbated by stress, and is relieved with rest or nitroglycerin), "atypical" (meets two of the characteristics of typical chest pain), or non-cardiac chest pain (meets zero or one symptom of typical chest pain; Fraker et al., 2009). A diagnosis of NCCP does not necessarily result from a medical label of "non-cardiac chest pain." The initial chest pain categorization from the interview and an assessment of risk factors determines which medical assessments are conducted ranging from exercise tolerance testing (i.e., exercise stress testing) to minimally invasive coronary angiography via cardiac catheterization. Coronary angiography is considered the gold standard means of assessing the presence of coronary artery disease and other cardiac etiologies (Noto et al., 1991). A cardiologist may choose a variety of diagnostic techniques to assess for coronary artery disease (CAD). If identifiable organic causes of chest pain are ruled out, than a diagnosis of NCCP may be given. In research, patients recruited from cardiology departments may undergo a variety of diagnostic procedures for CAD. Research studies on NCCP use different cardiac exclusion criteria to identify an NCCP sample. Studies that use cardiac catheterization as inclusion criteria to define the NCCP patient group have a greater degree of accuracy in ruling out obstructive cardiac disease.

While NCCP may be cardiovascularly benign in the short term, NCCP may bother some patients and affect their daily functioning. NCCP can "intrude into everyday life in a destructive manner" (Jerlock, Gaston-Johansson, & Danielson, 2005; p. 963), thereby influencing the quality of life of some patients with NCCP. Further, some patients with NCCP are at increased risk for occupational disability, a further indicator of interference in daily functioning; some patients with NCCP report missed work as a result of NCCP (Eslick & Talley, 2004). While patients with NCCP may report impairment in daily functioning, not all patients report impairment and further research is needed to differentiate these groups. One potential differentiating variable is co-morbid psychiatric diagnoses. NCCP patients have co-morbid psychiatric diagnoses at higher rates than population base rates.

NCCP and Psychiatric Diagnoses

Research consistently shows elevated rates of psychiatric disorders in NCCP patients (Bass & Wade, 1984; Bass, Wade, Hand, & Jackson, 1983; Eifert, Hodson, Tracey, Seville, & Gunawardane, 1996; White et al., 2008). Estimates place rates of psychiatric disorders between 41-65% of treatment seeking samples (Bass et al., 1983, Eifert et al., 1996; White et al., 2008). In an early study, researchers conducted standardized psychiatric interviews with 46 treatment-seeking patients with a chief complaint of chest pain and normal (n = 31) or near normal (n = 15) coronary arteries. The authors found that 61% of the sample met criteria for a psychiatric diagnosis (Bass et al., 1983). Eifert et al. (1996) had similar findings when they assessed 20 NCCP patients for psychiatric diagnoses with a structured diagnostic clinical interview. Eifert et al. found that 65% of the NCCP sample met criteria for psychiatric disorders, the most common of which was panic disorder. In another study examining psychiatric morbidity in patients with NCCP, the researchers specifically assessed for panic disorder in 94 patients who presented with chest pain and had angiographically normal coronary arteries. They found that 34% of their sample met diagnostic criteria for panic disorder (Beitman et al., 1989).

A recent study using a structured clinical diagnostic interview and a large sample reported that 44% had current Axis I disorders and 75% had clinical or sub-clinical Axis I disorders (White et al., 2008). White et al. (2008) assessed for psychiatric morbidity with the Anxiety Disorders Interview Schedule for the Diagnostic and Statistical Manual-4th Edition Lifetime Version (ADIS-IV-L; Di Nardo, Brown, & Barlow, 1994) and used a sample of 229 patients with NCCP. Of those with a clinical disorder, the most common were anxiety disorders, occurring in 41% of the sample. Of the anxiety disorders, the most common were social phobia (16%), specific phobia (14%), generalized anxiety disorder (13%), and panic disorder (12%). In sum, there have been relatively consistent findings of higher than base-rate prevalence of Axis I disorders in patients with NCCP. The high prevalence of psychiatric disorders in patients with NCCP may contribute to explanations of why a condition that is thought to be physiologically benign may result in functional impairment. This has contributed to the evolution of theories of the development and maintenance of NCCP.

Models of NCCP

Due in part to a lack of adequate medical explanation for NCCP, biopsychosocial models of NCCP have developed. Due in part to the high rates of co-morbid psychiatric disorders, leading theoretical models derive largely from theories of anxiety and panic (Barlow, 2002; Mayou, 1998; White & Raffa, 2004). These theories assert that the misappraisal of benign physiological sensations as harmful, or as evidence of illness, contributes to the cause and maintenance of NCCP (Mayou, 1998). Models of NCCP highlight the importance of physiological (e.g., mitral valve prolapse) and psychological vulnerabilities to developing NCCP (White & Raffa, 2004). Psychological vulnerabilities include increased anxiety sensitivity and cognitively mediated processes such as misinterpretation of benign physical sensations, hypervigilance to cardiac sensations, fear of heart attack, pain and death, sensitivity to pain, and heart focused worry (White & Raffa, 2004). There is growing empirical evidence to support the role of cognitive misappraisal of benign cardiopulmonary sensations in patients with NCCP (Aikens, Zvolensky, & Eifert, 2001; Bradley, Scarinci, & Richter, 1991). For example, NCCP patients differentially fear cardiopulmonary sensations compared to gastrointestinal sensations, numbness, and dissociation (Aikens, et al., 2001). Further, cardiopulmonary fear is associated with cardiac distress symptoms (as measured by heart rate increase, racing heart, chest pain, chest discomfort, chest tightness, and pain down one or more arms; Aikens, et al., 2001). Finally, NCCP patients are more likely to report catastrophic thoughts in response to pain compared to patients with gastrointestinal disorders and healthy controls (Bradley, et al., 1991) and reducing catastrophic thoughts is associated with reduced chest pain in patients with NCCP (Van Peski-oosterbaan, Spinoven, Van der Does, Bruschke, & Rooijmans, 1999). These findings indicate that cognitive misappraisals (including catastrophizing) in patients with NCCP may contribute to symptoms of NCCP.

Models of NCCP posit that cognitive misappraisals lead to behavioral responses, such as cardio-protective behaviors, interoceptive avoidance (exercise), healthcare utilization, and situational avoidance (e.g. work leisure; White & Raffa, 2004). Data indicate that fear of physical sensations is related to cardio-protective beliefs (beliefs that engaging in cardiac-symptom inducing activities may cause cardiac damage; Aikens, Michael, Levin, & Lowery, 1999). Further, findings indicate that heart-focused anxious patients with NCCP avoid activities that induce cardiac symptoms more than surgical patients and control participants (Eifert et al., 1996). This finding provides support for the premise that NCCP patients engage in cardio-protective behaviors. Additionally, preliminary data indicate that patients with NCCP who report increased interoceptive sensitivity produce lower output on cardiac stress tests (Stein, White, Berman, Covino, & Gervino, 2011). Finally, chest pain and anxiety in NCCP patients correlate to physical and psychosocial disability; however, the cognitive process of catastrophizing mediates this relation (Shelby, Somers, Keefe, Silva, McKee, She, et al., 2009). Taken together, these findings indicate that patients with NCCP are uniquely vigilant to cardiorespiratory cues and react to these sensations with fear and worry. The fear of cardiac sensations may lead patients to avoid activities that elicit cardiopulmonary sensations. This type of activity avoidance may impair quality of life in patients with NCCP.

The impact of these cognitive processes have not been investigated in relation to quality of life in patients with NCCP. Within the above outlined model, patients with NCCP who react to chest pain with fear and thoughts of catastrophic consequences may engage in behavioral responses that restrict the scope of the activities they engage in. This could result in impaired quality of life. The current study will examine the impact of these cognitive processes on quality of life.

Quality of Life in Patients with NCCP

This section reviews the extant NCCP quality of life literature, discusses methodological limitations, and suggests directions for future research. This literature includes studies with comparison groups (including patients without chest pain and patients with cardiac disease) and studies with longitudinal outcomes. Additionally, the limited research that has investigated factors (such as psychiatric diagnosis) that may account for impairment in quality of life will also be discussed. Each study reviewed used the Medical Outcomes Survey (MOS) Short-Form-36 (SF-36; Ware & Sherbourne, 1992), a self-report questionnaire that aims to measure health-related quality of life. This measure assesses for the domains of physical health functioning (including the sub-domains of physical functioning, physical role functioning, bodily pain, and general health perceptions) and mental health functioning (including the sub-domains of vitality, social functioning, emotional role functioning, and mental health).

Patients with NCCP compared to controls. Two studies have compared quality of life in patients with NCCP to participants without chest pain: One study was community-based and one was hospital-based. In the community study, the researchers categorized respondents into no chest pain, non-severe chest pain, and severe chest pain conditions. The authors differentiated the non-severe and severe categories of chest pain based on single-episode versus recurrent chest pain, and length of chest pain (non-severe < 15 minutes; Eslick et al., 2003). The authors found that the severe NCCP group reported greater impairment across all domains of quality of life compared to the no chest pain group. The non-severe NCCP group reported significantly more impairment than the no pain group on all domains except physical functioning and physical role functioning (Eslick et al., 2003). These findings indicate that patients with NCCP who have recurrent chest pain with longer episode duration experience greater impairment in quality of life than those with a single short episode, but that both groups experience more impairment than controls.

In the hospital-based study, NCCP patients reported significantly more impairment than a control sample in the domains of physical functioning, physical role functioning, and general health perceptions (Wong et al, 2002). In both the hospital- and community-based studies, patients with NCCP reported great variance in multiple sub-domains of quality of life. This suggests within group variance in patients with NCCP. Taken together, the findings from these two studies indicate that individuals with NCCP report greater impairment in quality of life compared to healthy controls.

Comparing these two studies, the hospital-based study found that individuals with NCCP were impaired in fewer domains of quality of life than in the community-based study. Methodological inconsistencies between the studies may account for these differences. First, sample size differences may contribute to the different findings; the hospital-based study had a considerably smaller sample and neither study reported effect sizes, which are more robust to the influence of differing sample sizes. Additionally, diagnostic procedures differed between the studies. In the community study, researchers classified participants as having NCCP through self-reported medical history and with the Rose Angina Questionnaire (Rose, 1965). Without a clinician-administered diagnostic evaluation, the researchers could have missed organic cardiac disease in some participants. The hospital based study determined NCCP group status by cardiac catheterization on all patients, which can lead to greater confidence that patients do not have CAD. Finally, only 23% of those classified with NCCP in the community study consulted a physician about chest pain in the previous year. This indicates that over threequarters of the sample were non-treatment seeking, differentiating them from the treatment-seeking sample used in the hospital-based study. Finally, in the community study, it is unclear how the researchers decided to divide their "severe" and "non-severe" categories; they could have used multiple pain and impairment characteristics. Despite the differences between the studies and the strengths and weaknesses of each, they both provide evidence that some individuals with NCCP experience impaired quality of life. These data provide support to the premise that NCCP may contribute to impaired functioning in some patients. To investigate further impairment in quality of life in NCCP, studies have compared patients with NCCP to other patient groups.

Patients with NCCP compared to patients with CAD. A comparison group of CAD patients can indicate whether patients with NCCP are as impaired as patients with identified organic disease. Two studies have compared quality of life in patients with NCCP to patients with CAD. Eslick and Talley (2004) found that patients with NCCP significantly differed from patients with CAD on the mental health subscale of the SF-36; the NCCP group reported significantly more impairment (Eslick, 2007). Scores were comparable between patients with NCCP and patients with CAD on all other subscales. This finding indicates that despite being diagnosed with a cardiovascularly benign condition, patients with NCCP are as or more impaired than patients with cardiac disease. Because NCCP patients show reduced mental health functioning, research needs to identify psychological factors that contribute to this impairment. However, patients with NCCP may not universally experience impairment; data indicate considerable within-group variance. The standard deviations of the quality of life subscales from both the

NCCP and CAD patient groups were considerable, ranging from 21.61 - 42.80 on a 100-point scale (Eslick, 2007), indicating within-group variance.

Further research has compared quality of life between patients with NCCP, patients with CAD, and two other patient groups in one analysis (Biggs, Aziz, Tomenson, & Creed, 2004). Findings indicate that there were no significant differences between groups on mental health functioning. The authors found significant differences between the four groups on physical health functioning but did not report post-hoc analyses. As such, it is unclear whether patients with NCCP and patients with CAD were significantly different from one another. However, the mean physical health functioning score for the NCCP group was only 3.1 points higher (on a 100-point scale) than for the CAD group compared to a nine-point difference between the CAD group and one other patient group. This suggests that the differences may not have been between patients with NCCP and patients with CAD. The authors did not report sub-score means on quality of life. The findings from this study provide further support to the premise that some patients with NCCP experience comparable impairment to patients with cardiac disease, again indicating the need to identify factors that contribute to impairment in patients with NCCP.

The findings from the above two studies are not directly comparable because they reported different scales of the SF-36; Eslick (2007; from the Eslick and Talley 2003 study) reported all of the subscales of the SF-36, while Biggs et al. (2004) reported physical and mental health functioning which are calculated by combining the other sub-scale scores of the Sf-36. Further, quality of life was not the primary focus of either study and, as such, the studies did not offer explicit hypotheses about quality of life in NCCP versus CAD and did not discuss the data comparing patients with NCCP and patients with CAD. Further, methodological limitations exist in these studies. It is unclear from Eslick and Talley's (2003) report whether all participants underwent physical examinations or whether researchers diagnosed some participants with the Rose Angina Questionnaire (Rose, 1962). In comparison, Biggs et al. used various clinical tests to diagnose NCCP as deemed medically appropriate. Consistent diagnostic methodology may improve future research by increasing the likelihood of higher accuracy of differentiating between NCCP and CAD patient samples.

Taken together, the findings from these two studies indicate that some patients with NCCP report comparable levels of impairment to patients with CAD: Some patients with NCCP report impaired quality of life despite the absence of cardiac pathology. In sum, the studies that utilized comparison groups (CAD and non-chest pain controls) indicate that some patients with NCCP are impaired but that patients with NCCP have diverse experiences of quality of life. Further studies have investigated the longitudinal course of quality of life in patients with NCCP to determine whether impairment in quality of life diminishes or increases over time.

Longitudinal studies. In one hospital based study, 41% of patients with NCCP reported increased bodily pain (on the SF-36 subscale) at six-month follow-up (Biggs et al., 2004). This suggests that for nearly half of patients with NCCP bodily pain may increase over time. The authors do not report six-month follow-up data from the other quality of life subscales. In another study, patients with NCCP reported significant improvement on physical role functioning, pain, social functioning, vitality, and emotional role functioning at two-year follow-up (Eslick & Talley, 2008). This study also included four-year follow-up and found no significant changes on any subscales; however, the majority of subscales decreased suggesting a decrease in quality of life. The four-year follow-up data consisted of less than half (47%) of the original sample limiting the generalizability of the four-year follow-up findings. At all three time points in this study, there are relatively large standard deviations (ranging from 15.53 – 41.93 on a 100-point scale) indicating within group variance of quality of life over time.

The authors posit that after two years NCCP patients adapt to their condition and their quality of life improves during this time; however, while some sub-scores improved statistically over the follow-up period it is unclear whether this translated into clinical differences. Physical functioning for example, remained relatively low across time points (M = 64.24-68.48). Compared to previous research, this data on physical functioning falls between that reported in a healthy control group (M = 89) and a chronic pain sample (M = 50; Fredheim, Borchgrevink, Saltnes, & Kaasa, 2007). This indicates that even if patients with NCCP have some improvement, they may continue to experience impairment in physical functioning.

Overall, the data from this study indicate that there may be a general trend of improvement in quality of life in patients with NCCP, but that in some domains this improvement may not reach levels comparable to healthy individuals. Taken together with the data using comparison groups, findings indicate that some patients with NCCP report ongoing impairment in quality of life while other patients with NCCP report less impairment in quality of life. Further studies have investigated factors that may differentiate between patients with NCCP who are reporting impairment in quality of life and those who are not.

Distress, psychiatric comorbidity, and quality of life. One factor that differentiates those who are reporting impaired quality of life is distress; distress is associated with lower quality of life in patients with NCCP (Biggs et al., 2004). Further research has investigated the impact of distress on quality of life by investigating the impact of psychiatric disorders in patients with NCCP. One study found that those with panic disorder reported significantly more impairment than those without panic disorder across all domains of quality of life (Dammen et al., 2008).

A later study found that NCCP patients with Axis I psychiatric comorbidity reported significantly greater impairment in physical functioning, role limitations due to physical problems, vitality, social functioning, role limitations due to emotional problems, and mental health compared to patients with gastroesophageal reflux disease and no psychiatric disorders (Husser, Bollmann, Kuhne, Molling, & Klein, 2006). This study, however, had a number of limitations. Exclusion and inclusion criteria were poorly defined; multiple participants were excluded from this study for various reasons that were not well laid out in the paper. Additionally, it is unclear from the report of the methods whether psychiatric diagnoses were made with valid and reliable instruments. Despite these limitations, these findings provide preliminary evidence that quality of life relates to psychiatric diagnoses in patients with NCCP.

Building on this, further research has included validated clinical psychiatric diagnostic instruments and compared patients with NCCP and a psychiatric diagnosis (i.e., Axis I anxiety, mood, and somatoform disorders) to those with NCCP without a psychiatric diagnosis (Jakle et al., 2009). The authors found that patients with a psychiatric diagnosis reported significantly lower quality of life across all indices. These findings indicate that psychiatric factors influence quality of life in patients with NCCP. Psychiatric diagnoses may differentiate between patients with NCCP who are reporting impaired quality of life and those who are not; however, it is unclear whether they fully account for impairment in patients with NCCP. It is possible that other psychological processes involved in the development and maintenance of NCCP influence quality of life beyond the impact of psychiatric severity.

Summary and future directions. Quality of life is more impaired in patients with NCCP than in healthy controls in both community and hospital samples (Eslick et al., 2003; Wong et al., 2002), and comparably impaired as patients with CAD across most domains (Biggs et al., 2004; Eslick, 2007). However, data indicate that patients with NCCP report a range of experiences: Some patients with NCCP report greater impairment in quality of life than others. Further, longitudinal data indicate that patients with NCCP may experience some improvement in quality of life at two-year follow-up, but that some domains of quality of life (such as physical functioning) remain relatively impaired (Eslick & Talley, 2008). Additionally, findings indicate that psychiatric status may be an important differentiating variable to identify those with lower levels of quality of life. Nearly half of patients with NCCP meet criteria for a psychiatric diagnosis (White et al., 2008) and those with psychiatric diagnoses are significantly more impaired across domains than those without psychiatric diagnoses (Dammen et al., 2008; Husser et al., 2006; Jakle et al., 2009). It is unclear, however, whether psychiatric status fully accounts for impaired quality of life in patients with NCCP. Psychological processes involved in the development and maintenance of NCCP may independently influence quality of life.

The current literature on quality of life in patients with NCCP is limited in that there are few studies. Replications and extensions are needed. Further, in many studies quality of life was not a primary outcome. As such, investigators do not always report findings on quality of life in NCCP. In addition, few studies that included psychiatric diagnoses have used empirically validated clinical diagnostic interviews. Validated psychiatric interviews and investigation of factors that contribute to impairment in quality of life beyond the impact of psychiatric diagnoses, would improve research in this area. The current research will build on previous research by exploring whether psychological factors involved in models of NCCP development and maintenance contribute to quality of life in patients with NCCP.

Current Study

The primary aim of this study is to examine whether psychological processes contribute to impaired quality of life in patients with NCCP. Specifically, pain catastrophizing and fear of pain will be examined based on models of NCCP that emphasize the importance of the cognitively mediated process of misinterpreting and worrying about benign physical sensations leading to avoidance behaviors (Mayou, 1998; White & Raffa, 2004) that may impact quality of life. Reacting to NCCP with fear and thoughts of catastrophic consequences may lead patients with NCCP to avoid activities that elicit cardiac sensations, and limit the quality of their lives. This study aims to identify whether psychological processes involved in NCCP development and maintenance impact quality of life in patients with NCCP beyond that accounted for by psychiatric disorder severity. The hypotheses are:

1. Among patients with NCCP, it was hypothesized that pain-related fear [as measured by the "fearful thinking of pain" subscale of the Pain Anxiety Symptoms Scale (PASS; McCracken, Zayfert, & Gross, 1992)] would significantly correlate with physical health-related quality of life (as measured by the SF-36 physical health functioning composite). It was expected that higher pain-related fear would correlate with lower quality of life.

2. Among patients with NCCP, it was hypothesized that pain-related fear (as measured by the "fearful thinking of pain" subscale of the PASS) would significantly correlate with mental health-related quality of life (as measured by the SF-36 mental health functioning composite). It was expected that higher pain-related fear would correlate with lower quality of life.

3. Among patients with NCCP, it was hypothesized that catastrophizing [as measured by the Pain Catastrophizing Scale (PCS; Sullivan, Bishop, & Pivik, 1995)] would significantly correlate with physical health-related quality of life (as measured by the SF-36 physical health functioning composite). It was expected that catastrophizing would be negatively correlated with quality of life.

4. Among patients with NCCP, it was hypothesized that catastrophizing (as measured by the PCS) would be significantly correlated with mental health-related quality of life (as measured by the SF-36 mental health functioning composite). It was expected that catastrophizing would be negatively correlated with quality of life.

5. Among patients with NCCP, it was hypothesized that pain-related fear (as measured by the "fearful thinking of pain" subscale of the PASS) and catastrophizing (as measured by the PCS) would be associated with physical health-related quality of life (as measured by the SF-36 physical health functioning composite). It was predicted that pain-related fear and catastrophizing would be negatively associated with physical health-related quality of life. It was anticipated that this relation would remain significant after accounting for the impact of current level of principal psychiatric disorder severity (as measured by the principal diagnosis clinical severity rating scale of the ADIS-IV-L).

6. Among patients with NCCP, it was hypothesized that pain-related fear (as measured by the "fearful thinking of pain" subscale of the PASS) and catastrophizing (as measured by the PCS) would be associated with mental health-related quality of life (as measured by the SF-36 mental health functioning composite). It was predicted that pain-related fear and catastrophizing would be negatively associated with mental health-related quality of life. It was anticipated that this relation would remain significant after accounting for the impact of current level of principal psychiatric disorder severity (as measured by the principal diagnosis clinical severity rating scale of the ADIS-IV-L).

Method

Design

This study was a cross-sectional design that used multiple modes of assessment including questionnaires and clinical diagnostic interviews.

Participants

Inclusion criteria. All participants met the following criteria to be eligible for study participation: a) clinical presentation with a chief complaint of chest pain, b) completion of a thorough medical workup (e.g., general physical exam) and cardiac catheterization, with angiographic evidence of normal or non-obstructive coronary arteries (i.e., < 30% luminal diameter narrowing), and c) all participants were 21 years of age or older.

Exclusion criteria. Patients were excluded if they met any of the following criteria: a) uncontrolled heart disease b) medically contraindicated participation as determined by treating physician, b) current severe psychiatric illness including drug or alcohol abuse, or active suicidal or homicidal ideation, c) any other uncontrolled significant medical illness, d) unable to communicate in English, and/or d) score of < 20 on the Cognitive Capacity Screening Examination (CCSE). Patients were not routinely assessed for cognitive impairment. However, if the patient's medical record suggested possible dementia patients were administered a brief cognitive screen.

Participant sample. The total sample was *N* = 29. Ages ranged from 37 – 80 years (*M* = 55.45, *SD* = 8.30). The sample was 62.1% female (18 out of 29 participants were female). The sample was 69% Caucasian, 27.6% African American, and 3.4% Hispanic or Latino. Over half of the sample reported full-time employment (55.2%; see Table 1). Seventy-six percent of the sample reported at least a high school education (for a full distribution of levels of education, see Table 1). Over half of the sample was married (58.6%; see Table 1) and the majority of the sample endorsed a religious affiliation (79%; see Table 1).

Table 1.

Participant Demographics

Demographic Variable	Frequency (*N* = 29)	Percentage
Employment		
Full – Time	16	55.2
Part – Time	2	6.9
Unemployed	2	6.9
Disability	5	17.2
Retired	4	13.8
Marital Status		
Never Married	1	3.4
Married	17	58.6
Divorced	6	20.7
Widowed	2	6.9
Separated	2	6.9
Cohabiting	1	3.4
Level of Education		
Less than High School	7	24.1
12th Grade or GED	6	20.7
Some College	6	20.7
Vocational/Trade School	4	13.8
Associates Degree	1	3.4
Bachelor Degree	3	10.3
Post Graduate Degree	2	6.9
Religious Affiliation		
Catholic	3	10.3
Non- Catholic Christian	19	65.5
Other	1	3.4
No Affiliation	5	17.2
Atheist	1	3.4

Measures

Demographic information. Participants provided demographic information including gender, age, ethnicity, level of education, marital status, employment status, and religion. They also provided information that characterized their chest pain, such as frequency, intensity, and duration.

Quality of life. Quality of life was assessed with the Medical Outcomes Survey (MOS) Short-Form-36 (SF-36; Ware & Sherbourne, 1992), a 36 item self-report measure. The SF-36 measures physical health functioning (including physical functioning, physical role functioning, bodily pain, and general health perceptions sub-domains) and mental health functioning (including vitality, social functioning, emotional role functioning, and mental health sub-domains). Data from a population of angina patients indicate that the test-retest reliability of the subscales range from .65 - .94 (Marquis, Fayol, Joire, & Leplege, 1995). The SF-36 displayed good internal consistency in a sample of patients with CAD (α = .72 - .94; Failde & Ramos, 2000). This instrument is the most widely used measure of quality of life globally and has displayed good validity (Hays & Morales, 2001).

Pain catastrophizing. Catastrophizing was measured with the Pain Catastrophizing Scale (PCS; Sullivan et al., 1995). The PCS is a 13 item self-report measure of pain catastrophizing with a total score and three subscale scores: Rumination, Magnification, and Helplessness. This measure displayed good internal consistency (α = .87; Sullivan et al., 1995). Validity studies provide good evidence for this measure. For example, in one study, among participants who had undergone a cold presser task, catastrophizers compared to non-catastrophizers (measured by the PCS) reported significantly greater emotional distress, pain-related thoughts, and pain intensity (Sullivan et al., 1995). This measure also demonstrated good test-retest reliability at six weeks (r = .75; Sullivan et al., 1995).

Fear of pain. The Pain Anxiety Symptoms Scale (PASS) was designed to asses fear of pain (McCracken, et al., 1992). This is a 40 item self-report measure with four subscales: Avoidance and escape responses to pain, cognitive anxiety symptoms related to the experience of pain, fearful thinking of pain, and physiological anxiety symptoms related to pain. The overall score presents a measure of pain-related fear and anxiety. This measure demonstrates good internal consistency for both the total score (α = .94) and sub-scale scores (α = .75 - .89; Osman, Barrios, Osman, Schneekloth, & Troutman, 1994) . The internal consistency for the "fearful thinking of pain" subscale is α = .89 (Osman et al., 1994). This scale has also demonstrated good reliability. The validity of this measure was demonstrated through significant correlations with measures of anxiety and disability, and regression analyses indicated that it accounted for a significant amount of variance in disability when emotional distress and pain were controlled for (McCracken et al., 1992).

Psychiatric morbidity. Participants were assessed for psychiatric morbidity using the ADIS-IV-L (Di Nardo et al., 1994). This instrument is a semi-structured interview that can comprehensively assess for the Diagnostic and Statistical Manual-4th edition (DSM-IV; American Psychiatric Association, 1994) anxiety, mood, somatoform, and substance use disorders. The clinical interviewer indicates a clinical severity rating that ranges from "0" (no interference or distress) to "8" (extreme interference or distress). Clinical severity ratings ≥ 4 indicate that the disorder is clinically significant and clinical severity ratings < 4 indicate subclinical disorders. The principal diagnosis is the one with the highest clinical severity rating. The ADIS-IV-L has very good to excellent inter-rater reliability for current disorders (range of κs = .67 - .86; Brown, Campbell, Lehman, Grisham, & Mancill, 2001).

Procedures

Ethical approval was obtained from the University of Missouri – St. Louis, University of Missouri – Columbia, and the Washington University School of Medicine ethics committees. Participants were recruited from the cardiology clinic of the Barnes - Jewish Hospital/Washington University in St. Louis – School of Medicine, the cardiology clinic of the Heart Care Institute (Washington University, St. Louis West County), and the Cardiac Catheterization Lab in the Division of Cardiovascular Medicine at the University of Missouri - Columbia. All participants in this study were from the cardiology clinic of the Barnes - Jewish Hospital/Washington University in St. Louis – School of Medicine. For patients identified as having NCCP by the cardiology staff and who were willing to participate, a staff member at Cardiology obtained written consent to be contacted about possible study participation. The graduate student researcher then telephoned patients who provided consent to be contacted. At this phone contact, the researcher explained the study, patients were fully informed of the nature of the study and their possible participation, the researcher answered any questions, and obtained verbal informed consent from participants. Participants were informed that they would receive $25 for their participation. Participants were also informed that research study data with identifying information would be stored in secure, locked files, research study data would be identified only by subject codes, and identities of participants would not be revealed in the presentation or publication of any result from this project. The researcher also ensured that the subject met all inclusion/exclusion criteria for the study and then sent eligible participants a questionnaire battery and written informed consent for the participant to complete and return using an included self-addressed stamped envelope. Completion time for the questionnaire battery was estimated at 30 - 45 minutes. The researcher also scheduled interview times with eligible and willing participants. These lasted approximately 1.5 - 2 hours, consisted of an ADIS-IV-L assessment interview; and took place over the telephone. Participants could choose to participate in the questionnaire only, interview only, or both the questionnaire and the interview.

Data handling. Raw data with identifying information was kept in a filing cabinet in a secured (locked) room. Each participant was assigned an identification number. Data was entered into SPSS using the client identification number. The database was saved on a password-protected computer in a secured room.

Results

Power Analyses

Power analyses were conducted using Cohen's (1992) guidelines to achieve power = .80 and with alpha set at $p < .05$. To test hypotheses 1 - 4, in order to run correlation analyses expecting a large effect size, 28 participants were needed. For hypotheses 5 and 6, in order to detect large effect sizes for regression analyses with three independent variables, 34 participants were needed.

Attrition

Eighty-seven potential participants agreed to be contacted regarding participation. Out of the 87 total, 22 were excluded, 10 declined to participate, and a further 10 could not be contacted. Out of the 45 who initially verbally agreed to participate, 16 dropped out prior to providing written informed consent. The remaining 29 participated in the study (N = 29). Out of the 29 participants, 20 completed both the questionnaire and the

ADIS-IV-L interview (Brown et al., 2001), 8 completed the interview only, and 1 completed the questionnaire only. This sample size allowed for detection of large to very large effect sizes for hypotheses 1 – 4. Analyses for hypotheses 5 – 6 were underpowered to detect even large effect sizes.

Attrition analyses indicated that participants, who completed both the questionnaire and interview portions of the study, did not differ significantly from those who completed only one of these two pieces of data on the following demographic variables: Age, level of education, marital status, ethnicity, employment status, or religion. However, the two groups differed significantly on gender. Those who completed both the interview and questionnaire were significantly more likely to be male ($p < .05$); Out of those who completed both, the sample was 50% female, while out of those who completed only one of the two pieces of data, the sample was 88.9% female.

Missing Data

Individual questionnaire data was included if it was at least 85% complete. On measures that were less than 100% complete but still met the inclusion requirements, mean replacements were used for missing items. One Pain Catastrophizing Scale was incomplete (< 85% complete), one entire Quality of Life measure was incomplete (< 85% complete), and an additional two mental health functioning subscales were incomplete (< 85% complete), and as such, were excluded from analyses.

Descriptive Analyses

Chest pain characteristics. Out of the 21 participants who provided this data, 57.2% reported experiencing chest pain on at least a weekly basis (4.8% reported chest pain several times per day) and 42.8% reported chest pain episodes monthly or less. One third of the sample (33.3%) reported that their chest pain usually lasts 5 – 20 minutes, with 38.1% reporting shorter duration and 28.5% reporting longer duration. Fifty percent of the sample reported having had chest pain for at least the previous six months and 71% rated their chest pain as moderate intensity or greater (*M* = 5.62, *SD* = 2.35, on a 0 - 10 scale, with *0* = not at all intense, *5* = moderately intense, and *10* = extremely intense). Compared to a previous sample of NCCP patients (White, Craft, & Gervino, 2010), the current sample of non-CAD patients reported a higher percentage of greater frequency and intensity of pain and shorter total duration (in months) of chest pain.

Quality of life. The quality of life questionnaire measures the domains of physical health and mental health functioning (Ware & Sherbourne, 1992). Physical health functioning displayed good reliability (α = .93). Scores on this 100-point measure ranged from 20 – 96.25 (with a score of 100 indicating higher levels of functioning). The variable had a *M* = 49.94, *SD* = 23.75. Mental health functioning also displayed good reliability (α = .91). This variable had a *M* = 59.60, *SD* = 25.11 (range = 17.13 – 89.50). Distribution for both variables (physical and mental health functioning) indicated that there were not significant differences between the distribution of these variables from a normal symmetrical distribution (skewness = .56 and -.54 respectively). To give some context for the physical health functioning (*M* = 49.94) and mental health functioning (*M* = 59.60) means, norm data from a non-patient sample, indicated means between 60 – 89 across subscales on this measure, with seven of the eight subscale means above 75 (Fredheim et al., 2007). Further, data from a sample of patients with chronic pain was available for five of the eight subscales on the SF-36 (physical functioning, mental health, social functioning, vitality, and bodily pain) and indicated means ranging from 22

– 58, with three of the reported five subscales below 45 and two in the 20s (Fredheim et al., 2007). This indicates that the sample from the current study reported relatively more impairment in quality of life (physical health functioning and mental health functioning) compared to a non-patient sample and relatively less compared to a sample of chronic pain patients.

Pain catastrophizing scale. This measure displayed good reliability in the current sample (α = .97). Scores on this measure ranged from 0 – 47 (with higher scores indicating higher levels of pain catastrophizing), *M* = 17.65, *SD* = 14.92. Previous studies have classified "catastrophizers" as those who score above 24 on this measure and "non-catastrophizers" as those who score below 15 on this measure (Sullivan et al., 1995). While this variable was not used as dichotomous in the current research, in order to give a sense of distribution of this variable in this sample, according to the above criteria, 50% of the current sample would qualify as "non-catastrophizers" and 35% would qualify as "catastrophizers". Data from the current sample showed a lower percentage of "catastrophizers" compared to a non-patient college student population, which indicated 38% "catastrophizers" and 38% "non-catastrophizers" (Sullivan et al., 1995). Further, data from the current sample indicated lower levels of pain catastrophizing than a sample of chronic pain patients with fibromyalgia syndrome (*M* = 20.26; Karsdorp & Vlaeyen, 2009). Distribution statistics indicated that there was not a significant difference between the distribution of this variable in the current sample from a normal symmetrical distribution (skewness = .42).

Fear of pain. Reliability analyses from the current sample indicated decent internal consistency on the measure of fear of pain (α = .85). A measure of skewness

(.30) indicated a relatively normal distribution of this variable. Scores for fear of pain ranged from 0 – 40, with a *M* = 18.48, *SD* = 10.54 (higher numbers indicate higher levels of fear of pain). Data from the current clinical sample reported more fear of pain than was reported in a previous sample of chronic pain patients (*M* = 16.5; Roelofs, McCracken, Peters, Crombez, van Breukelen, Vlaeyen, 2004) and more than was reported in a previous community sample (*M* = 11.60; Osman et al., 1994).

Psychiatric disorder severity. The measure of psychiatric disorder severity of principal Axis I diagnosis ranged from 0 – 7 in this sample (total range on this measure is 0 – 8; scores of 4 or more indicate clinical severity; Di Nardo et al., 1994). The mean reported on this measure was 4 (*SD* = 2.22). The skewness statistic indicates that there is not a significant difference between the distribution of this variable from a normal symmetrical distribution (skewness = -.82). For the current study, diagnostic confidence ratings ranged from 75% to 95% (*M* = 86%).

Table 2.

Means, Standard Deviations, and Ranges

	Mean	Standard Deviation	Range
Fear of Pain	18.48	10.54	0 – 40
Pain Catastrophizing	17.65	14.92	0 – 47
Psychiatric Severity	4.00	2.22	0 – 7
SF-36 (Mental)	59.60	25.11	17.13 – 89.50
SF-36 (Physical)	49.94	23.75	20.00 – 96.25

Psychiatric Diagnoses

In this sample, 71.4% of participants met diagnostic criteria for at least one current DSM-IV Axis I (American Psychiatric Association, 1994) psychiatric disorder. An equal number of participants met criteria for one diagnosis, two diagnoses, and three diagnoses (21.4% of the sample each respectively). A further 7.1% met criteria for four diagnoses. The most common diagnosis was Panic Disorder (32%), and nearly half (44%) of those with Panic Disorder met criteria for Agoraphobia (14% of the total sample). The next most common diagnoses were Generalized anxiety Disorder (25%), then Specific Phobia, Anxiety Disorder, NOS, and Major Depressive Disorder (18% each). The three most common principal diagnoses were anxiety disorder diagnoses: Panic Disorder (32%), Generalized Anxiety Disorder (14%), and Anxiety Disorder, NOS (14%).

Primary Analyses

Hypotheses 1 - 4. To test hypotheses 1 – 4, correlation analyses were conducted between the variables fear of pain and pain catastrophizing and the variables physical health functioning and mental health functioning (see Table 3). For hypothesis one, a medium correlation coefficient[1] was found for the relation between fear of pain and physical health functioning, but this relation did not reach statistical significance (r = -.41, p = .07). Hypothesis two was supported: There was a significant correlation between fear of pain and mental health functioning, with a large effect[1] (r = -.65, p < .01). For hypothesis three, a medium correlation coefficient[1] was found for the relation between pain catastrophizing and physical health functioning that was non-significance (r = -.42, p = .07). Hypothesis four was supported: A significant relation was found between pain

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[1] According to Cohen's (1992) criteria.

catastrophizing and mental health functioning with a large effect size[1] ($r = -.53$, $p < .05$). These findings indicate that fear of pain and pain catastrophizing have a stronger relation with mental health functioning than physical health functioning.

Table 3.

Summary of Intercorrelations

	1 (*n*)	2 (*n*)	3 (*n*)	4 (*n*)
1. PASS (Fear)	--	--	--	--
2. PCS	.84**(20)	--	--	--
3. Psych. Severity	.38 (20)	.21 (19)	--	--
4. SF-36 (Physical)	-.41 (20)	-.42 (19)	-.59**(19)	--
5. SF-36 (Mental)	-.65**(18)	-.53* (17)	-.75**(17)	.62**(18)

* $p < .05$
* *$p < .01$

Correlation between fear of pain and catastrophizing. Although the relation between fear of pain and catastrophizing was not hypothesized, it is notable that these two variables were highly intercorrelated ($r = .84$, $p < .001$).

Hypotheses 5 and 6. To test hypotheses 5 and 6, in order to assess the amount of variance in physical health and mental health functioning accounted for by fear of pain and catastrophizing, controlling for psychiatric disorder severity, two separate

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[1] According to Cohen's (1992) criteria.

hierarchical regression analyses were examined for the two dependent variables. The dependent variables were physical health functioning and mental health functioning respectively. In both analyses, psychiatric disorder clinical severity ratings were entered in the first block and fear of pain and catastrophizing were entered in the second block. Prior to the regression analyses, correlations were conducted to examine the relations between psychiatric disorder severity and physical health functioning (r = .-.59, $p < .01$) and psychiatric disorder severity and mental health functioning (r = -.75, $p < .01$; see Table 4).

Hypothesis five was not supported (see Table 4). Regression analyses indicated that a model including psychiatric disorder severity (in block one) and fear of pain and pain catastrophizing (in block two) accounted for a significant amount of variance in physical health functioning: F (3, 14) = 3.90, $p < .05$, Adjusted R^2 = .34. However, neither fear of pain (β = -.18, p = .64) nor pain catastrophizing (β = -.23, p = .52) contributed a significant amount of variance to the model, after controlling for psychiatric disorder severity.

Table 4.

Regression model: The impact of fear of pain and catastrophizing on physical health functioning, after accounting for psychiatric disorder severity

	Predictor	β	Adjusted R^2	F - value	*P*
Block 1					
	Psychiatric Severity	-.58	.29	7.92	.01
Block 2					
	Psychiatric Severity	-.41			.10
	Fear of Pain	-.18			.64
	Pain Catastrophizing	-.23			.52
	Total Model		.34	3.90	.03

n = 17

Hypothesis six was not supported (see Table 5). Regression analyses indicated that a model examining fear of pain and pain catastrophizing, controlling for psychiatric severity status, accounted for a significant amount of variance in mental health functioning: *F* (3, 12) = 6.00, *p* < .05. The model accounted for 50 % of the variance in mental health functioning (Adjusted R^2 = .50). However, neither fear of pain (β = -.23, *p* = .51) nor pain catastrophizing (β = -.08, *p* = .80) contributed a significant amount of variance to the model, after controlling for psychiatric disorder severity.

Table 5.

Regression model: The impact of fear of pain and catastrophizing on mental health functioning, after accounting for psychiatric disorder severity

	Predictor	B	Adjusted R^2	F- value	*p*
Block 1					
	Psychiatric Severity	-.73	.50	15.77	.001
Block 2					
	Psychiatric Severity	-.59			.02
	Fear of Pain	-.23			.51
	Pain Catastrophizing	-.08			.80
	Total Model		.50	6.00	.01

n = 15

Discussion

Overview

Previous research indicates variability in quality of life among patients with non-cardiac chest pain (e.g., Eslick et al., 2003; Wong et al, 2002). Few studies to date have examined factors that influence quality of life in this patient population (Biggs et al., 2004; Dammen et al., 2008; Jakle et al., 2009). Cognitive mis-appraisals of benign physiological sensations may impact NCCP (Mayou, 1998; White & Raffa, 2004); however, the direct impact of such cognitive misappraisals on current patient functioning, including quality of life, have not been examined. This is one of the first studies to examine the relation of the cognitive factors pain catastrophizing and fear of pain to quality of life in patients with NCCP.

Further, the current study investigated the impact of these factors on quality of life after controlling for psychiatric disorders, which have been shown to be prevalent in this population (Bass & Wade, 1984; Bass et al., 1983; Eifert et al. , 1996; White et al., 2008) and to impact quality of life (Dammen et al., 2008; Jakle et al., 2009). The following section discusses the current findings, followed by interpretations of the primary analyses. This section also includes limitations, directions for future research, and clinical implications.

Range of quality of life and psychiatric disorder prevalence. The current findings support previous findings of variability in quality of life among patients with NCCP (e.g., Eslick et al., 2003; Wong et al, 2002). In the current study, some patients with NCCP reported significant impairment, while others reported minimal impairment in quality of life. This study aimed to increase understanding of patients with NCCP who report impaired quality of life.

The current study also indicates some variability in psychiatric disorder status in this population. However, this sample displayed higher rates of current psychiatric disorders (71.4%) than reported in previous research (Bass & Wade, 1984; Bass et al., 1983; Eifert et al., 1996; White et al., 2008). The most prevalent psychiatric disorder found in the current study was Panic Disorder, occurring in 32% of the sample.

Interpretations of the Main Analyses

Some hypotheses were supported in this study. It is worth note that due to the small sample size, the analyses were only powered to detect large to extra large correlation coefficients. Results for the two dependent variables (the sub-domains of quality of life: Mental health functioning and physical health functioning) are discussed below in relation to fear of pain, pain catastrophizing, and psychiatric disorder severity.

Fear of pain and catastrophizing. Findings indicate that those who reported high levels of fear of pain were likely also to report high levels of pain catastrophizing. Conceptually, these two constructs are very similar; it makes sense that thoughts of fear and catastrophe related to pain would co-vary. Those who have catastrophic thoughts in relation to pain are likely to also experience fear of pain (and vice-versa). Further, many of the items on the fear subscale of the PASS are descriptions of cognitive reactions to pain (e.g., "When I feel pain I think that I may be seriously ill;" McCracken, et al., 1992), adding structural similarity as well as conceptual similarity to the measures of fear of pain and pain catastrophizing, further explaining the high correlation between these two measures.

Fear of pain and quality of life. As expected, findings indicated that those who reported higher fear of pain were more likely to report lower quality of life. This relation was stronger for mental health functioning, with the relation between fear of pain and physical health functioning non-significant. These findings provide broad support for the relation of fear of pain to quality of life in patients with NCCP. This finding is consistent with models of NCCP that emphasize the role of misinterpreting benign physiological sensations resulting in avoiding activities that elicit said sensations (Mayou, 1998; White & Raffa, 2004). The current findings suggest that patients with NCCP, who react to chest pain with fear, may avoid activities and report lower levels of quality of life. This finding is also consistent with fear/avoidance models of chronic musculoskeletal pain that assert that fear of pain can result in activity avoidance and poor behavioral performance (Vlaeyen & Linton, 2000).

The finding that fear of pain had a stronger relation to the sub-domain of mental health functioning compared to physical health functioning was an unexpected finding. The mental health functioning domain includes aspects of vitality, social functioning, emotional role functioning, and traditional aspects of mental health. This finding suggests that fear of pain may be associated with less engagement in areas such as social activities and role functioning reductions attributed to emotional causes, to a greater extent than physical activity avoidance. It is notable that while the relation between fear of pain and physical health functioning (including physical functioning, physical role functioning, bodily pain, and general health perceptions sub-domains) was non-significant, this relation displayed a medium to large correlation coefficient (according to Cohen, 1992 criteria). The relation between fear of pain and physical health functioning may reach significance with a larger sample size to detect medium to large effect sizes.

Pain catastrophizing and quality of life. As expected, findings indicated that those who reported increased pain catastrophizing reported lower quality of life. The pattern of findings was similar to those found for the relations between fear of pain and quality of life. This was unsurprising given that fear of pain and pain catastrophizing were highly correlated. This finding is consistent with models of NCCP (Mayou, 1998; White & Raffa, 2004) and supports the supposition that patients with NCCP who react to chest sensations with misinterpretations of catastrophic consequences may avoid activities and report lower levels of quality of life. This finding is also consistent with previous findings in this population that pain catastrophizing mediates the relation between chest pain and disability (Shelby, et al., 2009).

The relation between pain catastrophizing and quality of life was stronger for mental health functioning. This finding was not expected. Similar to the finding that fear of pain has a stronger relation to mental health functioning than physical health functioning, this finding suggests that pain catastrophizing may be associated with greater activity reduction in areas such as social activities and role functioning than physical activity avoidance. Additionally, however, while the relation between pain catastrophizing and physical health functioning was non-significant, the analyses were underpowered, and as such, this relation may prove significant with a larger sample size.

Fear of pain, catastrophizing, psychiatric disorders, and quality of life. Axis I psychiatric disorders were prevalent in this sample (71.4%). Based on previous research (Dammen et al., 2008; Jakle et al., 2009), it was anticipated that psychiatric disorder severity would correlate to quality of life. The current study found significant correlations between psychiatric disorder severity and quality of life.

The relations between principal psychiatric disorder severity to physical health functioning and mental health functioning displayed large correlation coefficients that were significant. Those with higher levels of psychiatric disorder severity reported lower levels of quality of life. Fear of pain and catastrophizing did not relate significantly to quality of life after psychiatric disorder severity was examined. As such, the current findings do not provide support for the hypotheses that fear of pain and pain catastrophizing impact quality of life after accounting for psychiatric disorder severity.

The small sample size, however, made these analyses largely uninformative; further research is needed with larger sample sizes.

Summary and conclusions from the current findings. The findings from the current study indicate that those who react with fearful and catastrophizing thoughts about painful sensations report lower quality of life. Previous research shows that patients with NCCP tend to over-attend to, and report higher levels of fear of, cardiac-related sensations compared to other physical sensations (Aikens, et al., 2001; White et al., 2008). Potentially benign cardiac sensations may be interpreted as representing cardiac dysfunction and, consistent with models of panic disorder (Barlow, 2002), anxious anticipation of these sensations may result in avoiding activities that elicit any cardiac sensations. The current study builds on previous research, which indicates a mediating role of cognitive misinterpretation of cardiac sensations between vigilance and pain interference (White et al., 2008), by also identifying a relation between cognitive misappraisals and a measure of current global functioning: quality of life. Patients with NCCP who avoid cardiac-eliciting sensations as a result of cognitive misinterpretations of these sensations, may avoid activities to the extent that they experience impaired quality of life. Additionally, patients with NCCP who direct energy towards diligently attending to and interpreting painful sensations, with the intent of avoiding cardiac dysfunction, may find that they are focusing less time and energy on other aspects of their lives, and further impairing their quality of life.

Limitations

This study is not without limitations. Due to sample size, the analyses were powered to detect large to very large effect sizes. As such, the current analyses did not detect relations with small, medium, or in some cases, large effect sizes. Further research needs to explore the proposed relations in this study with a larger sample size.

Secondly, due to the cross-sectional design, the direction of effects cannot be determined. Causality is inferred based on theory, but because data was collected at a single time point, causality cannot be determined. Further longitudinal data collection is needed to facilitate better determination of the directionality of the proposed relations. Specifically, future research may benefit from investigating whether fear of pain, catastrophizing, and psychiatric disorder severity at baseline predict changes in quality of life at follow-up time points.

Finally, there are multiple ways to quantify Axis I psychiatric disorders. The current analyses used a continuous measure as opposed to a categorical measure such as "diagnosis" and "no diagnosis". The continuous variable used for psychiatric disorder severity was the principal diagnosis clinical severity rating. Other ways to define Axis I disorder severity may include accounting for number of diagnoses and the clinical severity ratings of each diagnosis. Further, variables such as chronicity, current psychiatric treatment, or ratings of interference and distress could have been utilized. Finally, Global Assessment of Functioning scores could prove another useful measure. Future research may benefit from comparing various indices of psychiatric disorder severity for use with this population.

Directions for Future Research and Clinical Implications

The current study aimed to identify psychological factors that differentiate patients with NCCP who report impaired quality of life. Future research is needed to further support the evidence herein for the role of fear of pain and pain catastrophizing and to identify additional psychological factors, such as hypervigilance, that may directly impact quality of life. Further, research is needed to better elucidate whether psychiatric status fully accounts for impaired quality of life in this population.

The current study contributes to a broad attempt towards early identification of patients with NCCP who are most "at risk" for functional impairment and impaired quality of life, with the ultimate aim of increased functioning for each individual. Further research is needed to better identify a profile of potentially modifiable psychological factors that negatively influence quality of life in this population. Such psychological factors may then be targeted in interventions designed to improve functional outcomes.

Few studies of psychological interventions for patients with NCCP have been conducted to date (Kisely, Campbell, Skerritt, Yelland, 2010). However, a recent review of 10 such interventions, including relaxation training, hypnosis, guided breathing, and cognitive-behavioral therapy (CBT), indicated modest to moderate effects of psychological interventions, particularly CBT (Kisely, et al., 2010). Additionally, a recent randomized controlled trial compared a CBT intervention to Paroxetine and to placebo and found that CBT was significantly superior to Paroxetine and to placebo (Spinhoven, Van der Does, Van Dijk, and Van Rood, 2010). In the CBT treatment group, 47.6% of patients did not have pain at the end of treatment. Further, Spinhoven et al. (2010) investigated heart focused-anxiety, which mediated pain reduction in the CBT condition. This finding provides support for targeting cognitive responses to chest sensations, such as fear of pain and catastrophizing, in CBT treatments for patients with NCCP.

Conclusion

This is one of the first studies to examine empirically the direct relation of fear of pain and pain catastrophizing to quality of life in patients with NCCP. Findings provide support for the impact of these individual psychological factors on quality of life in patients with NCCP. However, it remains unclear whether they impact quality of life beyond the influence of psychiatric disorder severity. In sum, this study adds to current understanding of psychological factors related to quality of life in patients with NCCP.

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