ATTACHMENT AND ADJUSTMENT IN INDIVIDUALS WITH A HISTORY OF FUNCTIONAL ABDOMINAL PAIN

By

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CHAPTER I

INTRODUCTION

In his theory of attachment, Bowlby (1969; 1973; 1980) proposed that the nature of an infant's interactions with its caregiver has life-long influences on social and emotional development. Bowlby defined attachment as an aspect of personality that is determined by the degree of responsivity, consistency, and sensitivity of primary caregivers towards the developing infant. The infant's attachment behaviors (that is, efforts to elicit a response from a caregiver) are triggered when the infant perceives one of three kinds of threats: 1) danger in the environment (e.g., a predator), 2) actual or anticipated separation from the attachment figure (which would increase vulnerability to threats), or 3) internal distress (e.g., pain, sickness, or fatigue). The nature of the caregiver's responses influences the infant's formation of mental representations of the self (e.g., as worthy or unworthy) and of others (e.g., as trustworthy or untrustworthy).

Mental representations of the self and others provide the basis for two dimensions of attachment. Attachment anxiety is grounded in one's self-concept. Individuals high in attachment anxiety have doubts regarding their self worth, lack a sense of control over their environment, and tend to rely on the support and approval of others (Bowlby, 1969, 1973, 1980). Attachment anxiety is associated with hypervigilance towards threat, exaggerated appraisal of threat, and poorer coping (Porter, Davis & Keefe, 2007). Attachment anxiety is thought to develop largely as a result of inconsistent caregiving, which leads to worry over the availability, responsiveness, and positive regard of others.

Attachment avoidance, by contrast, is grounded in one's concept of others. Individuals with avoidant attachment are uncomfortable with closeness and interdependence. They view others as unavailable and unsympathetic and themselves as more self-sufficient than individuals with anxious attachment (Porter, Davis & Keefe, 2007). In contrast to attachment anxiety, attachment avoidance is associated with "deactivating" strategies that minimize appraisals of threat. Attachment avoidance is thought to result from a consistently critical and unavailable caregiver.

Individuals low in both attachment anxiety and attachment avoidance are said to have "secure" attachment. These individuals are thought to have experienced early attachment relationships in which their desires for comfort, support, and exploration were mostly respected and consistently met. Experiences of successfully eliciting their caregiver's support lead individuals to develop a mental representation of self as active, strong, and competent, and a representation of others as reliable and supportive. Compared to individuals with insecure attachment, those with secure attachment appraise threats more accurately and have greater self-efficacy regarding their ability to manage threat (Porter, Davis & Keefe, 2007). Considerable empirical research has validated the cognitive, emotional, behavioral, and interpersonal correlates of anxious and avoidant attachment (e.g., Bartholomew, 1990; Ciechanowski et al., 2002; Hazan & Shaver, 1987; Mikulincer, 1995).

Insecure attachment – high levels of anxious and/or avoidant attachment – has been linked to a wide range of mental health outcomes in adulthood, including reduced self-esteem (Feeney & Noller, 1990) depression (Bifulco, Moran, Ball, & Bernazzani, 2002; Hammen et al., 1995), posttraumatic stress symptoms (Currier, Holland, & Allen, 2012), and alcohol misuse (Currier et al., 2012). Insecure attachment also predicts decreased physical health in the form of

greater number of self-reported physical symptoms (Ciechanowski, Walker, Katon, & Russo, 2002; Feeney & Ryan, 1994; Taylor, Mann, White, & Goldberg, 2000), inflammation-based illness (Puig, Englund, Simpson, & Collins, 2012), likelihood of developing breast cancer (Tacon, 2003), and immunological vulnerability (e.g., increased cortisol levels; Jaremka et al., 2013; Picardi et al., 2013). Because the attachment system is activated by the threat of pain, researchers have begun to investigate the role attachment may play in the development of, and adjustment to, chronic pain. Kolb (1982) was one of the first to apply attachment theory to chronic pain by defining "pain complaining" as an attachment behavior. Based largely on his clinical experience, Kolb theorized that patients with persistent pain complaints often had poor attachment and dependent personalities.

Mikail, Henderson, and Tasca (1994) later proposed that insecure attachment not only presents a vulnerability to the development of chronic pain, but that individuals with insecure attachment are less able to cope with the stress presented by chronic pain because of their maladaptive mental representation of relationships and the perceived unavailability of reliable and caring others. Mikail and colleagues further hypothesized that this vulnerability is compounded in anxiously attached individuals by negative self-perceptions that lead them to lack confidence in their ability to deal with the threat invoked by pain. Avoidantly attached individuals, in contrast, were hypothesized to have negative perceptions of others that lead them to avoid healthcare providers and social support from others. According to Mikail and colleagues' model, securely attached individuals are less susceptible to – and better able to cope with – chronic pain because of their relatively realistic pain appraisals, effective support seeking, and adaptive emotion regulation and coping.

More recently, three major empirical findings have provided evidence that the cognitions, emotions, and behaviors associated with insecure attachment may contribute to the etiology of – and adjustment to – chronic pain. First, attachment insecurity and pain are reliably correlated. That is, individuals with insecure attachment report higher pain levels than securely attached individuals (McWilliams, 2000), and individuals with chronic pain are more likely to be insecurely attached than those without chronic pain (Davies et al., 2009). Second, insecure attachment in healthy populations has been associated with maladaptive emotional and behavioral responses to pain and pain threat. Such responses include hypervigilance to pain (McWilliams & Asmundson, 2007), increased pain-related fears (Wearden et al., 2006; McWilliams & Asmundson, 2007), and greater pain catastrophizing (Meredith, Strong, & Feeny, 2006b; McWilliams & Asmundson, 2007), each of which have been associated with poor adjustment to chronic pain (Andrew, Strong, & Meredith, 2012; Campbell et al., 2010; Labus et al., 2009; MacDonald & Kingsbury, 2006, Sullivan, Adams, Martel, Scott, & Wideman, 2011). Third, among individuals with chronic pain, insecure attachment has been associated with poor mental and physical health outcomes, including increased psychological distress (Ciechanowski, Sullivan, Jensen, Romano, & Summers, 2003; Meredith, Strong, & Feeney, 2007), higher number of pain sites (Davies, Macfarlane, McBeth, Morriss, & Dickens, 2009), and increased pain perception and disability (McWilliams, Cox, & Enns, 2000).

Two additional lines of research conducted with individuals with chronic pain suggest a potential mechanism by which insecure attachment may contribute to poor adjustment. First, insecure attachment has been associated with appraisal of greater pain threat (Ciechanowski, Sullivan, Jensen, Romano, & Summers, 2003; Meredith, Strong, & Feeney, 2007) and lower pain self-efficacy (Meredith, Strong, & Feeney, 2006a; Meredith, Strong, & Feeney, 2006). Second,

among individuals with chronic pain, high pain threat appraisals and low pain self-efficacy have been associated with passive coping (Strahl, Kleinknecht, & Dinnel, 2000), which in turn has been shown to exert direct negative effects on long-term health (Jones et al., 2006; Mercado, Carroll, Cassidy, & Côté, 2005; Walker, Smith, Garber, & Claar, 2005). Taken together, this evidence suggests a two-step mediation process in which attachment affects pain threat appraisals and pain self-efficacy, which in turn affect coping, which in turn affects mental and physical health.

Meredith, Ownsworth, & Strong (2008) recently proposed a model of such a process in their Attachment-Diathesis Model of Chronic Pain (ADM). The ADM is a heuristic model of attachment and chronic pain based on current empirical research. Pain is hypothesized to trigger attachment-related processes including appraisal of pain ("pain threat"), appraisal of one's own capacity for coping with the pain ("pain self-efficacy"), and appraisal of social support. The theory of stress appraisal and coping formulated by Lazarus and Folkman (1984) is invoked to explain how appraisals of pain (i.e., the stressor) influence coping with pain. Finally, coping responses are hypothesized to impact one's adjustment to pain. The current study uses the ADM as a framework for investigating the role of pain appraisals, pain self-efficacy, and passive pain coping in the relation between attachment and adjustment to chronic pain.

The study tested a two-step mediation model illustrated in Figure 1. According to the hypothesized model: (1) cognitive appraisals (pain threat and pain self-efficacy) mediate the relation between attachment and passive coping with pain, and (2) passive coping with pain mediates the relation between cognitive appraisals and health related quality of life (HR-QOL). Since we did not want to pre-emptively rule out the possibility of partial mediation, we also included direct effects in the model (i.e., HR-QOL and passive coping with pain regressed on

attachment anxiety; HR-QOL regressed on pain self-efficacy and pain threat appraisal). We tested the model in a sample of adolescents and young adults with a childhood history of functional abdominal pain (FAP), a common pediatric pain disorder associated with increased risk for impaired HR-QOL (Walker, Dengler-Crish, Rippel & Bruehl, 2010).

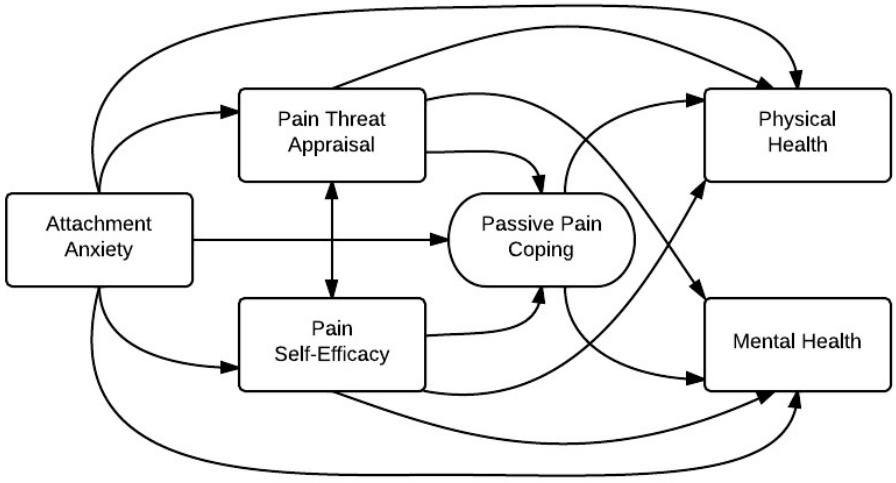

Figure 1. Theoretical model predicting mental and physical health as a function of attachment anxiety, pain appraisals, and passive coping in chronic pain. Rectangles denote measured variables. The oval denotes a latent variable (passive coping). One-headed arrows represent regression paths; two-headed arrows represent correlations.

Evidence for the effect of attachment anxiety on adjustment to physical discomfort is stronger than that for attachment avoidance (McWilliams et al., 2000; Meredith, et al., 2006; Schmidt, Strauss, & Braehler, 2002; Tremblay & Sullivan, 2009). Therefore, we focused on the relation of attachment anxiety to health outcomes in our model. We hypothesized that greater attachment anxiety would be associated with poorer mental and physical HR-QOL. We also hypothesized that pain threat, pain self-efficacy, and coping would mediate this relation. Specifically, we predicted that higher levels of anxious attachment would be associated with appraisals of higher pain threat and lower pain self-efficacy. Moreover, we predicted that these pain-related appraisals would be associated with more frequent use of passive strategies for

coping with pain, which in turn would be associated with poorer mental and physical health among adolescents and young adults with a childhood history of FAP. We also conducted exploratory analyses to test whether avoidant attachment was associated with poor adjustment, and if so, whether this relation was mediated by the same variables as hypothesized for anxious attachment.

CHAPTER II

METHOD

Participants

Participants were recruited from a database of consecutive new patients evaluated for abdominal pain at a pediatric gastroenterology clinic between 1993 and 2004 and enrolled in studies at that time (Walker, Garber, Smith, van Slyke, & Lewis Claar, 2001; Walker, Smith, Garber, & Claar, 2005). Eligibility criteria for these studies included abdominal pain of at least three months duration, absence of other chronic illness or disability, and absence of an organic disease diagnosis for abdominal pain from the referring physician. Eligibility criteria for the current study included: 12 years of age or older, at least four years elapsed since initial study enrollment, and absence of significant organic disease at follow-up by self-report.

Procedure

Recruitment. 760 former FAP participants met eligibility criteria for age and follow-up interval. They were sent letters with a card to return to decline further contact. Six declined contact, leaving 754 potential participants. Of these, 261 (34%) could not be located, 54 (7%) declined participation, 40 (5%) could not be scheduled, 3 were excluded due to recent self-reported onset of chronic disease, and 122 were excluded because they did not complete the measure of attachment, leaving a final sample of 274 for the analyses presented in this paper. Participants in the follow-up study did not differ significantly from non- participants on sex, age, or baseline pain severity. Participants with and without a completed attachment measure did not differ significantly on sex or scores on attachment, appraisals, or coping. However, participants with a completed attachment measure, compared to those without the measure, were significantly younger (mean age= 20.24, SD=3.36 vs. mean age=22.17, SD= 4.71, t=4.65, p=.000) and had significantly better overall QOL as indicated by total SF-36 score (mean = 79.76, SD = 13.72, vs. M=72.37, SD= 17.92, t=-4.44, p=.000).

Protocol. Self-report symptoms were assessed online or by telephone by a trained interviewer. Participants completed phone interviews in a private place to ensure privacy and confidentiality. Informed consent or assent was obtained from all participants. Parental consent was obtained for participants under the age of 18 years. The Vanderbilt Institutional Review Board approved all procedures.

Measures

The Experiences in Close Relationships Scale (ECR) is a 36-item questionnaire assessing attachment anxiety (18 items) and attachment avoidance (18 items). The validity of the ECR has been demonstrated in numerous studies (Brennan et al., 1998; Fraley et al., 2000). Participants indicate their level of agreement with a series of statements on a scale from 1 (Strongly Disagree) to 7 (Strongly Agree). Example items are "I worry about being rejected or abandoned" (attachment anxiety scale) and "I don't feel comfortable opening up to others" (attachment avoidance scale). Scale scores are calculated by taking the average score of the items from each scale. Higher values indicate greater degree of attachment anxiety or attachment avoidance, respectively. To make the wording of the ECR more appropriate for our sample of adolescents and young adults, we replaced the words "close relationship partners", "relationship partners", and "my partners" with the words "people I care about". Cronbach's alpha was .920 for attachment avoidance and .925 for attachment anxiety in the current sample.

The 36-item Medical Outcomes Study Short Form Health Survey (SF-36) measures HR-QOL and yields two summary scores, each comprising four subscales (Ware & Sherbourne, 1992). The psychometric properties of the SF-36 have been shown to be excellent in a variety of populations (McHorney, Ware, & Raczek, 1993; McHorney, Ware, Lu, & Sherbourne, 1994). The Physical Component Summary (SF-36-Physical) measures overall physical functioning and health, and comprises the subscales of physical functioning (10 items), bodily pain (2 items), general health perceptions (5 items), and physical role functioning (4 items). The Mental Component Summary (SF-36-Mental) measures general mental health and comprises the subscales of vitality (4 items), emotional role functioning (3 items), social role functioning (2 items), and mental health perceptions (5 items). Example items include "Does your health now

limit you in vigorous activities, such as running, lifting heavy objects, participating in strenuous sports? (Yes, A Lot; Yes, A little, No)" (SF-36-Physical Physical Functioning item) and "During the past 4 weeks, how much of the time has your physical or emotional problems interfered with your social activities (like visiting with friends, relatives, etc.)? (0= All of the time; 4= None of the time)" (SF-36-Mental Social Role Functioning item). Each scale is directly transformed into a 0-100 scale, with each question carrying equal weight. Higher values indicate better health. Cronbach's alpha was .862 for the SF-36-Physical and .872 for the SF-36-Mental in the current sample.

The Pain Beliefs Questionnaire is a 32-item measure that assesses appraisals of pain seriousness and perceived self-efficacy in using problem- and emotion- focused pain coping strategies. Twenty items assess perceived seriousness of the pain condition ("pain threat appraisal; e.g., ''My stomach aches mean I have a serious illness''). Six items each assess emotion-focused coping efficacy (e.g., ''I know I can handle it no matter how bad my stomach hurts'') and problem-focused coping efficacy (e.g., ''When I have a bad stomach ache, there are ways I can get it to stop''). Response options range from 0 (not at all true) to 4 (always true). Mean scores are created for each scale (pain threat appraisal, problem-focused coping efficacy, and emotion-focused coping efficacy). We defined pain self-efficacy as the sum of the problem- and emotion-focused coping efficacy scales. Internal consistency for the scales is good (Walker, Smith, Garber, & Claar, 2005). Cronbach's alpha was .911 for primary appraisal and .785 for self-efficacy in the current sample.

Passive Coping with Pain. For the current study, we defined passive pain coping as a latent construct comprising the three subscales of the Pain Response Inventory (PRI; described below) as well as total score on the Pain Catastrophizing Scale (PCS). *The PCS* is a 13-item scale

measuring pain catastrophizing (Sullivan & Bishop, 1995). Example items are "When I'm in pain, it's terrible and I think it's never going to go away" and "When I have pain, I feel I can't go on". Response options range from 0 (not at all) to 4 (extremely). Responses are summed, with higher values indicating greater levels of catastrophizing. The scale demonstrates high criterion-related, concurrent, and discriminant validity (Osman et al., 2000). Cronbach's alpha was .923 in the current sample. *The PRI* is a 60-item self-report questionnaire that assesses responses to abdominal pain (Walker, Smith, Garber, & Van Slyke; 1997). The PRI has thirteen subscales, each comprising three to six items. The stem for each item is, "When you have a bad stomach ache, how often do you…" The subscales (with sample items) of the Passive Coping Factor include: Behavioral Disengagement (e.g., give up since nothing helps); Catastrophizing (e.g., think to yourself that it's going to get worse); and Self-isolation (e.g., stay away from people). Response options range from never (0) to always (4). A mean score ranging from 0 to 4 is calculated for each subscale, with higher scores indicating greater frequency of the response. Empirical validation of the PRI and a list of all items for each subscale are reported by Walker and colleagues (1997). Coefficient alpha levels of the subscales ranged from .798 to .934 in the current sample. Cronbach's alpha for our latent passive pain coping variable was .915.

Data Analysis

Descriptive and correlational analyses were conducted using IBM SPSS version 19.0. Confirmatory factor analyses and structural equation modeling were conducted using Mplus Version 6 (Muthén & Muthén, 1998-2010). The distributions of scores on several variables (i.e., the SF-36-Mental, SF-36-Physical, pain threat appraisal, and pain self-efficacy) violated the assumption of normality. Therefore we used robust maximum likelihood estimation to adjust the standard errors for nonnormality. Only one individual was missing data on the SF-36 outcome variables. Two individuals were missing the PRI, and one individual was missing the PBQ. Full information maximum likelihood estimation was used because data were assumed to be missing at random.

Figure 2 illustrates our hypothesized model, which is based on the ADM (Meredith et al., 2008). The model flows from left to right, with an arrow representing a hypothesized causal impact of one variable on another. The model represents a two-stage mediation process. In the first stage of the model, attachment anxiety predicts greater perceived pain threat and lower pain self-efficacy, each of which in turn predict increased passive coping. The second stage of the model follows Lazarus and Folkman's (1984) work by postulating that maladaptive cognitive appraisals (low pain self-efficacy and high perceived pain threat) result in passive emotional and behavioral responses, which in turn predict inferior mental and physical health.

CHAPTER III

RESULTS

Demographic Characteristics

Sample characteristics are described in Table 1. Correlations between all pairs of study variables are presented in Table 2.

Table 1. *Sample characteristics*

	N(%)/M(SD) Total Sample (N=274)
Age (years)	20.237 (3.358)
Gender	
Male	94 (34.3)
Female	180 (65.7)
Race	
White	251 (91.6)
African American	16 (5.8)
Asian	2 (.7)
Other	5 (1.8)

Table 2. *Observed correlations between hypothesized predictor and outcome variables*

		Attachment Anxiety	Attachment Avoidance	Pain Self-Efficacy	Pain Threat Appraisal	Passive Coping (PRI)	PCS	SF-36-Mental	SF-36-Physical
Attachment Anxiety	Pearson Correlation	1	.335**	-.242**	.189**	.320**	.363**	-.303**	-.157**
	Sig. (2-tailed)		0	0	0.002	0	0	0	0.009
	N	274	274	273	273	272	274	273	273
Attachment Avoidance	Pearson Correlation	.335**	1	-.199**	.153*	.308**	.131*	-.207**	-0.069
	Sig. (2-tailed)	0		0.001	0.011	0	0.03	0.001	0.256
	N	274	274	273	273	272	274	273	273
Pain Self-Efficacy	Pearson Correlation	-.242**	-.199**	1	-.587**	-.542**	-.487**	.273**	.339**
	Sig. (2-tailed)	0	0.001		0	0	0	0	0
	N	273	273	273	273	272	273	272	272
Pain Threat Appraisal	Pearson Correlation	.189**	.153*	-.587**	1	.577**	.554**	-.330**	-.440**
	Sig. (2-tailed)	0.002	0.011	0		0	0	0	0
	N	273	273	273	273	272	273	272	272
Passive Coping (PRI)	Pearson Correlation	.320**	.308**	-.542**	.577**	1	.547**	-.300**	-.348**
	Sig. (2-tailed)	0	0	0	0		0	0	0
	N	272	272	272	272	272	272	271	271
Pain Catastrophizing Scale (PCS)	Pearson Correlation	.363**	.131*	-.487**	.554**	.547**	1	-.355**	-.397**
	Sig. (2-tailed)	0	0.03	0	0	0		0	0
	N	274	274	273	273	272	274	273	273
SF-36-Mental	Pearson Correlation	-.303**	-.207**	.273**	-.330**	-.300**	-.355**	1	.560**
	Sig. (2-tailed)	0	0.001	0	0	0	0		0
	N	273	273	272	272	271	273	273	273
SF-36-Physical	Pearson Correlation	-.157**	-0.069	.339**	-.440**	-.348**	-.397**	.560**	1
	Sig. (2-tailed)	0.009	0.256	0	0	0	0	0	
	N	273	273	272	272	271	273	273	273

Note. The Passive Coping variable used in our model was a latent variable comprising both the Passive Coping subscale of the PRI and the total PCS score.

Model Testing

Confirmatory factor analyses indicated good fit of the data to the hypothesized structural model of our latent variable, passive coping (Chi-square test of model fit = .488 with 2 degrees of freedom, p = .783; comparative fit index (CFI) = 1.00; Tucker-Lewis fit index (TLI) = 1.01; root mean square error of approximation (RMSEA) = .000 (90% CI = .000, .069); standardized root mean square residual (SRMR) = .006).

Structural Equation Modeling

Figure 2 includes the unique relationships between the variables on the basis of SEM. The Chi-square test of model fit value was 34.856 with 17 degrees of freedom (p = .007). The fit statistic is the RMSEA, and by convention a value lower than .10 is considered an acceptable fit (Browne & Cudeck, 1992). The RMSEA for our proposed model is .062 (90% CI = .032, .091), indicating that it provides a close fit for the data. The CFI is .979, and the TLI is .956. Those values indicate a good fit between the proposed model and the data. Standardized parameter estimates are provided in Figure 2. No post-hoc modifications were indicated from the analysis because of the good-fit indices, and the residual analysis did not indicate any problems (SRMR = .028).

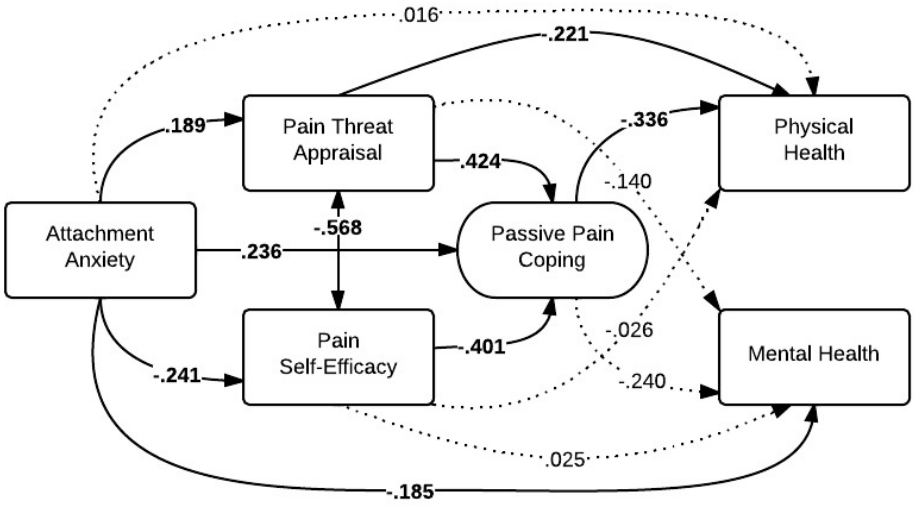

Figure 2. Theoretical model including standardized coefficients. Estimated errors are omitted for visual clarity. All factor loadings are significant at p<.001 (two-tailed). Solid paths are significant at p<.05 (two-tailed). Fit statistics: χ^2 (17, N = 271) = 34.856, p = .0065, CFI = .979, TLI = .956, RMSEA = 0.062.

SEM results indicated that, consistent with our theoretical model, pain threat appraisal and pain self-efficacy each significantly mediated the relation between attachment anxiety and

passive pain coping (standardized indirect effect estimates = .080 (95% CI=.032, .128) and .097 (CI=.042, .151); p = .006 and .005, respectively). Furthermore, passive pain coping significantly mediated the effect of pain threat appraisal and pain self-efficacy on physical health (standardized indirect effect estimates = -.143 (95% CI=-.255, -.030) and .135 (CI=.028, .242); p = .015 and .015, respectively). By contrast, pain threat appraisal, pain self-efficacy, and passive pain coping did not significantly mediate the relation between attachment anxiety and mental health; only a direct effect of attachment anxiety on mental health was supported.

Next, we explored whether the addition of attachment avoidance as a predictor would improve the fit of the model. We found no direct effect of attachment avoidance on either mental or physical health, and no effect on pain threat appraisal. However, attachment avoidance had a significant indirect effect on passive coping (standardized estimate = .050, p=.03) via a small but significant negative effect on pain self-efficacy (standardized estimate = -.128), and passive coping had a significant negative effect on physical health (standardized estimate = -.331). The effects of attachment avoidance and attachment anxiety on self-efficacy did not differ significantly (p=.564). With the addition of attachment avoidance as a predictor variable in the model, fit decreased slightly but was still acceptable (χ^2 (20, N = 271) = 61.074, p = .0000; CFI= .964; TLI = .920; RMSEA = .072 (90% CI = .052, .093); SRMR = .036). These results indicate that adding attachment avoidance as a predictor did not improve the ability of our model to predict the observed data.

CHAPTER IV

DISCUSSION

Our results demonstrated that greater attachment anxiety in adolescents and young adults with a history of chronic abdominal pain was associated with poorer QOL in both the mental and physical health domains. Moreover, the association between attachment anxiety and physical health was consistent with the ADM model, in which pain triggers attachment-related processes including appraisal of pain threat and self-efficacy, which in turn influence pain coping, which affects adjustment to pain. These findings providing further support for the theory that the negative self-perceptions held by individuals with anxious attachment lead them to lack confidence in their ability to effectively cope with pain. These low appraisals of self-efficacy, in combination with the tendency to evaluate pain as highly threatening, appear to lead anxiously-attached individuals to utilize passive strategies for coping with pain which in turn result in their reduced physical health.

Because our data are cross-sectional, causation cannot be inferred. However, a recent study found that attachment assessed in infancy prospectively predicts physical health thirty years later (Puig et al., 2012), lending support to our proposed direction of effects. Furthermore, results of at least two longitudinal studies (Hamilton, 2000; Waters, Merrick, Treboux, Crowell, & Albersheim, 2000) support Bowlby's proposition that attachment is fairly stable across the lifespan, lending support to our proposal that the degree of anxious attachment observed in our sample as adolescents and young adults is likely at least moderately associated with their attachment in infancy (prior to the development of FAP). However, research has shown that

stressful life events increase the likelihood that a child with secure attachment will transition to insecure attachment later in development (McConnell & Moss, 2011). Pediatric chronic pain is known to be stressful for both children and parents (Eccleston, Crombez, Scotford, Clinch, & Connell, 2004; van Tilburg et al., 2006) and stressed parents are less able to consistently provide the support required for the development and maintenance of secure attachment (Webster-Stratton, 1990). Therefore, it would be reasonable to expect that the experience of FAP may increase attachment anxiety. Similarly, it would be reasonable to hypothesize that the experience of a functional pain disorder (i.e., pain with no known cause and no universally effective treatment) might decrease pain self-efficacy, increase pain threat appraisal, and increase passive coping with pain.

It is also conceivable that the anxiety and depression often associated with chronic illness leads to greater catastrophizing (e.g., higher pain threat), lower self-efficacy, and withdrawal (e.g., passive coping), which may have a negative impact on close relationships and thereby increase anxious attachment. Such effects would be consistent with the downward spiral of pain-associated disability syndrome described by Zeltzer and colleagues (Bursch, Walco, & Zeltzer, 1998; Hyman et al., 2002). Because our population involved both adolescents and young adults, it is also important to recognize that participants' attachment may have been substantially influenced by romantic relationships.

Unexpectedly, our proposed mediators did not significantly mediate the relation between attachment anxiety and mental health. This result differs from results of several longitudinal studies that have found that passive coping with stress significantly mediates the relation between stress and mental health (e.g., Covic, Adamson, Spencer, & Howe, 2003; Yang, Brothers, & Andersen, 2008). It is possible that because our measures of coping asked

specifically about coping responses to pain, our construct was not general enough to significantly mediate the effects of attachment anxiety on mental health.

Our results are consistent with previous research in that we found no direct effect of attachment avoidance on physical health. There is less evidence in the literature for the effect of attachment avoidance, compared to attachment anxiety, on health-related QOL (McWilliams et al., 2000; Meredith et al., 2006; Schmidt et al., 2002; Tremblay & Sullivan, 2009); therefore, it was not unexpected that the addition of attachment avoidance as a predictor did not improve the fit of the data to our conceptual model. Consistent with research showing that anxiously attached individuals tend to catastrophize in response to laboratory-induced pain but that those with attachment avoidance do not (Meredith et al., 2006), avoidant attachment failed to significantly predict pain threat appraisal in our study. However, attachment avoidance exerted an indirect effect on physical health via a small but significant effect on pain self-efficacy. Whether we would detect such an effect was an exploratory question, since research in this area has been inconclusive. In the one study of the relation between attachment and self-efficacy in chronic pain patients, anxious attachment and fearful (anxious and avoidant) attachment was associated with low pain self-efficacy (Meredith et al., 2006a), whereas pure (non-anxious) attachment avoidance was related to higher pain self-efficacy, particularly for males. Another study investigating attachment and perceived control over experimentally-induced pain in healthy participants found that attachment anxiety predicted lower pain self-efficacy, whereas attachment avoidance was unrelated to pain self-efficacy. These discrepancies parallel the mixed findings on self-esteem in individuals with avoidant attachment, since one's self-concept influences one's perceived ability to exert control over a threat. While Bartholomew and Horowitz proposed (1991) – and a large amount of research supports – the notion that individuals high in avoidant

attachment have higher self-esteem than individuals with anxious attachment, other research has found that individuals high in avoidant attachment still have fragile self-esteem compared to more securely-attached individuals (e.g., Hankin, Kassel, & Abela, 2005).

Although attachment avoidance in our sample was significantly related to decreased self-efficacy, interpretation of this effect is limited because we did not assess perceived social support. A mental representation of others as unavailable and unreliable may lead avoidantly attached individuals to estimate the probability of effectively eliciting the support they need to effectively cope with pain as low. Therefore, it is possible that controlling for perceived social support would decrease or eliminate the observed relation between avoidant attachment and pain self-efficacy. Future research should assess whether perceived social support more fully accounts for the relation between avoidant attachment and passive coping than does self-efficacy. However, because there was also no evidence for a direct effect of attachment avoidance on either mental or physical health, and because the one indirect path that was observed was fairly weak, we believe that the current results further validate the results of past research showing that avoidant attachment is less toxic to mental and physical health than is anxious attachment (e.g., Jaremka et al., 2013).

One strength of our study is the use of SEM. SEM is a very general and powerful multivariate technique. Compared to multiple regression, it allows for more flexible assumptions, the use of CFA to reduce measurement error, the testing of whole models as opposed to individual coefficients, and the testing of models with multiple dependent variables. To our knowledge, our study is the first to use SEM to assess the potential role of pain appraisal and coping in the impact of attachment on health.

One limitation of the study is the cross-sectional nature of the data. A second limitation is the self-report of health outcomes. Future studies assessing health using objective health measurements such as viral load would be useful. A third limitation is the relatively homogeneity of our sample. Studies with larger and more diverse samples will help determine whether our results generalize to other age groups, ethnicities, and chronic pain populations. Studies investigating the physiological mechanisms by which attachment anxiety, pain appraisals, and coping contribute to decreased mental and physical health are also needed. Future research should also investigate the impact of social factors (perceived social support, objective responses to pain by others, and modeling of coping and pain behaviors) on adjustment. Social and other important factors such as illness self-management may play an important role in the relation between attachment and adjustment.

In particular, one area that may prove fruitful for future research is the impact of attachment on the patient-provider relationship, and whether certain combinations of attachment styles predict improved treatment responses compared to others. Individuals with chronic pain are notoriously difficult to treat and have frustrated doctors for decades if not centuries (Dixon-Woods & Critchley, 1999; Kolb, 1982; Matthias et al., 2010;), in part because they require a great deal of time, energy, and resources (Talley, Gabriel, Harmsen, Zinsmeister, & Evans, 1995; Upshur, Luckmann, & Savageau, 2006). We know that a good patient-provider relationship is essential for the successful treatment of chronic pain (Drossman, 2006; Farin, Gramm, & Schmidt, 2012; Ilnyckyj, Graff, Blanchard, & Bernstein, 2003; Owens, Nelson, & Talley, 1995; Stewart et al., 2000; Vowles & Thompson, 2012) yet many of these relationships are wrought with frustration on the part of both physician and patient. Attachment theory suggests that some combinations of patient-provider attachment styles may be more successful than others. For

example, an anxiously attached patient who seeks constant reassurance paired with an avoidantly attached provider who is uncomfortable with displays of neediness may result in an especially ineffective relationship. The tailoring of treatment plans to individual patients' attachment styles may result in greater satisfaction for both parties and better health outcomes for the patient.

The current findings have valuable implications for interventions in chronic pain populations because they suggest that individuals with insecure attachment – particularly, those with attachment anxiety – are at risk for poor adjustment in the context of chronic pain. If attachment anxiety then manifests in relationships with significant others and providers in a way that further affects adjustment to pain, interventions that take into account the interpersonal relationships that surround pain may be useful. Furthermore, pain appraisals and coping may serve as effective targets for improving physical health outcomes in chronic pain.

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