Associations Between Adult Attachment Ratings and Health Conditions: Evidence From the National Comorbidity Survey Replication

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Objective: Attachment insecurity has been hypothesized to be a risk factor for the development of disease and chronic illness. This study was the first to investigate associations between adult attachment ratings and a wide range of health conditions. ***Design:*** Cross-sectional data from the National Comorbidity Survey Replication ($N = 5645$) were used. ***Measures:*** Participants completed Hazan and Shaver's (1987) measure of adult attachment and provided reports regarding 15 health conditions. ***Results:*** Logistic regression analyses that adjusted for demographic variables indicated that avoidant attachment ratings were positively associated with conditions defined primarily by pain (e.g., frequent or severe headaches). Anxious attachment ratings were positively associated with a wider range of health conditions, including several involving the cardiovascular system (i.e., stroke, heart attack, high blood pressure). Secure attachment ratings were unrelated to the health conditions. Additional analyses investigated whether the attachment ratings accounted for unique variance in the health conditions beyond that accounted for by lifetime histories of depressive, anxiety, and alcohol- or substance-related disorders. In these analyses, anxious attachment ratings continued to have significant positive associations with chronic pain, stroke, heart attack, high blood pressure, and ulcers. ***Conclusion:*** The findings were generally supportive of the theory that insecure attachment is a risk factor for the development of disease and chronic illness, particularly conditions involving the cardiovascular system. Further research regarding the role of attachment in the development of specific health conditions is warranted.

Keywords: attachment theory, cardiovascular disease, pain, ulcer, psychopathology

Attachment theory (Bowlby, 1969) has been a major influence in social and developmental research over the past few decades (Roisman et al., 2007). In short, it posits an evolutionarily based system designed to ensure infants maintain proximity to caregivers during times of threat. On the basis of interactions with primary caregivers, children are thought to develop enduring cognitive schemas that continue into adulthood and guide behavior and expectations in other relationships. Responsive caregiving tends to result in the development of comfort with interpersonal closeness and a willingness to depend on others, which is referred to as *secure attachment.* Insecure attachment develops in response to inconsistent or unresponsive caregiving and can involve a tendency to be anxious regarding possible rejection, discomfort with close relationships, or both. Two approaches to adult attachment research have evolved (Bartholomew & Shaver, 1998). The developmental approach has used the Adult Attachment Interview to infer states of mind regarding childhood experiences with caregivers. The second approach was developed within social and personality research and uses self-report measures of attachment-related thoughts and feelings in adult relationships (e.g., degree of anxiety and avoidance). Health-related research regarding attachment has relied almost exclusively on self-report measures of adult

attachment, which involve ratings of particular attachment styles (Hazan & Shaver, 1987), or scales assessing attachment dimensions (Bartholomew & Horowitz, 1991) thought to underlie attachment styles.

Attachment theory has increasingly been applied to understanding disease and chronic illness. Much of this work has been based on a pathoplasty model (Clark, Watson, & Mineka, 1994) that suggests that a variable (viz., insecure attachment) influences the expression or course of a disorder. For example, using a mail survey of patients with diabetes, Ciechanowski et al. (2004) found evidence that self-reports of insecure attachment were associated with poorer diabetes self-management (e.g., lower adherence to recommendations related to diet, exercise, foot care, oral hypoglycemic medications, and smoking) and negative outcomes (e.g., elevated glycosylated hemoglobin levels). This research did not address the question of causality but rather suggested that attachment influences coping responses to diabetes and possibly the disorder's severity. Similarly, in the context of chronic pain, ratings of insecure adult attachment have been found to be positively associated with disability levels (McWilliams, Cox, & Enns, 2000) and with depressive symptoms (Ciechanowski, Sullivan, Jensen, Romano, & Summers, 2003; Meredith, Strong, & Feeney, 2007).

Predisposition models posit that vulnerability factors play a causal role in the development of a disorder (Clark et al., 1994). Related to this model, Maunder and Hunter (2001) delineated three mechanisms that could lead those with insecure attachment to have elevated rates of disease. First, those with insecure attachment have an increased susceptibility to stress, such as the tendency to perceive more stress and have more extreme physiological re-

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sponses to stress. Second, those with insecure attachment have a greater tendency to use external methods of regulating affect, such as substance use and food consumption, which could lead to health problems. Finally, those with insecure attachment have less effective help-seeking behavior, such as the underuse of social support and difficulties using medical assistance effectively. This model has growing support. For example, self-reports of attachment avoidance have been found to be associated with altered autonomic functioning (Maunder, Lancee, Nolan, Hunter, & Tannenbaum, 2006). However, it is important to note that these mechanisms could play a role in both the development of a disorder and adjustment to that disorder. For example, an unwillingness to follow medical recommendations regarding diet and exercise would be expected to influence the development of conditions, such as heart disease and diabetes, and adjustment to these conditions.

Although a growing body of research clearly supports the possibility that insecure attachment could be a risk factor for a variety of health conditions, a paucity of research has investigated the hypothesis that those with insecure attachment actually experience more disease or illness. One small study (Tacón, 2003) did find that women with a history of breast cancer ($N = 52$) had higher scores on a measure of attachment avoidance relative to a control sample of women with no history of breast cancer ($N = 52$). Aside from this study, no other published research exists regarding associations between adult attachment and health conditions.

In this study, we used data from the National Comorbidity Survey Replication (NCS–R; Kessler & Merikangas, 2004) to investigate associations between attachment and 15 health conditions. The NCS–R was a large investigation of the prevalence and correlates of psychiatric disorders in the general U.S. civilian population. Most of the NCS–R interview involved the administration of a comprehensive diagnostic interview based on criteria of the fourth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (*DSM–IV*; American Psychiatric Association, 1994). However, a large subsample used in the present study ($N = 5,692$) was also administered a series of questions regarding lifetime histories of health problems and completed ratings of attachment. The attachment measure was based on Hazan and Shaver's (1987) original self-report measure of adult attachment that includes single-item ratings of secure, avoidant, and anxious attachment. The NCS–R does have some methodological limitations, such as a cross-sectional design and the use of brief measures of attachment and health conditions. Nonetheless, it provides a rare opportunity to investigate attachment and a wide range of health conditions in a community sample representative of the U.S. adult population.

Research with nonclinical samples has suggested that both attachment anxiety and avoidance may influence physiological responses to stress that could determine later health outcomes. For example, Gallo and Matthews (2006) found that in conjunction with particular social interactions, both forms of insecurity were associated with ambulatory blood pressure readings obtained from adolescents. During blood pressure monitoring periods involving recent or current interactions with friends, attachment anxiety was associated with augmented diastolic and systolic blood pressure. During periods involving social conflict, avoidance was associated with augmented diastolic blood pressure. However, some studies have found only one type of insecure attachment to be related to

health-relevant variables. For example, lower natural killer cell cytotoxicity was found to be associated with avoidance but not with anxiety (Picardi et al., 2007). In light of these diverse findings, it was not possible to develop hypotheses regarding associations between specific attachment ratings and specific health conditions, so we simply hypothesized that attachment insecurity would be positively associated with the health conditions. Numerous studies have demonstrated that psychopathology is positively associated with both ratings of insecure attachment (e.g., Mickelson, Kessler, & Shaver, 1997) and a wide range of health conditions (Scott et al., 2007). Thus, it is possible that associations between attachment ratings and health conditions may simply be the result of the variance these variables share with psychopathology. A secondary goal of this study was to determine whether ratings of adult attachment account for unique variance in health conditions beyond that contributed by several forms of psychopathology.

Method

Participants and Procedures

We used Part 2 of the NCS–R public-use data set for this study. The NCS–R is a probability sample of the U.S. noninstitutionalized civilian population, age 18 or older, and reported a response rate of 70.9%. Administration of the interview consisted of two parts. Part 1 consisted primarily of a diagnostic assessment of psychiatric disorders and was administered to 9,282 participants. Part 2 included questions regarding potential risk factors and was administered to 5,692 respondents. The second group of respondents included all of the Part 1 respondents who reported a lifetime disorder along with a probability subsample of the others. A weighting procedure was used to adjust for differential probabilities of selection and nonresponse and to adjust the sample to reflect the U.S. population's demographics (sex, race, marital status, education, living arrangements, region, urbanicity). All analyses conducted in this study are based on Part 2 data and used these weights. Ethical approval for the primary data collection of the NCS was provided by the University of Michigan. Further details of the NCS–R methodology are available in Kessler, Berglund, et al. (2004). The interview materials described in the next section are available at http://www.hcp.med.harvard.edu/ncs/replication.php.

Measures

Demographic variables. Participants provided information regarding their demographic characteristics. This information was used to calculated odds ratios that adjusted for gender, marital status (e.g., never married, married, or divorced, separated, or widowed), race (e.g., Caucasian, Hispanic, Black, or other), age (e.g., 18–29, 30–44, 45–59, or 60 and above), and education level (0–11 years, 12 years, 13–15 years, 16-plus years).

Attachment style. Adult attachment style was measured by presenting Hazan and Shaver's (1987) attachment style measure in an interview format. It included brief statements describing adult versions of the three attachment styles (secure, avoidant, and anxious) originally identified in children (Ainsworth, Blehar, Waters, & Wall, 1978). Secure attachment was assessed with this statement: "I find it relatively easy to get close to other people. I am comfortable

depending on others and having them depend on me. I don't worry about being abandoned or about someone getting too close to me." Avoidant attachment was assessed with the statement "I am somewhat uncomfortable being close to others; I find it difficult to trust them completely and difficult to depend on them. I am nervous when anyone gets too close to me." Anxious attachment was assessed with the statement "I find that others are reluctant to get as close as I would like. I often worry that people who I care about do not love me or won't want to stay with me. I want to merge completely with another person, and this desire sometimes scares people away." Similar to Shaver and Brennan's (1992) modification of this measure, each respondent provided a self-rating on each of these statements using a 4-point scale ranging from 1 (*not at all like me*) to 4 (*a lot like me*).

Chronic health conditions. Lifetime experiences with chronic conditions were measured using a yes–no format. Seven questions assessed the participants in terms of lifetime histories of arthritis, chronic back or neck problems, frequent or severe headaches, other forms of chronic pain, seasonal allergies, stroke, and heart attack. The remaining eight questions asked whether participants had ever been told by their doctor that they had the health problem (i.e., "Did a doctor or other health professional ever tell you that you had any of the following illnesses: heart disease?"). These questions assessed the participants in terms of lifetime histories of heart disease, high blood pressure, asthma, chronic lung disease, diabetes or high blood sugar, ulcers, epilepsy or seizures, and cancer.

Psychiatric disorders. The World Health Organization Composite International Diagnostic Interview (CIDI; Robins et al., 1988) was used to assess a wide range of *DSM–IV* (American Psychiatric Association, 1994) disorders. The CIDI is a fully structured lay-administered diagnostic interview. In this study, we used composite variables representing lifetime histories of depressive disorders (major depressive disorder and dysthymia), anxiety disorders (generalized anxiety disorder, panic disorder, agoraphobia, social phobia, simple phobia, and posttraumatic stress disorder), and alcohol- and substance-related disorders (alcohol abuse, alcohol dependence, substance abuse, and substance dependence). A clinical reappraisal study supportive of the CIDI's validity (Kessler, Abelson et al., 2004) found good concordance between CIDI diagnoses and the research nonpatient version of the Structured Clinical Interview for *DSM–IV* (First, Spitzer, Williams, & Gibbon, 1995).

Results

Because of the complex sample design and weighting, all analyses were calculated using STATA (StataCorp, College Station, TX), which used the Taylor series linearization method and the stratification and weighting information available in the NCS–R data to factor design effects into its variance estimates. Given the large number of analyses, we used a critical p value of .01 (two-tailed) to reduce the chance of Type I error.

A small number of participants ($n = 47$) did not complete each attachment rating and were excluded from all analyses, resulting in a final sample of 5,645. Secure attachment was rated most strongly by the participants ($M = 2.90$, 95% CI [2.86–2.93]), followed by avoidant attachment ($M = 1.77$, 95% CI [1.74–1.81]) and anxious attachment ($M = 1.31$, 95% CI [1.28–1.33]). Secure ratings were negatively associated with the avoidant ($r = -.29$, $p < .001$) and anxious ($r = -.07$, $p < .001$) ratings. The two insecure ratings were positively associated with each other ($r = .34$, $p < .001$). The number of participants reporting each of the 15 health conditions are also reported in Table 1. The most common conditions were seasonal allergies (37.6%), chronic back or neck problems (29.3%), arthritis (27.%), and high blood pressure (24.0%).

We used logistic regression analyses to determine whether the attachment ratings were associated with each health condition. The

Table 1
Bivariate and Multivariate Associations Between Attachment Ratings and Health Conditions (N = 5645)

Health condition[a]	Secure		Avoidant		Anxious	
	OR	Adjusted OR	OR	Adjusted OR	OR	Adjusted OR
Arthritis (1,531)	0.94 [0.87–1.03]	0.94 [0.85–1.03]	1.10 [1.00–1.21]	1.15 [1.04–1.28]*	1.06 [0.96–1.18]	1.07 [0.93–1.23]
Back or neck problem (1,651)	0.89 [0.83–0.96]*	0.91 [0.84–0.98]	1.19 [1.10–1.28]**	1.16 [1.08–1.25]**	1.13 [1.03–1.24]*	1.08 [0.98–1.19]
Headaches (1,275)	0.88 [0.81–0.95]*	0.91 [0.83–1.00]	1.23 [1.16–1.31]**	1.14 [1.04–1.24]*	1.32 [1.19–1.47]**	1.27 [1.10–1.47]*
Other chronic pain (546)	0.97 [0.88–1.07]	1.02 [0.91–1.14]	1.26 [1.14–1.38]**	1.19 [1.07–1.32]*	1.39 [1.23–1.56]**	1.31 [1.14–1.51]**
Allergies (2,127)	1.02 [0.96–1.08]	1.00 [0.93–1.08]	1.07 [0.99–1.16]	1.10 [1.00–1.21]	0.94 [0.85–1.04]	0.96 [0.85–1.08]
Stroke (150)	0.86 [0.72–1.03]	0.86 [0.71–1.05]	1.05 [0.86–1.29]	0.93 [0.74–1.17]	1.41 [1.11–1.80]*	1.55 [1.17–2.05]*
Heart attack (207)	1.03 [0.83–1.28]	1.06 [0.86–1.31]	1.20 [1.00–1.43]	1.12 [0.92–1.36]	1.43 [1.10–1.87]*	1.47 [1.13–1.91]*
Heart disease (281)	1.00 [0.83–1.19]	0.97 [0.80–1.19]	1.12 [0.97–1.28]	1.17 [0.99–1.38]	1.03 [0.88–1.20]	1.05 [0.85–1.32]
High blood pressure (1,349)	1.00 [0.92–1.08]	1.00 [0.91–1.10]	1.06 [0.98–1.15]	1.06 [0.96–1.18]	1.19 [1.07–1.32]*	1.29 [1.13–1.46]**
Asthma (653)	1.03 [0.94–1.13]	1.10 [1.00–1.20]	1.12 [1.01–1.25]	1.09 [0.98–1.22]	1.20 [1.03–1.41]	1.13 [0.95–1.33]
Lung disease (124)	0.92 [0.74–1.14]	0.97 [0.81–1.16]	1.17 [0.97–1.40]	1.06 [0.84–1.32]	1.39 [1.08–1.79]	1.32 [0.94–1.86]
High blood sugar (406)	0.89 [0.77–1.02]	0.89 [0.78–1.02]	1.06 [0.91–1.24]	1.03 [0.89–1.20]	1.14 [0.95–1.38]	1.17 [0.94–1.47]
Ulcer (526)	0.90 [0.81–1.01]	0.91 [0.80–1.02]	1.17 [1.08–1.27]**	1.06 [0.95–1.17]	1.36 [1.23–1.50]**	1.35 [1.17–1.54]**
Seizures (99)	0.89 [0.74–1.07]	0.98 [0.78–1.22]	1.21 [0.97–1.52]	1.10 [0.87–1.38]	1.27 [1.02–1.59]	1.11 [0.88–1.39]
Cancer (371)	1.22 [1.11–1.33]**	1.13 [1.01–1.27]	0.96 [0.82–1.11]	1.08 [0.91–1.27]	0.93 [0.78–1.10]	1.06 [0.86–1.31]

Note. Odds ratios (OR) were adjusted for gender, marital status, education level, race, age, and the other attachment style ratings; 95% confidence intervals are included in brackets.
[a] Numbers in parentheses indicate the number of participants reporting each health condition.
* $p < .01$. ** $p < .001$.

first set of analyses investigated bivariate associations between each attachment rating and each health condition. The odds ratios from these analyses are presented in Table 1. Eight of the health conditions were associated with at least one attachment variable. Ratings of secure attachment were positively associated with cancer and negatively associated with chronic back or neck problems and headaches. Ratings of avoidant attachment were positively associated with chronic back and neck problems, frequent or severe headaches, other forms of chronic pain, and ulcers. Ratings of anxious attachment were positively associated with chronic back or neck problems, frequent or severe headaches, other forms of chronic pain, stroke, heart attack, high blood pressure, and ulcers.

The second set of analyses adjusted for (i.e., included as independent variables) demographic variables including gender, marital status, race, age, and education level. The demographic variables selected were similar to those used in numerous previous studies using the NCS–R data set. The second set of analyses also simultaneously entered the three attachment ratings into the logistic regression analyses. This approach was designed to investigate whether the attachment ratings could account for unique variance in the health conditions after accounting for (a) demographic variables that could be confounded with either attachment ratings or the health conditions and (b) responses to the other attachment ratings. The odds ratios from these analyses are also presented in Table 1. In these multivariate analyses, eight of the health conditions were associated with at least one attachment variable. Ratings of secure attachment were not significantly associated with any of the health conditions. Ratings of avoidant attachment were positively associated with arthritis, back and neck problems, headaches, and other chronic pain. Ratings of anxious attachment were positively associated with headaches, other chronic pain, stroke, heart attack, high blood pressure, and ulcer.

In several cases, the findings of the multivariate analyses were inconsistent with those of the bivariate analyses. In most cases, associations that were initially significant were no longer significant after adjusting for the demographic variables (i.e., the association between anxious attachment ratings and back or neck pain). The association between avoidant attachment ratings and arthritis was the only one in which a statistically significant finding was obtained after adjusting for the demographic variables. Detailed examination of the findings from this multivariate logistic regression analysis indicated that women were more likely to report arthritis (OR = 1.41, 95% CI [1.16–1.73], $p = .001$) and that age, marital status, and education level were also related to arthritis. In terms of age, the youngest group was treated as the reference group. Relative to the 18- to 29-year-olds, those in the 30–44 age group (OR = 2.36, 95% CI [1.70–3.30], $p < .001$), the 45–59 age group (OR = 8.72, 95% CI [5.60–13.56], $p < .001$), and the 60 and older age group (OR = 16.08, 95% CI [10.29–25.12], $p < .001$) were all found to have a significantly increased adjusted odds of having arthritis. For marital status, the married group was treated as the reference category and those who were divorced, separated, or widowed were more likely to report arthritis (OR = 1.38, 95% CI [1.11–1.73], $p = .005$). For education, those with 12 years of education were the reference group. Fewer than 12 years of education was positively associated with arthritis (OR = 1.50, 95% CI [1.19–1.91], $p = .001$) and 16 or more years of education was negatively associated with arthritis (OR = .58, 95% CI

[0.47–0.70], $p < .001$). As noted earlier and reported in Table 1, avoidant attachment ratings were also associated with arthritis. This pattern of findings indicates that an association between ratings of avoidant attachment and arthritis exists but that it is only observable after accounting for several demographic variables also associated with arthritis.

Also noteworthy were that the bivariate findings regarding cancer were in the direction opposite to expectations. In the case of the insecure ratings, these findings were not statistically significant. However, secure attachment did have a positive and statistically significant association with cancer. After adjusting for the demographic variables, this positive association was only marginally significant (OR = 1.13, 95% CI [1.01–1.27], $p = .034$). Because this finding was so counterintuitive, we explored it in more detail. In the multivariate analyses, we found age, race, and marital status to be associated with cancer. Relative to the 18–29 age group, being in the 30–44 age group had a marginally significant association with cancer (OR = 2.37, 95% CI [1.19–4.71], $p = .016$). The 45–59 age group (OR = 4.99, 95% CI [2.44–10.23], $p < .001$) and the 60 and older group (OR = 15.88, 95% CI [7.37–34.20], $p < .001$) both had a positive association with cancer. In terms of race, the Caucasian group was treated as the reference category and Black race was found to be negatively associated with cancer (OR = 0.38, 95% CI [0.21–0.71], $p < .01$). As well, relative to the married group, never being married had a marginal negative association with cancer (OR = 0.44, 95% CI [0.23–0.84], $p = .014$). It is possible that the initial significant positive association between secure attachment ratings and cancer was the result of a confound involving one or more of these demographic variables. Consistent with this possibility, secure attachment ratings had a small but significant positive association with age ($r = .06$, $p < .01$) and a negative association with Black race ($B = -.35$, $p < .001$) and never-married marital status ($B = -.17$, $p < .01$).

The second aim of the study was to determine whether the attachment ratings could account for unique variance in the health conditions beyond that accounted for by psychopathology. As a preliminary step, we investigated associations between each attachment rating and three forms of psychopathology. These findings are presented in Table 2. Secure attachment ratings were negatively associated with lifetime history of depressive disorders, anxiety disorders, and alcohol- and substance-related disorders. As expected, the two insecure attachment ratings had positive associations with each of these forms of psychopathology.

Table 2

Associations (Odds Ratios and 95% Confidence Intervals) Between Attachment Ratings and Three Types of Lifetime Psychiatric Disorders

Attachment ratings	Type of psychiatric disorder		
	Depressive	Anxiety	Alcohol and substance
Secure	0.86 [0.80–0.93]	0.80 [0.74–0.86]	0.82 [0.74–0.91]
Avoidant	1.48 [1.38–1.58]	1.68 [1.56–1.81]	1.51 [1.41–1.63]
Anxious	1.49 [1.33–1.66]	1.67 [1.49–1.88]	1.54 [1.41–1.68]

Note. All odds ratios were significant at $p < .001$.

Given that the attachment ratings shared variance with each form of psychopathology, it was appropriate to determine whether the attachment ratings could account for unique variance in the health conditions. We used additional multivariate analyses to investigate this possibility. These analyses adjusted for the same demographic variables as the earlier multivariate analyses and included three variables representing lifetime histories of depressive disorders, anxiety disorders, and alcohol- and substance-related disorders. The dependent variables were the conditions positively associated with the attachment ratings in the earlier multivariate analyses. The first set of these analyses included the pain-related conditions and are reported in Table 3. The depressive and anxiety disorder variables were positively associated with each pain condition. The alcohol- and substance-related disorders variable was only associated with chronic back or neck problems. In the earlier analyses, avoidant attachment ratings, anxious attachment ratings, or both were positively associated with the pain conditions, but in these analyses the only significant finding regarding attachment was the positive association between anxious attachment and other forms of chronic pain.

The second set of analyses adjusting for lifetime psychiatric disorders included three health conditions involving the cardiovascular system as the dependent variables. These findings are reported in Table 4. Lifetime history of an anxiety disorder had a significant positive association with high blood pressure, but the psychiatric disorder variables were not otherwise significantly associated with the cardiovascular conditions. In the earlier multivariate analyses, ratings of anxious attachment had significant positive associations with stroke, heart attack, and high blood pressure, and these association remained significant in these analyses.

The final analysis included ulcers as the dependent variable. Depressive disorders (OR = 1.36, 95% CI [1.13–1.63], $p < .01$), anxiety disorders (OR = 1.55, 95% CI [1.21–2.00], $p < .01$), and alcohol- or substance-related disorders (OR = 1.50, 95% CI [1.13–1.99], $p < .01$) were all positively associated with ulcers. Anxious attachment ratings were positively associated with ulcers in the earlier analyses and continued to be associated with ulcers in the final analysis (OR = 1.27, 95% CI [1.12–1.44], $p < .001$). Also consistent with the earlier analyses, secure (OR = .92, 95% CI [.81–1.04], ns) and avoidant (OR = .98, 95% CI [.88–1.10], ns) attachment ratings were not significantly associated with ulcers.

Discussion

This study is the first to investigate associations between adult attachment ratings and a wide range of health conditions. Consistent with the study's general hypothesis, both the bivariate and the initial multivariate logistic regression analyses indicated that insecure attachment was positively associated with approximately half of the health conditions investigated.

We made no specific hypotheses regarding associations between the attachment ratings and particular health conditions. Relative to avoidant attachment, anxious attachment ratings were more strongly associated with poor health because they were associated with more health conditions, and these associations were generally larger than those involving avoidant attachment ratings. Beyond this, two other trends emerged. First, when considering the initial multivariate analyses, avoidant attachment ratings were significantly associated with only those conditions that primarily involve symptoms of pain (i.e., arthritis, back or neck problems, frequent or severe headaches, and other forms of chronic pain). In contrast, anxious attachment ratings were associated with a wider range of conditions. Second, anxious attachment ratings were associated with several conditions involving the cardiovascular system, including stroke, heart attack, and high blood pressure.

Previous research has already found insecure attachment ratings to be positively associated with physical symptoms (Feeney, 2000). The findings of this study go beyond these earlier findings by considering specific health conditions such as stroke, heart attack, high blood pressure, and seizures. However, it is important to note that some of the health conditions (e.g., back or neck problems) in this study overlap with those included in the physical symptom ratings used in earlier studies. As well, in some cases the distinction between a condition and symptoms is not clear. For example, "frequent or severe headaches" could have been endorsed by individuals with specific conditions, such as migraine, and by those who subjectively rated their headaches as severe or frequent.

A second aim of this study was to determine whether ratings of adult attachment account for unique variance in health conditions beyond that contributed by three forms of psychopathology. In the initial multivariate analyses regarding the four pain-related conditions, six significant positive associations involved insecure ratings of attachment. In the analyses that adjusted for lifetime histories of psychiatric disorders, only the association between anxious attach-

Table 3

Multivariate Odds Ratios (and 95% Confidence Intervals) From Logistic Regression Models Predicting Pain Conditions

	Pain conditions			
Select independent variables[a]	Arthritis	Back and neck problem	Headaches	Other chronic pain
Depressive disorders	1.28 [1.07–1.53]*	1.63 [1.43–1.84]**	1.98 [1.71–2.28]**	1.88 [1.49–2.38]**
Anxiety disorders	1.55 [1.27–1.89]**	1.61 [1.41–1.83]**	1.81 [1.49–2.19]**	1.63 [1.31–2.02]**
Alcohol- or substance-related disorders	1.18 [0.93–1.51]	1.50 [1.26–1.79]**	1.15 [0.95–1.40]	1.37 [1.01–1.86]
Secure attachment	0.95 [0.86–1.05]	0.92 [0.85–1.00]	0.94 [0.85–1.03]	1.04 [0.93–1.17]
Avoidant attachment	1.09 [0.99–1.21]	1.07 [0.99–1.16]	1.04 [0.94–1.14]	1.09 [0.97–1.21]
Anxious attachment	1.02 [0.89–1.16]	1.01 [0.92–1.10]	1.17 [1.03–1.34]	1.22 [1.06–1.40]*

[a] All analyses included independent variables to adjust for gender, marital status, education level, race, and age.
* $p < .01$.   ** $p < .001$.

Table 4
*Multivariate Odds Ratios (and 95% Confidence Intervals) From Logistic Regression Models
Predicting Cardiovascular Conditions*

Select independent variables[a]	Cardiovascular conditions		
	Stroke	Heart attack	High blood pressure
Depressive disorders	1.34 [0.97–1.87]	1.00 [0.67–1.48]	1.16 [0.91–1.48]
Anxiety disorders	1.45 [0.99–2.11]	1.20 [0.82–1.77]	1.44 [1.23–1.69][**]
Alcohol- or substance-related disorders	1.07 [0.60–1.90]	1.55 [1.02–2.35]	0.98 [0.86–1.13]
Secure attachment	0.86 [0.71–1.05]	1.07 [0.86–1.32]	1.01 [0.92–1.11]
Avoidant attachment	0.88 [0.70–1.11]	1.08 [0.88–1.33]	1.03 [0.92–1.14]
Anxious attachment	1.49 [1.11–1.99][*]	1.45 [1.11–1.91][*]	1.24 [1.09–1.41][*]

[a] All analyses included independent variables to adjust for gender, marital status, education level, race, and age.
[*] $p < .01$.   [**] $p < .001$.

ment and other forms of chronic pain remained statistically significant. These findings raise the possibility that psychopathology, particularly depressive and anxiety disorders, may mediate the relationship between insecure attachment and pain conditions. Given evidence that in many cases psychopathology develops subsequent to the onset of chronic pain (Fishbain, Cutler, Rosomoff, & Rosomoff, 1997) and the cross-sectional nature of the data, we did not test mediational models regarding attachment, psychopathology, and the pain conditions.

Neuroticism is a personality construct that refers to the tendency to experience negative affect. It is positively associated with exaggerated reporting of physical symptoms (Johnson, 2003), perceptions of poor health (Goodwin & Engstrom, 2002), and numerous health conditions included in the original NCS (Goodwin, Cox, & Clara, 2006). Ratings of avoidant and anxious attachment are also moderately associated with neuroticism (Mickelson et al., 1997; Shaver & Brennan, 1992). Given this overlap, it is possible that the associations between insecure attachment ratings and some of the health conditions could have been inflated because of a bias toward reporting or identifying symptoms. This issue is particularly relevant to the conditions defined by symptoms of pain. Unfortunately, the NCS–R did not include a measure of neuroticism, so we could not directly examine this possibility. However, neuroticism overlaps conceptually and empirically with the psychiatric disorders included in this study (see Enns & Cox, 1997), so adjusting for psychiatric disorders in this study could arguably be considered similar to adjusting for neuroticism. Thus, the initial positive associations between the insecure attachment ratings and the pain-related conditions may have been the result of their shared variance with neuroticism. Consistent with this possibility, all but one of the significant associations between insecure attachment ratings and the pain-related conditions were no longer significant after adjusting for the psychopathology variables.

The findings regarding the cardiovascular-related conditions were much different than those obtained regarding the pain-related conditions. First, the psychopathology variables were, with one exception, unrelated to the cardiovascular conditions. Second, the associations between anxious attachment ratings and each of these conditions remained significant after adjusting for psychopathology. Thus, anxious attachment had robust associations with these conditions that cannot be accounted for by shared variance with psychopathology. As noted earlier, anxious attachment is associ-

ated with elevated blood pressure during social interactions (Gallo & Matthews, 2006). It is possible that our findings regarding the cardiovascular-related conditions reflect the long-term health consequences of this relationship.

After ulcers were found to involve infectious disease, there was a rapid decline in research regarding the psychological aspects of this condition (Levenstein, 2000). However, several recent studies with large community samples (e.g., Goodwin, Keyes, Stein, & Talley, 2009; Goodwin & Stein, 2002) have found psychiatric disorders to be positively associated with ulcers. The present findings are consistent with this research and suggest that anxious attachment may also be an additional risk factor for ulcers. Levenstein (2000) suggested several psychophysical processes that could be involved in the development of ulcers, such as the effects of hypothalamic–pituitary–adrenal axis activation on healing, that bear similarity to the heightened physiological response to the stress mechanism that Maunder and Hunter (2001) hypothesized as a link between insecure attachment and poor health.

The study's cross-sectional design is one of its main limitations because it precluded the directions of the associations from being investigated. Although insecure attachment is theorized to lead to the onset of various health conditions, it is certainly possible that the experience of poor health could lead to relationship distress and heightened relationship insecurity. The cross-sectional design also has implications for interpreting several of the unexpected findings. Although not a focus of the study, the psychopathology variables were largely unrelated to the cardiovascular-related conditions. Previous longitudinal research has found positive associations between psychopathology and cardiovascular events including stroke (Jonas & Mussolino, 2000; Larson, Owens, Ford, & Eaton, 2001) and heart attacks (Rutledge et al., 2009). These studies captured incident cases including those resulting in death. In contrast, the cases captured in this study included only the survivors of such events who were able to participate in a community survey. Thus, a selection bias related to survival of these conditions may be responsible for the unexpected null findings regarding psychopathology and the cardiovascular-related conditions. It is also possible that the associations between the attachment ratings and the health conditions with high rates of mortality could have been attenuated as a result of such a selection bias. However, prospective studies would be required to clarify the

relationships among attachment, incident health conditions, survival, and adjustment to such health conditions.

One finding was opposite to what was hypothesized. In the bivariate analysis, secure attachment was positively associated with cancer. This positive finding became marginally significant ($p = .034$) in the multivariate analyses that adjusted numerous demographic variables. Given that this positive association was only marginally significant, not overinterpreting it is important. Nonetheless, this positive association may reflect a form of posttraumatic growth among those who have experienced cancer (see Costanzo, Ryff, & Singer, 2009). Alternatively, attachment may be unrelated to the development of cancer, but a positive association between secure attachment ratings and cancer could have emerged because those with secure attachment may be more likely to survive cancer and be captured in a cross-sectional survey of the general population. This explanation has strong potential because psychological distress is associated with insecure attachment (Mickelson et al., 1997) and appears to be a predictor of cancer prognosis (i.e., cancer mortality among those with a current cancer diagnosis or a history of cancer) rather than of incident cases of cancer (see Brown, Levy, Rosberger, & Edgar, 2003; Hamer, Chida, & Molloy, 2009).

We should note two other limitations. Self-reports of physician diagnoses are appropriate for conditions that can only be identified with diagnostic procedures, but they also pose methodological problems because there is evidence that diagnostic testing is influenced by patients' personality. For example, associations between neuroticism and self-reported high blood pressure appear to be the result of a confounding between neuroticism and exposure to medical attention that can increase the detection and awareness of this condition (Irvine, Garner, Olmstead, & Logan, 1989). Thus, it is possible that a similar process is responsible for the present finding of an association between anxious attachment and high blood pressure. A final limitation of the study is that attachment was assessed with ratings of three attachment styles. Theory (Bartholomew & Horowitz, 1991) and research (Fraley & Waller, 1998) have indicated that attachment is most appropriately conceptualized as involving two dimensions (anxiety or model of self and avoidance or model of others). The use of continuous measures of these two dimensions would have been ideal, but such measures were not available in the NCS–R. Despite the limitations noted here, the findings provide important preliminary support for Maunder and Hunter's (2001) model and indicate that further research examining the role of insecure attachment in the development of health conditions is warranted. The findings of earlier research on attachment and physiological responses to stress (Gallo & Matthews, 2006) and the present findings suggest that research regarding the role of anxious attachment in the development of cardiovascular-related conditions holds particular promise.

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