Attachment and Adjustment in Adolescents and Young Adults With a History of Pediatric Functional Abdominal Pain

Kelsey T. Laird, MS, Kristopher J. Preacher, PhD, and Lynn S. Walker, PhD

Objectives: This study tested predictions of the Attachment-Diathesis Model (ADM) of Chronic Pain in a cross-sectional sample of adolescents and young adults with a history of childhood functional abdominal pain (FAP). ADM posits that attachment anxiety is a diathesis for poor adjustment (physical health, mental health, and functioning) in the context of chronic pain and that pain self-efficacy, pain threat appraisal, and passive coping mediate this effect.

Methods: Participants (N = 261) were recruited from a database of consecutive new patients evaluated for abdominal pain at a pediatric gastroenterology clinic. Participants' mean age at the follow-up assessment was 21 years. Structural equation modeling was used to test the fit of our conceptual model to the data.

Results: Model fit was good (comparative fit index = 0.971, the Tucker-Lewis index = 0.940, root mean square error of approximation = 0.067). Attachment anxiety significantly predicted poorer health in both the mental and physical domains. Model fit was consistent with our hypothesis that pain self-efficacy mediates the effect of attachment anxiety on passive coping and that passive coping, in turn, mediates the effect of pain self-efficacy and pain threat appraisal on mental and physical health.

Discussion: Among individuals with a childhood history of FAP, those with anxious attachment may be at higher risk for poor physical and mental health. Pain beliefs and coping may mediate the relation between anxious attachment and health outcomes and may serve as effective targets for intervention in chronic pain.

Key Words: attachment, chronic pain, pain beliefs, passive coping, quality of life (QOL)

(*Clin J Pain* 2015;31:152–158)

Although it has long been understood that the nature of an infant's interactions with its caregiver has life-long influences on social and emotional development, only recently has it become clear that these interactions significantly influence physical health across the lifespan as well. Bowlby[1–3] defined attachment as an aspect of personality that is formed in childhood based on the degree of responsivity, consistency, and sensitivity of primary caregivers toward the infant in the face of a perceived threat. Bowlby hypothesized that the nature of the caregiver's response influences the individual's mental representations of the self (eg, as worthy or unworthy) and of others (eg, as trustworthy or untrustworthy).

These mental representations provide the basis for 2 dimensions of attachment. Individuals high in attachment anxiety are thought to doubt their self-worth and be overly reliant on the support and approval of others.[1–3] Individuals high in avoidant attachment, in contrast, view others as unavailable and unsympathetic, are uncomfortable with closeness, and view themselves as more self-sufficient than individuals with anxious attachment.[4] Individuals low in both attachment anxiety and attachment avoidance are said to have "secure" attachment. Compared with individuals with insecure (avoidant or anxious) attachment, these individuals appraise threats more accurately and have greater self-efficacy regarding their ability to manage threat.[4]

Although the construct of attachment was initially applied to infants, it has since proven useful in understanding close relationships between adults.[5] Insecure attachment in adulthood has been linked to adverse mental health outcomes,[6,7] although anxious attachment has been more consistently associated with negative affect than has avoidant attachment. Insecure attachment is also associated with decreased physical health in both adolescents[8,9] and adults,[10–14] although again, evidence for the relation between attachment anxiety and physical health is stronger than that for attachment avoidance.[9,15–17] Because the attachment system is activated by the threat of pain, researchers have begun to investigate the role attachment may play in adjustment to chronic pain.

Mikail et al[18] proposed that individuals with insecure attachment are less able to cope with the stress presented by chronic pain because of their maladaptive mental representations. Specifically, the negative perceptions of self held by anxiously attached individuals may lead them to lack confidence in their ability to deal with the threat invoked by pain. Such individuals are said to have low "pain self-efficacy".[19]

Several recent empirical studies have verified that among individuals with chronic pain, insecure attachment is associated with poor mental and physical health outcomes.[15,20,21] Potential mechanisms by which insecure attachment may result in poor adjustment in individuals with chronic pain include increased perception of the pain as threatening to one's well-being (that is, greater "pain threat")[20,22] and lower pain self-efficacy.[16,23] High pain threat appraisals and low pain self-efficacy, in turn, have been associated with passive coping in individuals with chronic pain,[24] which in turn has been shown to exert direct negative effects on long-term health.[25–27] Taken together, this evidence suggests a 2-step mediation process

Received for publication September 5, 2013; revised April 1, 2014; accepted February 18, 2014.

From the Department of Pediatrics, Vanderbilt University, Nashville, TN.

Supported by R01 HD23264 to L.S.W. The study was also supported in part by the Vanderbilt Kennedy Center (P30 HD15052), the Vanderbilt Digestive Disease Research Center (DK058404), and the Vanderbilt CTSA grant (1 UL1 RR024975) from the National Center for Research Resources, National Institutes of Health, Nashville, TN. The authors declare no conflict of interest.

Reprints: Lynn S. Walker, PhD, Division of Adolescent and Young Adult Health, Department of Pediatrics, Vanderbilt University School of Medicine, 2146 Belcourt Ave, Nashville, TN 37212 (e-mail: lynn.walker@vanderbilt.edu).

DOI: 10.1097/AJP.0000000000000090

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 et al[28] recently proposed a model of such a process in their Attachment-Diathesis Model of Chronic Pain (ADM). The ADM is a heuristic model of adult attachment and chronic pain based on current empirical research. In the first step of the model, pain is hypothesized to trigger attachment-related processes including appraisal of pain (pain threat) and appraisals of one's own capacity for coping with the pain (pain self-efficacy).

The second step of the model invokes the stress appraisal and coping framework advanced by Lazarus and Folkman.[29] This framework emphasizes the importance of the individual's perceptions in evaluating potential stressors.[30] One major subjective evaluation in this process is the individual's self-efficacy for effectively coping with a particular stressor. Lazarus and Folkman distinguish between problem-focused coping self-efficacy, which refers to the individual's perceived ability to alter circumstances to make them more desirable (in this case, to alleviate pain), and emotion-focused coping self-efficacy, which refers to the individual's perceived ability to accept and adjust to circumstances (ie, to accept and adjust to pain). According to this framework, one's self-efficacy predicts the nature of coping strategies (eg, active or passive) that an individual will use in confronting a particular stressor.

Because pain due to functional disorders such as FAP is largely uncontrollable (and therefore cannot be alleviated by problem-focused coping[31,32]), emotion-focused coping self-efficacy is a particularly important aspect of pain self-efficacy. Work in our laboratory supports the hypothesis that among children with functional abdominal pain (FAP), low emotion-focused pain self-efficacy is associated with increased passive coping, that is, coping characterized by passivity, negative cognitions, and lack of active problem solving.[27]

In the third step of the model, coping responses are hypothesized to impact one's adjustment to pain. This stage resembles the second part of a model of pain appraisal and coping proposed and tested by Walker et al[27] in a prospective study of 133 children with abdominal pain. In this data set, passive coping predicted significant increases in both episode-specific somatic distress and episode-specific emotional distress. This distress, in turn, predicted increased somatic symptoms, disability, and depressive symptoms at 3-month follow-up. The last 2 steps of the model also closely resemble the Fear-Avoidance Model,[33] in which pain-related fear (ie, "pain threat") leads to avoidant coping and hypervigilance, which in turn lead to increased depression and disability.

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 in a sample of adolescents and young adults with a history of FAP. Consistent with a biopsychosocial approach, we define "adjustment" not only as the individual's experience of pain but as his or her overall physical health, mental health, and functioning.[34,35]

In this study we tested a 2-step mediation model derived from ADM in which: (1) cognitive appraisals (pain threat and pain self-efficacy) are hypothesized to mediate the relation between attachment anxiety and passive coping with pain, and (2) passive coping with pain is hypothesized to mediate the relation between cognitive appraisals and health-related quality of life (HR-QOL; Fig. 1). Because we did not expect these relationships to be entirely explained through the proposed indirect pathways, we also included direct effects in the model. We tested the model in a sample of adolescents and young adults with a childhood history of FAP, a common pediatric pain disorder associated with increased risk for impaired HR-QOL.[36]

Evidence for the effect of attachment anxiety on adjustment to physical discomfort is stronger than that for attachment avoidance.[9,15–17] 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

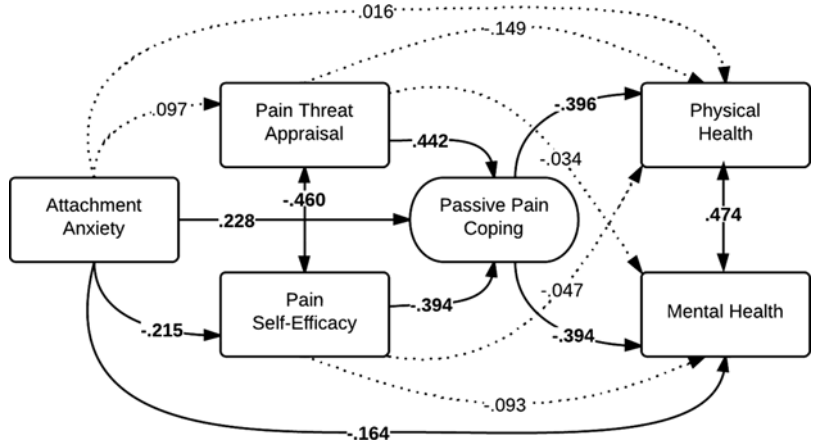

FIGURE 1. Theoretical model predicting mental and physical health as a function of attachment anxiety, pain appraisals, and passive coping in chronic pain. Rectangles denote measured variables. The oval denotes a latent variable (passive coping). Single-headed arrows represent regression paths; double-headed arrows represent residual correlations. Standardized coefficients are included but estimated errors are omitted for visual clarity. All factor loadings are significant at $P < 0.001$ (2-tailed). Solid paths are significant; dotted paths were hypothesized but not significant at $P < 0.05$ (2-tailed). Fit statistics: χ^2 ($df = 17$, N = 261) = 36.837; $P = 0.004$; comparative fit index = 0.971, the Tucker-Lewis index = 0.940, root mean square error of approximation = 0.067 (90% confidence interval: 0.037, 0.097).

HR-QOL. We also hypothesized 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.

METHODS

Participants

This study reports data that were collected as part of a comprehensive evaluation of health outcomes of pediatric patients with chronic FAP; other aspects of the evaluation have been reported elsewhere.[36–41] Participants were recruited from an existing database of new patients who presented to a tertiary pediatric gastroenterology clinic for evaluation of abdominal pain between 1993 and 2004 and enrolled in studies at that time.[27,42] Eligibility criteria for these earlier studies included abdominal pain of at least 3 months duration, absence of other chronic illness or disability, and absence of an organic disease diagnosis for abdominal pain from the referring physician. Participants were eligible for the follow-up study of health outcomes on which the current study is based, if they were aged above 12 years, if at least 4 years had elapsed since initial study enrollment, no evidence of significant organic disease was found in the medical evaluation at the tertiary clinic, and they reported no major chronic disease (eg, inflammatory bowel disease, multiple sclerosis). Data for the current study were collected between 2007 and 2010. Demographic information is reported in Table 1. At the time of the current assessment, 217 participants (83.10% of our sample) endorsed experiencing abdominal pain in the previous 3 months.

Procedure

Recruitment

The sample for the current study was drawn from a database of 760 former FAP participants who met the eligibility criteria for the follow-up study of health outcomes. 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 (0.4%) were excluded because of recent self-reported onset of chronic disease, and 122 (16%) were excluded because they did not complete the measure of attachment (which was emailed to participants separately from other measures), leaving a sample of 274, representing 36% of those eligible for the health outcomes study. Participants and nonparticipants in the outcomes study did not differ significantly on sex, age, or baseline pain severity. Participants with and without a completed attachment measure did not differ significantly on sex or scores on appraisals or coping. However, participants with a completed attachment measure, compared with those without the measure, were significantly younger (mean [*M*] age = 20.21, SD = 3.03 vs. *M* = 21.84, SD = 3.97; $t = -4.65$; $P < 0.005$) and had significantly better HR-QOL as indicated by both the Physical and Mental Component Summary scores of the 36-item Medical Outcomes Study Short Form Health Survey (SF-36) (Physical *M* = 83.63, SD = 14.00 vs. *M* = 78.85, SD = 19.30; $t = 2.84$; $P < 0.005$; and Mental *M* = 79.02, SD = 15.28 vs. *M* = 72.25; SD = 19.87; $t = 3.85$; $P < 0.005$). The current study included only participants who were aged above 15 years (N = 261) at the follow-up assessment.

TABLE 1. Sample Characteristics

	Total Sample (N = 261) (N [%])
Age (*M* [SD]) (y)	20.56 (3.10)
Sex	
Male	88 (33.7)
Female	173 (66.3)
Race	
White	239 (91.6)
African American	16 (6.1)
Asian	2 (0.8)
Other	4 (1.5)

Protocol

The SF-36 was administered by telephone by a trained interviewer. Participants completed phone interviews in a private place to ensure privacy and confidentiality. Attachment, pain threat appraisal, pain self-efficacy, and pain coping were assessed online by self-report. Informed consent was obtained from all participants. Parental consent was obtained for participants under the age of 18 years. The 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.[43,44] 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 a greater degree of attachment anxiety or attachment avoidance. To make the wording of the ECR more appropriate for the adolescents in our sample, we replaced the words "close relationship partners," "relationship partners," and "my partners" with the words "people I care about." No participant missed >1 item on the Attachment Anxiety Scale. In cases of missing data, the average of the completed items was taken to form a composite score. The Cronbach α was 0.93 for attachment anxiety in the current sample.

The SF-36 measures HR-QOL and yields 2 summary scores.[45] The psychometric properties of the SF-36 have been shown to be excellent in a variety of populations.[46,47] The Physical Component Summary (SF-36-Physical) measures overall physical functioning and health including bodily pain. The Mental Component Summary (SF-36-Mental) measures general mental health. Each scale is directly transformed into a 0 to 100 scale, with each question carrying equal weight. Higher values indicate better health. If any item was missing, the subscale for that item was counted as missing. This resulted in SF-36-Mental data being omitted for 2 participants. The Cronbach α was 0.86

for the SF-36-Physical and 0.87 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 coping self-efficacy. Twenty items assess perceived seriousness of the pain condition (pain threat appraisal, for example, "My stomach aches mean I have a serious illness"). Six items assess emotion-focused pain coping self-efficacy (henceforth referred to as "pain self-efficacy"), which refers to the individual's perceived ability to accept and adjust to pain (eg, "I know I can handle it no matter how bad my stomach hurts"). Response options range from 0 (not at all true) to 4 (very true). Mean scores are created for each scale (pain threat appraisal and pain self-efficacy). Reliability, validity, and sensitivity to treatment have been documented for the PBQ scales.[27,48–52] Pain threat appraisal was calculated if at least 16 of 20 questions were answered; pain self-efficacy was calculated if at least 5 of 6 questions were answered. In these cases, the mean of the completed remaining items was taken to form the composite score. The Cronbach α was 0.91 for pain threat appraisal and 0.79 for pain self-efficacy in the current sample.

For the current study, we defined Passive Pain Coping as a latent construct comprising 3 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.[53] 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.[54] Sum scores were calculated if at least 12 of 13 items were completed. In these cases, the mean of the completed items was calculated and then multiplied by 13 to get an unbiased sum score. The Cronbach α was 0.92 in the current sample. The PRI is a 60-item self-report questionnaire that assesses responses to abdominal pain.[55] The PRI has 13 subscales, each comprising 3 to 6 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 et al.[55] Self-isolation, Behavioral Disengagement, and Catastrophizing were each calculated if at least 4 of the 5 items were answered. In these cases, the mean of the completed items was taken to form the subscale score. Coefficient α levels of the subscales ranged from 0.80 to 0.93 in the current sample.

Data Analysis

Descriptive and correlational analyses were conducted using IBM SPSS version 19.0. Confirmatory factor analyses and structural equation modeling was conducted using Mplus Version 6.[56] The distribution of scores on several variables (ie, 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 non-normality. Full information maximum likelihood estimation was used because missing data were assumed to be missing at random.

Figure 1 illustrates our hypothesized model, which is based on the ADM.[28] The model flows from left to right, with an arrow representing a hypothesized causal impact of one variable on another. The model represents a 2-stage mediation process. In the first stage of the model, attachment anxiety is hypothesized to increase perceived pain threat and decrease pain self-efficacy. The second stage of the model follows Lazarus and Folkman's[29] 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.

RESULTS

Demographic Characteristics

The sample comprised 261 adolescents and young adults between the ages of 15 and 31 years (Table 1). Correlations between all pairs of study variables are presented in Table 2. (At the editor's suggestion, we evaluated the correlation of age with all other study variables. There was a statistically significant correlation between age and pain self-efficacy ($P = 0.050$), suggesting that individuals who were older may have been more confident in their ability to effectively cope with pain. This effect was small ($r = 0.126$). Age was not significantly correlated with any other study variables. We also conducted moderation analyses; age did not significantly moderate the effect of attachment anxiety on any study variables.)

Measurement Model

Confirmatory factor analysis indicated good fit of a one-factor model to passive coping indicators ($\chi^2 = 0.672$, $df = 2$, $P = 0.715$). The fit statistic is the root mean square error of approximation (RMSEA), and by convention a value < 0.08 is considered an acceptable fit.[57] The RMSEA for our proposed model was 0.000 (90% confidence interval [CI]: 0.000, 0.079). The comparative fit index (CFI) was 1.000, and the Tucker-Lewis index (TLI) was 1.013. The residual analysis did not indicate any problems (standardized root mean square residual [SRMR] = 0.008).

Structural Equation Modeling

Figure 1 includes the unique relationships between the variables on the basis of structural equation modeling. Structural equation modeling indicated acceptable fit of our proposed model to the data, and that close fit cannot be rejected ($\chi^2 = 36.837$, $df = 17$, $P = 0.004$; CFI = 0.971, TLI = 0.940, RMSEA = 0.067 [90% CI: 0.037, 0.097]; SRMR = 0.031). Standardized parameter estimates are provided in Figure 1.

Structural equation modeling results indicated that, consistent with our theoretical model, pain self-efficacy significantly mediated the relation between attachment anxiety and passive pain coping (standardized indirect effect estimates = 0.085 [95% CI: 0.036, 0.134]). (This and all subsequent CIs are 95% bias-corrected bootstrap intervals based on 5000 resamples unless otherwise noted.) Furthermore, passive pain coping significantly mediated the effects of pain threat appraisal and pain self-efficacy on

TABLE 2. Observed Pearson Correlations Among Hypothesized Predictor and Outcome Variables

	Attachment Anxiety	Pain Self-efficacy	Pain Threat Appraisal	PRI	PCS	Passive Coping	SF-36-Mental	SF-36-Physical
Attachment anxiety	SD = 1.118							
Pain self-efficacy	**−0.215**	SD = 0.572						
Pain threat appraisal	0.097	**−0.468**	SD = 0.784					
Passive coping (PRI)	**0.268**	**−0.459**	**0.502**	SD = 0.603				
Pain catastrophizing scale (PCS)	**0.323**	**−0.466**	**0.495**	**0.499**	SD = 9.158			
Passive coping (latent)	**0.356**	**−0.650**	**0.649**	NA	NA	SD = 0.367		
SF-36-Mental	**−0.288**	**0.215**	**−0.262**	**−0.302**	**−0.367**	**−0.415**	SD = 16.078	
SF-36-Physical	−0.129	**0.277**	**−0.382**	**−0.327**	**−0.379**	**−0.457**	**0.563**	SD = 15.227
Mean	3.305	3.282	1.598	0.752	10.927	0.000	77.508	81.499

Bolded values are significant at $P < 0.05$. 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. Across all study variables, percent missing data ranged from 0.00% to 1.09%.

PCS indicates Pain Catastrophizing Scale; PRI, Pain Response Inventory.

physical health (standardized indirect effect estimates = −0.175 [95% CI, −0.314, −0.037] and 0.156 [95% CI, 0.026, 0.286], respectively). Similarly, passive pain coping significantly mediated the effects of pain threat appraisal and pain self-efficacy on mental health (standardized indirect effect estimates = −0.174 [CI: −0.307, −0.042] and 0.155 [CI: 0.029, 0.282], respectively). An additional direct effect of attachment anxiety on mental health was supported. Unexpectedly, the relation between attachment anxiety and pain threat appraisal was not statistically significant (2-tailed $P = 0.132$).

DISCUSSION

Our results demonstrated that greater attachment anxiety in adolescents and young adults with a history of FAP was associated with poorer HR-QOL in both the mental and physical health domains. Moreover, the association between attachment anxiety and HR-QOL was consistent with the ADM model, in which pain is thought to trigger attachment-related processes including pain self-efficacy, which in turn influences pain coping, which affects adjustment to pain. These findings provide further support for the theory that individuals with anxious attachment generally perceive themselves as lacking the ability to cope effectively with pain. These low appraisals of pain self-efficacy may lead anxiously attached individuals to utilize passive strategies for coping with pain, which in turn may compromise their mental and physical health.

Unexpectedly, pain threat appraisal was not significantly related to attachment anxiety in our model. This finding differs from the results of previous studies showing that anxiously attached individuals are more likely to perceive pain as highly threatening.[16,20,28] It is possible that our study lacked the statistical power to detect this effect.

It is of note that age did not significantly moderate the effect of attachment anxiety on any of our other study variables. This suggests that the effect of attachment anxiety on pain appraisals, pain self-efficacy, coping, and HR-QOL may be similar for older adolescents and young adults. Studies with larger and more diverse samples are needed to further explore the relationship between attachment, coping, and health over the lifespan.

One strength of our study is the use of structural equation modeling. Structural equation modeling is a very general and powerful multivariate technique. Compared with multiple regression, it allows for more flexible assumptions, the use of latent variables to reduce the effects of measurement error, the testing of whole models in addition to individual coefficients, and the testing of models with multiple dependent variables. To our knowledge, this study is the first to use structural equation modeling to assess the potential role of pain appraisal and coping in the impact of attachment on physical and mental health.

One limitation of the study is the cross-sectional nature of the data, which limits what we can conclude about causality. Demonstration of mediation requires measurement over time to demonstrate that the relationships within the mediation model unfold in the predicted way over time. However, a recent study found that attachment assessed in infancy prospectively predicts physical health 30 years later,[11] consistent with our observed effects and their proposed direction. Furthermore, results of at least 2 longitudinal studies[58,59] support Bowlby's proposition that attachment is fairly stable across the lifespan. However, research has shown that stressful life events increase the likelihood that an individual with secure attachment will transition to insecure attachment later in development.[60] Pediatric chronic pain is known to be stressful for both children and parents[61,62] and stressed parents are less able to consistently provide the support required for the development and maintenance of secure attachment.[63] 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 (ie, 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 (eg, higher pain threat), lower self-efficacy, and withdrawal (eg, 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.[64,65]

A second limitation is the self-report of health outcomes. Future studies assessing health using objective health measurements would be useful. A third limitation is our low yield of participants. Participants with a completed attachment measure, compared with those without the

measure, were significantly younger and had better mental and physical functioning. Therefore, our results may not generalize to older adults or those with more impaired functioning. A fourth limitation is the relative 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. 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 with others. Chronic pain is notoriously difficult to treat.[66–68] A good patient-provider relationship is essential for successful treatment,[69–74] yet many of these relationships are fraught 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. 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 important 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.

REFERENCES

1. Bowlby J. *Attachment and Loss: Attachment*. New York, NY: Basic Books; 1969.
2. Bowlby J. *Attachment and Loss: Separation*. New York, NY: Basic Books; 1973.
3. Bowlby J. *Attachment and Loss: Loss, Sadness, and Depression*. New York, NY: Basic Bookis; 1980.
4. Porter LS, Davis D, Keefe FJ. Attachment and pain: recent findings and future directions. *Pain*. 2007;128:195–198.
5. Mikulincer M, Shaver PR. *Attachment in Adulthood: Structure, Dynamics, and Change*. New York: Guilford Press; 2010.
6. Bifulco A, Moran PM, Ball C, et al. Adult attachment style. I: its relationship to clinical depression. *Soc Psychiatry Psychiatr Epidemiol*. 2002;37:50–59.
7. Currier J, Holland J, Allen D. Attachment and mental health symptoms among US Afghanistan and Iraq veterans seeking health care services. *J Trauma Stress*. 2012;25:633–640.
8. Feeney JA, Ryan SM. Attachment style and affect regulation: relationships with health behavior and family experiences of illness in a student sample. *Health Psychol*. 1994;13:334–345.
9. Tremblay I, Sullivan MJ. Attachment and pain outcomes in adolescents: the mediating role of pain catastrophizing and anxiety. *J Pain*. 2010;11:160–171.
10. Ciechanowski PS, Walker EA, Katon WJ, et al. Attachment theory: a model for health care utilization and somatization. *Psychosom Med*. 2002;64:660–667.
11. Puig J, Englund MM, Simpson JA, et al. Predicting adult physical illness from infant attachment: a prospective longitudinal study. *Health Psychol*. 2013;32:409–417.
12. Tacon AM. Attachment experiences in women with breast cancer. *Fam Community Health*. 2003;26:147–156.
13. Jaremka LM, Glaser R, Loving TJ, et al. Attachment anxiety is linked to alterations in cortisol production and cellular immunity. *Psychol Sci*. 2013;24:272–279.
14. Picardi A, Miglio R, Tarsitani L, et al. Attachment style and immunity: a 1-year longitudinal study. *Biol Psychol*. 2013; 92:353–358.
15. McWilliams L, Cox B, Enns M. Impact of adult attachment styles on pain and disability associated with arthritis in a nationally representative sample. *Clin J Pain*. 2000;16: 360–364.
16. Meredith P, Strong J, Feeney J. The relationship of adult attachment to emotion, catastrophizing, control, threshold and tolerance, in experimentally-induced pain. *Pain*. 2006;120:44–52.
17. Schmidt S, Strauss B, Braehler E. Subjective physical complaints and hypochondriacal features from an attachment theoretical perspective. *Psychol Psychother*. 2002;75(pt 3):313–332.
18. Mikail S, Henderson PR, Tasca GA. An interpersonally based model of chronic pain: an application of attachment theory. *Clin Psychol Rev*. 1994;14:1–16.
19. Lefebvre JC, Keefe FJ, Affleck G, et al. The relationship of arthritis self-efficacy to daily pain, daily mood, and daily pain coping in rheumatoid arthritis patients. *Pain*. 1999;80:425–435.
20. Ciechanowski P, Sullivan M, Jensen M, et al. The relationship of attachment style to depression, catastrophizing and health care utilization in patients with chronic pain. *Pain*. 2003;104:627–637.
21. Davies KA, Macfarlane GJ, McBeth J, et al. Insecure attachment style is associated with chronic widespread pain. *Pain*. 2009;143:200–205.
22. Meredith PJ, Strong J, Feeney JA. The relationship of adult attachment to emotion, catastrophizing, control, threshold and tolerance, in experimentally-induced pain. *Pain*. 2006;120:44–52.
23. Meredith P, Strong J, Feeney J. Adult attachment, anxiety and pain self-efficacy as predictors of pain intensity and disability. *Pain*. 2006;123:146–154.
24. Strahl C, Kleinknecht RA, Dinnel DL. The role of pain anxiety, coping, and pain self-efficacy in rheumatoid arthritis patient functioning. *Behav Res Ther*. 2000;38:863–873.
25. Jones GT, Johnson RE, Wiles NJ, et al. Predicting persistent disabling low back pain in general practice: a prospective cohort study. *Br J Gen Pract*. 2006;56:334–341.
26. Mercado AC, Carroll LJ, Cassidy JD, et al. Passive coping is a risk factor for disabling neck or low back pain. *Pain*. 2005;117:51–57.
27. Walker LS, Smith CA, Garber J, et al. Testing a model of pain appraisal and coping in children with chronic abdominal pain. *Health Psychol*. 2005;24:364–374.
28. Meredith P, Ownsworth T, Strong J. A review of the evidence linking adult attachment theory and chronic pain: presenting a conceptual model. *Clin Psychol Rev*. 2008;28:407–429.
29. Lazarus RS, Folkman S. *Stress, Appraisal, and Coping*. New York: Springer Publishing Company; 1984.
30. Monroe SM, Kelley JM. Measurement of stress appraisal. In: Cohen S, Kessler R, Gordon L, eds. *Measuring Stress: A Guide for Health and Social Scientists*. New York: Oxford University Press; 1995:122–147.
31. Folkman S, Lazarus RS. An analysis of coping in a middle-aged community sample. *J Health Soc Behav*. 1980;21:219–239.
32. Forsythe CJ, Compas BE. Interaction of cognitive appraisals of stressful events and coping: testing the goodness of fit hypothesis. *Cognit Ther Res*. 1987;11:473–485.
33. Vlaeyen JW, Linton SJ. Fear-avoidance and its consequences in chronic musculoskeletal pain: a state of the art. *Pain*. 2000;85:317–332.
34. Turk DC, Dworkin RH, Allen RR, et al. Core outcome domains for chronic pain clinical trials: IMMPACT recommendations. *Pain*. 2003;106:337–345.

35. Gatchel RJ, Peng YB, Peters ML, et al. The biopsychosocial approach to chronic pain: scientific advances and future directions. *Psychol Bull*. 2007;133:581–624.
36. Walker LS, Dengler-Crish CM, Rippel S, et al. Functional abdominal pain in childhood and adolescence increases risk for chronic pain in adulthood. *Pain*. 2010;150:568–572.
37. Bruehl S, Dengler-Crish CM, Smith CA, et al. Hypoalgesia related to elevated resting blood pressure is absent in adolescents and young adults with a history of functional abdominal pain. *Pain*. 2010;149:57–63.
38. Dengler-Crish CM, Bruehl S, Walker LS. Increased wind-up to heat pain in women with a childhood history of functional abdominal pain. *Pain*. 2011;152:802–808.
39. Dengler-Crish CM, Horst SN, Walker LS. Somatic complaints in childhood functional abdominal pain are associated with functional gastrointestinal disorders in adolescence and adulthood. *J Pediatr Gastroenterol Nutr*. 2011;52:162–165.
40. Sherman AL, Bruehl S, Smith CA, et al. Individual and additive effects of mothers' and fathers' chronic pain on health outcomes in young adults with a childhood history of functional abdominal pain. *J Pediatr Psychol*. 2013;38:365–375.
41. Walker LS, Sherman AL, Bruehl S, et al. Functional abdominal pain patient subtypes in childhood predict functional gastrointestinal disorders with chronic pain and psychiatric comorbidities in adolescence and adulthood. *Pain*. 2012;153:1798–1806.
42. Walker L, Garber J, Smith C, et al. The relation of daily stressors to somatic and emotional symptoms in children with and without recurrent abdominal pain. *J Consult Clin Psychol*. 2001;69:85–91.
43. Brennan K, Clark PR, Shaver PR. Self-report measurement of adult attachment: An integrative overview. In: JASWS Rholes, ed. *Attachment Theory and Close Relationships*. New York: The Guilford Press; 1998:46–76.
44. Fraley RC, Waller NG, Brennan KA. An item response theory analysis of self-report measures of adult attachment. *J Pers Soc Psychol*. 2000;78:350–365.
45. Ware JE Jr, Sherbourne CD. The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. *Med Care*. 1992;30:473–483.
46. McHorney C, Ware J Jr, Lu J, et al. The MOS 36-item Short-Form Health Survey (SF-36): III. Tests of data quality, scaling assumptions, and reliability across diverse patient groups. *Med Care*. 1994;32:40–66.
47. Jenkinson C, Wright L, Coulter A. Criterion validity and reliability of the SF-36 in a population sample. *Qual Life Res*. 1994;3:7–12.
48. Anderson J, Acra S, Bruehl S, et al. Relation between clinical symptoms and experimental visceral hypersensitivity in pediatric patients with functional abdominal pain. *J Pediatr Gastroenterol Nutr*. 2008;47:309–315.
49. Langer SL, Walker LS, Romano JM, et al. Predictors of maternal responses to child abdominal pain. *Child Health Care*. 2007;36:63–81.
50. Levy RL, Langer SL, Walker LS, et al. Cognitive-behavioral therapy for children with functional abdominal pain and their parents decreases pain and other symptoms. *Am J Gastroenterol*. 2010;105:946–956.
51. Lipsitz JD, Gur M, Albano AM, et al. A psychological intervention for pediatric chest pain: development and open trial. *J Dev Behav Pediatr*. 2011;32:153–157.
52. Walker LS, Baber KF, Garber J, et al. A typology of pain coping strategies in pediatric patients with chronic abdominal pain. *Pain*. 2008;137:266–275.
53. Sullivan M, Bishop SR, Pivik J. The Pain Catastrophizing Scale: development and validation. *Psychol Assess*. 1995;7:524.
54. Osman A, Barrios FX, Gutierrez PM, et al. The Pain Catastrophizing Scale: further psychometric evaluation with adult samples. *J Behav Med*. 2000;23:351–365.
55. Walker L, Smith CA, Garber J, et al. Development and validation of the Pain Response Inventory for children. *Psychol Assess*. 1997;9:392–405.
56. Muthén LK, Muthén BO. *Mplus User's Guide (Version 6)*. Los Angeles: Muthén & Muthén; 1998-2010.
57. Browne MW, Cudeck R. Alternative ways of assessing model fit. *Sociological Methods Res*. 1992;21:230–258.
58. Hamilton CE. Continuity and discontinuity of attachment from infancy through adolescence. *Child Dev*. 2000;71:690–694.
59. Waters E, Merrick S, Treboux D, et al. Attachment security in infancy and early adulthood: a twenty-year longitudinal study. *Child Dev*. 2000;71:684–689.
60. McConnell M, Moss E. Attachment across the life span: factors that contribute to stability and change. *Australian J Educ Dev Psychol*. 2011;11:60–77.
61. Eccleston C, Crombez G, Scotford A, et al. Adolescent chronic pain: patterns and predictors of emotional distress in adolescents with chronic pain and their parents. *Pain*. 2004;108:221–229.
62. van Tilburg MA, Venepalli N, Ulshen M, et al. Parents' worries about recurrent abdominal pain in children. *Gastroenterol Nurs*. 2006;29:50–55; quiz 56-57.
63. Webster-Stratton C. Stress: a potential disruptor of parent perceptions and family interactions. *J Clin Child Psychol*. 1990;19:302–312.
64. Bursch B, Walco GA, Zeltzer LK. Clinical assessment of chronic pain and pain-associated disability syndrome. *J Dev Behav Pediatr*. 1998;19:45–53.
65. Hyman PE, Bursch B, Sood M, et al. Visceral pain-associated disability syndrome: a descriptive analysis. *J Pediatr Gastroenterol Nutr*. 2002;35:663–668.
66. Dixon-Woods M, Critchley S. Medical and lay views of irritable bowel syndrome. *Fam Pract*. 2000;17:108–113.
67. Kolb LC. Attachment behavior and pain complaints. *Psychosomatics*. 1982;23:413–425.
68. Matthias MS, Parpart AL, Nyland KA, et al. The patient-provider relationship in chronic pain care: providers' perspectives. *Pain Med*. 2010;11:1688–1697.
69. Drossman DA. The functional gastrointestinal disorders and the Rome III process. *Gastroenterology*. 2006;130:1377–1390.
70. Farin E, Gramm L, Schmidt E. The patient-physician relationship in patients with chronic low back pain as a predictor of outcomes after rehabilitation. *J Behav Med*. 2013;36:246–258.
71. Ilnyckyj A, Graff LA, Blanchard JF, et al. Therapeutic value of a gastroenterology consultation in irritable bowel syndrome. *Aliment Pharmacol Ther*. 2003;17:871–880.
72. Owens DM, Nelson DK, Talley NJ. The irritable bowel syndrome: long-term prognosis and the physician-patient interaction. *Ann Intern Med*. 1995;122:107–112.
73. Stewart M, Brown JB, Donner A, et al. The impact of patient-centered care on outcomes. *J Fam Pract*. 2000;49:796–804.
74. Vowles KE, Thompson M. The patient-provider relationship in chronic pain. *Curr Pain Headache Rep*. 2012;16:133–138.