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Predicting Adult Physical Illness From Infant Attachment: A Prospective Longitudinal Study

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Objective: Recent epidemiological and longitudinal studies indicate that attachment relationships may be a significant predictor of physical health in adulthood. This study is among the few to *prospectively* link attachment classifications assessed in infancy to physical health outcomes 30 years later in adulthood, controlling for various health-related confounds. ***Methods:*** Participants were 163 individuals involved in a 32-year longitudinal study of risk and adaptation who have been followed since birth. Attachment classifications were assessed at ages 12 and 18 months using the Ainsworth Strange Situation Procedure. Stability of attachment security was derived from these assessments. At age 32, participants completed a questionnaire asking about the presence of or treatment for current physical illnesses. ***Results:*** Binary logistic regression analyses controlling for health-related confounds at age 32 indicated that individuals who were insecurely attached (i.e., anxious-resistant or anxious-avoidant) during infancy were more likely to report an inflammation-based illness in adulthood than those classified as securely attached during infancy. There also was a trend whereby individuals classified as anxious-resistant reported more nonspecific symptoms in adulthood than those classified as either anxious-avoidant or secure. Individuals who were continuously insecure during infancy were more likely to report all types of physical illness in adulthood. ***Conclusion:*** These findings reveal the lasting effect of early interpersonal relationships on physical health and suggests that infancy may be a fruitful point for prevention efforts. The widespread influence that attachment has on endogenous and exogenous health-related processes may make it particularly potent in the prevention of later physical health problems.

Keywords: infant attachment, physical illness, developmental antecedents, longitudinal study

Clinical and developmental psychologists have long assumed that early life experiences hold a privileged place in influencing later life outcomes (Sameroff, 2010; Sroufe, 1997). Although this framework is often associated with developmental precursors to psychopathology, it has been extended to the etiology of chronic diseases (e.g., Felitti et al., 1998; Shonkoff, Boyce, & McEwen, 2009). Researchers in medicine and psychology have suggested that developmental principles should be applied to the study of physical illnesses (e.g., Barker, Gluckman, Godfry, Harding, Owens, & Robinson, 1993; Boyce, 1985), but a lack of longitudinal data has prevented this framework from being tested (for an exception, see Friedman & Martin, 2011; Moffitt et al., 2010). The current longitudinal study was guided by a developmental approach (see Sroufe, Egeland, Carlson, & Collins, 2005) and examines how early parent–child attachment relationships may impact adult physical health outcomes 30 years later.

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The links between interpersonal functioning and health outcomes have long been established. Several large-scale epidemiological studies have revealed that not having social relationships is a significant risk factor for poor health, similar in magnitude to smoking, obesity, and chronic physical inactivity (House, Landis, & Umberson, 1988). Other findings (e.g., Christakis & Fowler, 2007) indicate that obesity spreads through social networks across geographical and interpersonal distance up to three 'degrees of separation' from target participants. Furthermore, the quality of close relationships, especially marital relationships, affects immune functioning, neuroendocrine functioning, and reactivity to stressful events, rendering individuals vulnerable to various diseases (Coan, Schaefer, & Davidson, 2006; Kiecolt-Glaser, Glaser, Cacioppo, & Malarkay, 1998). These and other studies indicate the significant impact that relationships can and do have on the health and well being of adults.

Researchers have also focused on the role of early adverse experiences in laying the foundations for adult physical illness. For example, the 'fetal origins hypothesis' states that maternal health and nutrition in the prenatal period send signals to the fetus about the relative harshness of world in which he or she will be born (Barker, 1995). Supporting this hypothesis, individuals with low birth weight (<5.5 lbs.) are more susceptible to diabetes and heart disease as adults than are individuals with typical birth weights (5.5–8.5 lbs; Barker et al., 1993; Roseboom et al., 2000). Other studies have found associations between adult health and adverse events in childhood and adolescence. The Adverse Childhood Experiences (ACE) Study retrospectively assessed abuse and

household dysfunction in adults who were receiving a standard medical evaluation. This study found a linear association between exposure to abuse and dysfunction before age 18 and the likelihood of having a physical illness in adulthood (Felitti et al., 1998).

Viewed together, these studies document associations between both early adverse experiences and health and the quality of relationships and health. However, little research has examined the links between the quality of *early* relationships and physical health in adulthood. Despite the fact that relationship functioning is an emergent process shaped by an individual's prior history of relationships (Ainsworth, 1989), virtually all of the existing research examining relationship functioning and health outcomes involves concurrent measures taken at one time-point. Furthermore, longitudinal studies of social functioning and health (e.g., Christakis & Fowler, 2007; House et al., 1988) only examine time periods in adulthood. Incorporating prospective assessments of relationship functioning from early in development may give us an unbiased understanding of how the quality of relationships in infancy influence adult health.

The advantages of adopting a developmental theory linking social functioning with physical illness were first noted by Boyce (1985), who proposed that the primary attachment relationship between caregiver and child should be foundational in affecting the quality of social functioning, which in turn should affect physical health during childhood (see also Bowlby, 1969). This early relationship serves as a secure base from which infants can explore the world as well as a safe haven when they are distressed, and it reflects the quality of care that infants have received during the first years of life (Ainsworth, Blehar, Waters, & Wall, 1978). According to attachment theory, the quality of early care that children receive is internalized and then shapes their social functioning in adulthood (Bowlby, 1973). Individuals who are securely attached during infancy have a history of receiving sensitive and appropriate care, which increases their confidence in their ability to both provide and receive sufficient care later in life (Waters, Merrick, Treboux, Crowell, & Albersheim, 2000). Individuals who are insecurely attached during infancy, in contrast, have received suboptimal care (i.e., either inconsistent care or rejection from caregivers). As a result, individuals with insecure histories have greater difficulty giving and/or receiving care in their adult relationships (Simpson & Rholes, 2012). Research suggests that infant attachment relationships are associated with aspects of health in childhood that may be linked to health across the life span (Anderson & Whitaker, 2011).

Observations of the connection between early attachment relationships and physical health, however, are rare in the literature. The findings, most of which are based on self-reported romantic attachment styles in adulthood, suggest that securely attached adults report more salubrious and fewer deleterious health behaviors than insecurely attached adults. These findings are stronger for individuals involved in romantic relationships (Scharfe & Eldredge, 2001). Self-reported attachment styles are also associated with physical illness (McWilliams & Baily, 2010). Adults who report being insecurely attached also report more illnesses than securely attached individuals. Moreover, adults who have an anxious attachment style report more cardiovascular-related illnesses. Those who have an avoidant style report more pain conditions.

The current longitudinal study contributes to the extant literature by *prospectively* examining the links between the quality of attachment relationships during the first 2 years of life and various health problems in adulthood. We hypothesized that individuals who were classified as insecurely attached in infancy (either anxious-resistant or anxious-avoidant) would report more physical health problems at age 32 compared with individuals who were classified as securely attached in infancy. Previous research has found that adult insecure attachment styles uniquely predict categories of physical illness (McWilliams & Baily, 2010). We tested whether insecure infant attachment classifications differentially predict inflammation-related illnesses and nonspecific somatic complaints. Individuals classified as anxious-avoidant tend to suppress emotions and are prone to exaggerated inflammatory responses when exposed to interpersonal stressors (Gouin et al., 2008; Sroufe & Waters, 1977). Based on these findings, we predicted that infants classified as anxious-avoidant would later report more inflammation-related illnesses in adulthood. Infants classified as anxious-resistant are more likely to develop anxiety disorders in adolescence (Warren, Houston, Egeland, & Sroufe, 1997). Because anxiety disorders often include somatic symptoms such as muscle tension, headache, and upset stomach (American Psychiatric Association, 2000), we predicted that infants classified as anxious-resistant would be more likely to report nonpathognomonic symptoms (hereafter referred to as "nonspecific symptoms") in adulthood. Finally, we examined how the continuity of attachment security assessed at two time-points during infancy (at 12 and 18 months) predicted physical health outcomes in adulthood. We hypothesized that individuals who were classified as secure at both time-points would report the fewest health problems in adulthood.

Method

Participants

Participants were drawn from a longitudinal study of risk and adaptation (see Sroufe et al., 2005, for a description). A low-income sample of women receiving free health care from public health clinics in a midwestern city between 1975 and 1977 were recruited during their third trimester of pregnancy. The current participants are the first-born children of the original participants; all were born into low-SES, high-risk environments. Two hundred twelve participants were assessed at 12 months, 197 were assessed at 18 months, and 163 were assessed at age 32. Reasons for attrition include loss of contact with participant, moving out of state, and declining to participate. Eighty were male (49.1%) and 83 were female (50.9%). The racial composition was 64.5% white, 11.0% African American, 18.7% mixed race, and 5.8% undetermined because of missing father information (see Table 1 for complete demographics).

Measures

Table 2 reports the means, standard deviations, and correlations of all independent, dependent, and control variables used in the analyses.

Attachment (12 and 18 months). Attachment was assessed using the Ainsworth Strange Situation Procedure (SSP) when participants were 12 and 18 months old. The SSP is a 20-min laboratory procedure during which the infant is exposed to a series of stressful separations from and reunions with his or her primary

Table 1
Demographics for the Longitudinal Sample at Age 32 (N = *163)*

Demographic	*N*	Percent
Education		
No degree	12	7%
High school diploma/GED	86	52%
Associates degree	36	22%
4-year degree	18	11%
Master's degree	8	5%
Professional/graduate degree	4	2%
Marital status*		
Single	35	21.3%
Dating	34	20.7%
Living together/engaged	30	18.2%
Married	64	39%
Employment*		
Employed	132	81%
Unemployed	19	13%
Household income		
$0–25,000	34	21%
$25,001–50,000	48	28%
$50,001–75,000	33	20%
$75,001–100,000	20	12%
$100,000	30	18%

* Data were missing on marital status for one person (2% of the sample). Data were missing on employment for 13 people (8% of the sample).

caregiver (see Ainsworth et al., 1978). Certified raters classified each participant's attachment relationship with his or her primary caregiver at 18 months as secure (*N* = 94; 57.3%) or insecure: anxious-resistant (*N* = 22; 13.4%), or anxious-avoidant (*N* = 34; 20.7%; missing data = 8.6%). Classifications were coded based on how each participant responded to the separations and reunions with his or her mother. Rater agreement for attachment classification at 12 months was 89% and was 93% at 18 months (Egeland & Farber, 1984). Although the amount of time between these assessments was brief (6 months), it represents 50% more time for interactions between mother and child to become internalized. Since the 18-month attachment classifications assessed a more extensive history of parent–child interactions, these are the classifications we decided to use in the primary analyses.

The stability of attachment security was assessed by summing the number of times each infant was classified as secure at the 12 and 18-month SSP assessments. Secure attachment was coded 1, and insecure attachment (anxious-avoidant and anxious-resistant) was coded 0 at both the 12 and 18-month assessments. Thus, individuals with a score of 2 were securely attached at both time-points (*N* = 66, 41%), individuals with a score of 1 were securely attached at one time-point (*N* = 53, 33%), and those with a score of 0 were insecurely attached at both time-points (*N* = 42, 26%). This aggregate variable is a more psychometrically sound measure of attachment security, as it is less prone to measurement error. For other analyses, attachment insecurity at 18 months was dummy-coded to create three binary variables representing each unique attachment pattern. For example, the variable for secure attachment was assigned a value of 1 for securely attached infants and a value of 0 was assigned for anxious-resistant or anxious-avoidant infants.

Physical health (32 years). Reports of physical illness were assessed with the Adult Health Survey, a self-report health questionnaire adapted from the Adolescent Health Survey to be more appropriate for adults (Blum, Resnick, & Bergeisen, 1989). Participants reported how often they had experienced each of several different physical illnesses within the past 12 months. Physical illnesses were divided into those associated with increased inflammatory markers (e.g., Cardiovascular Disease and Asthma; Deraz, Kamel, El-Kerdany, & El-Ghazoly, 2011; Pearson et al., 2003) and nonspecific symptoms (see Table 3). Sixty percent of the sample reported having *no* physical illness at the 32-year assessment. Because of the skewness of the distribution of physical illness, binary variables were created in which those who reported one or more physical illnesses were coded 1, and those who reported no physical illness were coded 0. Variables for inflammation-related illnesses and nonspecific symptoms were made using the same procedure.

Control Variables

To document the unique predictive and discriminant validity of early attachment relationships on adult health outcomes, we statistically controlled for the following variables.

Table 2
Correlations of Predictor, Control, and Outcome Variables

	M	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Secure attachment (18 months)	.60	.49	—													
2. Avoid attachment (18 months)	.25	.43	−.70**	—												
3. Resist attachment (18 months)	.15	.36	−.51**	−.16**	—											
4. Stability sec	1.15	.81	.81**	−.56**	−.47**	—										
5. Physical health	.41	.49	−.24**	.18	.18*	−.24**	—									
6. Inflammation	.23	.42	−.27**	.24	.24**	−.21**	.66**	—								
7. Nonspecific symptoms	.30	.46	−.21*	.15	.11	−.21**	.79**	.27**	—							
8. Gender	1.51	.50	.00	.08	−.08	.05	.15	.08	.19*	—						
9. Negative emotion	18.55	5.98	−.18	.27**	−.08	−.21*	.22**	.06	.35**	.24**	—					
10. BMI	28.50	7.32	.03	−.03	−.04	.04	.32**	.29**	.22**	−.04	.03	—				
11. Life stress	8.94	7.35	−.12	.17	.03	−.12	.14	.01	.23**	.15	.26**	.10	—			
12. SES	−.03	.84	.08	−.04	−.07	.10	.04	.01	−.03	.12	−.21*	−.04	−.19*	—		
13. Instrumental support	2.52	.72	.10	−.10	−.21	.20**	−.05	.03	−.07	.03	−.15	−.07	−.16*	.11	—	
14. Emotional support	3.12	.65	.10	−.09	−.03	.17*	−.13	−.01	−.14	.16*	−.20*	−.11	−.17*	.09	.64**	—

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

Table 3
Physical Health Questions From the Adult Health Survey

Have you been treated for or experienced any of the following (within the past year)	
1. Angina or coronary heart disease	Inflammation
2. Asthma, bronchitis, emphysema	Inflammation
3. Diabetes or high blood sugar	Inflammation
4. Dizzy spells or fainting spells	NSS*
5. High blood pressure or hypertension	Inflammation
6. Migraine headaches	NSS
7. Persistent skin troubles	NSS
8. Chest pains	NSS
9. Recurring stomach trouble, indigestion, diarrhea	NSS
10. Sciatica, lumbago, or recurring backache	NSS
11. Stroke	Inflammation

* NSS = nonspecific symptoms.

Household Socioeconomic Status (SES; 32 years). This variable was a composite of three variables: highest education level attained, household income, and occupational prestige. If a participant reported that his or her partner contributed to the household income, the highest educational level and the highest occupational prestige between the two partners were used in the composite; both participant and partner income were used to calculate household income.

Body Mass Index (32 years). Each participant reported his or her height (without shoes on) and weight, from which a Body Mass Index (BMI) was calculated using the following formula (Center for Disease Control, 2011):

$$\text{BMI} = \text{weight(lb)} * 703/[\text{height (in)}]^2$$

BMI is associated with increased morbidity and mortality (Mokdad, Marks, Stroup, & Gerberding, 2005), and it has been linked to the number of environmental changes that have occurred during these individual's lives (Swinburn et al., 2011). In our sample, 49 people (30%) were overweight, and 59 (36%) were obese.

Stressful life events (32 years). The negative impact that stressful life events can have on physical health is well established (Cohen, Janicki-Deverts, & Miller, 2007). Stressful life events were assessed by the Life Events Schedule (Egeland, Breitenbucher & Rosenburg, 1980), a 41-question interview that measures the amount and severity of different types of stress experienced during the preceding 12 months. Trained coders listened to audio recordings of each participant's interview and rated each life stressor in terms of its disruptiveness to the participant's life (where 0 = no disruption, 1 = moderately disruptive, and 2 = highly disruptive; Egeland et al., 1980). The average total life stress at age 32 was 8.92 (range: 0–41; $\alpha = .98$).

Negative emotional style (32 years). Negative emotional style was assessed by the Berkeley Personality Profile (BPP; Hararay & Donohue, 1994), a self-report questionnaire. Studies comparing the BPP to other personality questionnaires (e.g., the NEO Five Factor Inventory (NEO-PI) and the Eysenck personality inventory (Costa & McCrae, 1985; Eysenck & Eysenck, 1968) confirm that the BPPs measure of negative emotional style is highly correlated with neuroticism measured by the NEO-PI and nervousness measured by the Eysenck personality inventory (all *r*s $>.60$ for all measures; Kentle, 2002). Questions asked about negative affect, particularly depression and anxiety ($\alpha = .84$).

Perceived instrumental and emotional support (32 years). Each participant's perceptions of social support were assessed by a modified version of the Social Support Questionnaire (Sarason, Levine, Basham, & Sarason, 1983), which taps perceptions of emotional and instrumental support from close others. Composites for each type of social support were calculated by averaging the total amount of support reported. Perceptions of social support influence susceptibility to illness, and are theoretically linked to attachment patterns in infancy (Bowlby, 1973; Cohen, Sherrod, & Clarke, 1986).

Procedures

Initial consent to participate was provided by participant's mothers when they were infants; participants have given their consent at each assessment since they were 13 years old. All participants signed a consent form before participating in the current assessment at age 32. This assessment involved interviews and questionnaires that were administered by trained graduate students and staff, and that took 2.5–3 hr to complete. Information on romantic relationships, parenting experiences, work, education, and health (both physical and mental) were also gathered. Data from the health questionnaire are the primary outcome measures in the current study. Assessments took place at the University of Minnesota, in participants' homes, or over the phone, depending on the situation. Each participant received $100 for participating.

Data Analysis Plan

To account for missing data in the predictor variables (total = 3.2%; range = 0–8.6%), multiple imputation procedures using MPlus 6.11 (Muthén & Muthén, 1996-2010) were conducted using Markov chain Monte Carlo simulation to produce 10 imputed data sets. In addition to the predictor and outcome variables, the following variables were also included in the imputation procedure: participants' sex, maternal sensitivity at 6 months, prenatal maternal SES, maternal education at participants' birth, maternal marital status at participants' birth (married vs. not), and mothers' age at participants' birth. All categorical variables were identified as such in the imputation procedure. To test our hypotheses, we ran a series of binary logistic regressions in MPlus 6.11 using maximum likelihood model estimation.

Results

Correlations (see Table 2) indicated that sex, negative emotional style, BMI, and life stress were all significantly correlated with reports of inflammation and/or nonspecific symptoms at age 32. Thus, all of these variables were statistically controlled in the primary analyses reported below. We also controlled for participants' SES and perceived instrumental and emotional support (indicators of current social functioning), which can influence physical health (Cohen, 2004).

Infant Attachment and Physical Health

Binary logistic regressions revealed that attachment during infancy significantly predicted the likelihood of reporting physical

illnesses in adulthood (see Table 4). Individuals who were anxious-resistant as infants were approximately *six times* more likely to report physical illnesses in adulthood than those who were secure as infants. No significant differences were found between infants classified as anxious-resistant and those classified as anxious-avoidant.

To test whether the two insecure attachment patterns predicted different health outcomes, we ran additional regression models predicting the likelihood of reporting inflammation-related illnesses and nonspecific symptoms. Individuals who were classified as either anxious-avoidant or anxious-resistant as infants were approximately *three times* and *7.5 times* more likely to report inflammation-related illnesses at age 32 compared with their secure counterparts. There was no significant difference in the likelihood of reporting inflammation-related illnesses between those who were classified as anxious-avoidant or anxious-resistant in infancy. There was a trend whereby individuals who were anxious-resistant in infancy were *three times* more likely to report nonspecific symptoms in adulthood compared with their secure counterparts. There was no significant difference in reported nonspecific symptoms between anxious-avoidant and anxious-resistant individuals and anxious-avoidant and secure individuals.

Continuity of Attachment Security and Physical Health

For each time-point at which individuals were classified as insecurely attached during infancy, they were approximately *two times* more likely to report having physical illnesses in adulthood (see Table 5). In other words, individuals who were insecurely attached at both time-points were *four times* more likely to report physical illnesses at age 32 than those who were continuously secure early in life. The same pattern emerged when predicting specific categories of illnesses. Individuals who were insecure at both 12 and 18-months were *four times* more likely to report inflammation-related illnesses, and nearly *four times* more likely to report nonspecific symptoms than those who were secure at both time-points.

Posthoc Analyses

Twelve-month attachment. Binary logistic regressions were run regressing overall physical health, inflammation-related illness, and nonspecific symptoms onto 12-month attachment (results not shown). A similar pattern of results emerged whereby anxious-resistant individuals were *four times* ($b = 1.47$, $p = .006$) and *3.5 times* ($b = 1.26$, $p = .006$) more likely to report a physical illness at age 32 than their secure and anxious-avoidant counterparts, respectively. There was no significant difference in the likelihood of reporting a physical illness between secure and anxious-avoidant individuals. Attachment classifications at 12 months of age did not predict inflammation-related attachment. Anxious-resistant individuals were *three times* ($b = 1.18$, $p = .03$) more likely to report a nonspecific symptom than securely attached individuals.

Mediators. Mediational analyses were run examining variables that are theoretically linked to both infant attachment *and* physical health across the life span: emotion regulation in infancy and adolescence, emotional health and peer competence in childhood, attribution styles in late childhood, and the quality of romantic relationships in adulthood. None of these variables were significant mediators of the relation between infant attachment and physical health.

Discussion

In this prospective longitudinal study, we tested whether and how attachment security assessed very early in life predicted physical health outcomes 30 years later. The results revealed that the quality of parent–child attachment relationships during infancy predicted the likelihood of experiencing physical illnesses in adulthood, controlling for several well-known predictors of physical health. Thus, even after statistically controlling for gender, SES,

Table 4
Binary Logistic Regression Results Predicting the Likelihood of Reporting a Physical Illness, an Inflammation-Related Illness, and Nonspecific Symptoms at Age 32 From Attachment Classification at 18 Months

	Physical illness				Inflammation related illness				Nonspecific symptoms			
Measures	*b*	*SE*	OR	95% CI	*b*	*SE*	OR	95% CI	*b*	*SE*	OR	95% CI
Attachment 18 months												
Avoidant vs. secure	.65	.47	1.92	.83–6.02	1.20*	.53	3.32	1.50–14.62	.46	.49	1.58	.71–5.39
Resistant vs. secure	1.78**	.61	5.92	1.56–19.87	2.02**	.59	7.54	1.68–21.56	1.14†	.59	3.13	.80–9.92
Resistant vs. avoidant	1.13	.70	3.10	.09–1.72	.92	.66	2.51	.19–3.20	.66	.69	1.93	.10–1.25
Controls												
Gender	.73†	.41	2.08	.68–4.00	.55	.47	1.73	.40–3.34	.71	.43	2.03	.61–3.98
Negative emotion	.08*	.04	1.08	1.00–1.18	.01	.04	1.01	.90–1.09	.12**	.04	1.13	1.04–1.23
Life stress	.01	.03	1.01	.96–1.10	−.03	.03	1.03	.89–1.05	.03	.03	1.03	.99–1.13
Instrumental support	.29	.34	1.34	.55–2.32	.26	.39	1.30	.32–1.84	.26	.36	1.30	.55–2.57
Emotional support	−.49	.40	1.63	.30–1.72	−.04	.45	1.04	.56–4.30	−.44	.41	1.55	.35–2.04
BMI	.13**	.03	1.14	1.10–1.23	.11**	.03	1.12	1.06–1.21	.07*	.03	1.07	1.02–1.15
SES	.30	.23	1.35	.80–2.11	.04	.27	1.04	.62–1.94	.19	.24	1.21	.61–1.75
Pseudo R^2			.36**				.27**				.32**	

† $p < .10$. * $p < .05$. ** $p < .01$.

Table 5
Binary Logistic Regression Predicting the Likelihood of Reporting a Physical Illness, an Inflammation-Related Illness, and Nonspecific Symptoms at 32 From the Stability of Attachment Security Between 12 and 18 Months

	Physical health				Inflammation related				Nonspecific symptoms			
Measures	*b*	*SE*	OR	95% CI	*b*	*SE*	OR	95% CI	*b*	*SE*	OR	95% CI
Stability attachment security	−.71**	.24	2.04	1.21–3.23	−.84**	.28	2.32	1.41–4.56	−.54*	.26	1.72	1.01–2.86
Controls												
Gender	.76†	.41	2.13	.90–4.90	.60	.46	1.82	.62–4.44	.77†	.43	2.16	.93–5.53
Negative emotion	.06	.04	1.06	.99–1.14	.00	.04	1.00	.91–1.07	.11	.04	1.12	1.03–1.20
Life stress	.01	.03	1.01	.96–1.07	−.02	.03	1.02	.95–1.08	.04	.03	1.04	.98–1.09
Instrumental support	.42	.34	1.52	.67–2.66	.36	.38	1.43	.47–2.40	.34	.36	1.40	.63–2.74
Emotional support	−.54	.40	1.72	.73–4.76	−.07	.43	1.08	.30–2.00	−.48	.41	1.62	.68–3.57
BMI	.12**	.03	1.13	1.07–1.22	.10**	.03	1.11	1.06–1.20	.07**	.03	.62	1.02–1.15
SES	.27	.23	1.31	.83–2.10	.02	.25	1.02	.63–1.84	.17	.24	1.19	.67–1.85
Pseudo R^2		.33**				.22**				.32*		

† $p < .10$. * $p < .05$. ** $p < .01$.

current BMI, life stress, negative emotional style, and perceived social support, individuals who had been insecurely attached early in life were significantly more likely to experience illnesses in general and specifically inflammation-related illnesses than those who were securely attached during infancy. Contrary to our initial expectations, the two patterns of insecure attachment did not differentially predict the likelihood of having specific types of illnesses (e.g., inflammation-related vs. nonspecific symptoms). There was a trend whereby individuals who were anxious-resistant early in life were over three times more likely to report nonspecific symptom of physical illness in adulthood. Similar to other samples, the number of anxious-resistant individuals in our sample was low, possibly preventing us from having the statistical power needed to detect an effect.

We also investigated whether being securely attached at two points in infancy (at 12 and 18 months) was a stronger predictor of physical health problems in adulthood than being secure at one time-point or being insecure at both time-points. Individuals who were secure at both time-points reported the fewest physical illnesses in adulthood compared with those who were inconsistently secure or consistently insecure. The same pattern emerged when predicting inflammation-related and nonspecific symptoms from the continuity of attachment security. This indicates that having a sustained history of secure attachment during infancy is a powerful antecedent of having fewer health problems in adulthood. Considering that attachment status was assessed 30 years *before* health outcomes were assessed and that confounds were statistically controlled, the odds ratios in the study (some of which approach *4*) are remarkably large.

Attachment classifications at 12-months were also examined as predictors of physical illness in adulthood. While the findings of these analyses were consistent with the 18-month analyses, many of the results were statistically insignificant. This pattern of results is expected given the rapid pace of development in infancy. The first 18 months of life are important for brain growth and myelination of areas associated with emotion processing (Schore, 2001). Attachment at 18 months may be a better predictor of adult outcomes than at 12 months because the assessment takes place at the close of a sensitive time period of brain development that is especially sensitive to emotional stimuli in the environment (Schore, 2005). Mediators of the relation between infant attachment and adult health were explored, yielding nonsignificant findings. We speculate that this is largely because of the high percentage of participants who did *not* report a physical illness, as this percentage increases we anticipate significant results to emerge. Furthermore, we believe the nonsignificance of a broad array of mediators spanning multiple developmental periods lends credence to the unique and powerful impact of early experience.

Taken together, these findings suggest that insecure attachment in infancy is an important predictor of poor physical health in adulthood and that continuous insecure attachment and/or anxious-resistant attachment may be particularly predictive of poor health. One potential reason for this finding is the role that infant attachment plays in the development of the biological processes the underlie stress regulation (Lupien, McEwen, Gunnar, & Heim, 2009). The dyadic nature of stress reactivity in childhood is acknowledged in the definition of toxic stress: "[The] strong, frequent, and/or prolonged activation of the body's stress-response systems in the absence of the buffering protection of adult support" (Shonkoff, Boyce, & McEwan, 2009, p. 2256). The buffering effect of a supportive adult is particularly important in infancy when the child is wholly dependent on his or her caregiver for protection and comfort (Center on the Developing Child at Harvard University, 2011). While insecure attachment is not necessarily a sign of toxic stress, it does reflect a caregiver's suboptimal response to infant distress (Ainsworth et al., 1978). Experiencing insensitive and unresponsive care may heighten stress reactivity, especially to interpersonal stress, initiating biological and behavioral pathways toward poor health (Miller, Chen, & Parker, 2011).

Biological processes including the Hypothalamic-Pituitary-Adrenocortical (HPA) axis and the immune system are sensitive to the quality of interpersonal relationships, like infant attachment, and may represent the interface between relationships and physical health. Aspects of innate immunity, specifically inflammation, are regulated by the HPA axis. When individuals encounter tolerable stressors that activate the HPA axis, inflammation is suppressed (Gunnar & Quevedo, 2007). However, exposure to toxic stressors causes sustained activation of the HPA axis, which weakens its control over inflammatory responses. In other words, temporary

stress inhibits inflammation, whereas chronic stress exacerbates it. Over time, excessive inflammation can cause tissue breakdown, which triggers cardiovascular disease and metabolic syndrome (McEwen, 1998, 2000). Recent developmental research has confirmed that individuals who are insecurely attached tend to have poorer quality relationships across the first 20 years of life (Simpson, Collins, Tran, & Haydon, 2007). Poorer quality relationships are likely to be a primary chronic stressor that dysregulates biological processes, leading insecure individuals to experience more physical illnesses later in life than their secure counterparts.

Our findings for specific attachment classifications and categories of physical illness differ from some prior studies (e.g., McWilliams & Baily, 2010). These discrepancies may be attributable to the different types of attachment relationships examined (parent–child in the current study vs. romantic in previous studies), the period of life when attachment was measured (infancy vs. adulthood), or the use of observational versus self-reported attachment measures. The empirical links between attachment classifications assessed in the SSP and self-report measures of adult romantic attachment tend to be weak (e.g., Roisman, 2009), indicating that they do not tap the same underlying construct. Theoretically, because infant attachment reflects the quality of the first significant relationship, it should serve as the foundation for later close relationships. Furthermore, individuals classified as insecure in the SSP show predictable and fairly consistent patterns of emotional dysregulation and poor interpersonal functioning across development (Simpson et al., 2007; Sroufe, 1983). Self-reported romantic attachment, on the other hand, taps current and conscious thoughts and feelings about romantic partners and relationships, which may be more strongly affected by recent relationship events. Any of these factors may contribute to the discrepant findings between the current study and previous self-report attachment and health research.

The timing of attachment assessments also differentiates the current study from its predecessors. Previous research has found that self-reported adult romantic attachment styles are correlated with concurrent measures of health, but the direction of this effect is not clear from concurrent associations (see McWilliams & Baily, 2010; Scharfe & Eldredge, 2001). Our prospective longitudinal design beginning in infancy, along with various discriminant analyses, allows us to draw clearer inferences about the possible directionality between early attachment patterns and later physical health outcomes.

Although this is the one of the few longitudinal studies of infant attachment and adult health outcomes, it has some limitations. For example, despite our robust findings, our sample size is relatively small, and our participants were born into poverty. Replications in larger or nationally representative samples would strengthen our conclusions. We also could not confirm participants' health reports against actual medical records. As a result, our health responses should be viewed as proxy measures of participants' actual physical health. Despite these limitations, some of our effect sizes are large, particularly given the 30-year gap between attachment assessments and physical health measures. Previous studies have found modest effects (odds ratios of 1–1.5) between self-reported romantic attachment styles and health assessed concurrently and with very large samples (e.g., McWilliams & Baily, 2010).

The current findings also hint at opportunities for early prevention efforts aimed at promoting physical health across the life span. The current study solidifies the important role that early interpersonal experiences assume in forecasting adult physical health outcomes. In a similar vein, Miller and colleagues (2011) have recently found that retrospective accounts of maternal nurturance early in life mediate the relation between low SES and symptoms of metabolic syndrome in middle adulthood (Miller et al., 2011). This type of supportive care and responsiveness also predicts secure attachment (Egeland & Farber, 1984). The vital role that early attachment relationships assume in social development indicates that attachment may affect health via a host of pathways, such as by facilitating high quality interpersonal relationships (Simpson et al., 2007), increasing medical treatment adherence (Ceichanowski, Walker, Katon, & Russo, 2002), and maintaining health-promotive behaviors (Scharfe & Eldredge, 2001). As mortality rates from chronic illnesses continue to rise, we must broaden the search for factors that contribute to disease onset and maintenance. Our longitudinal study indicates that *early* interpersonal functioning is one important, but hitherto overlooked, factor that impacts adult physical health.

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