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Early Manifestations of Personality and Adult Health: A Life Course Perspective

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Objective: The aim of this study is to investigate whether individual personality or temperamental qualities that emerge early and persist over the life course, predict adult midlife health. Specific childhood personality attributes considered include distress proneness, behavioral inhibition, and ability to stay focused on a task. ***Design:*** Prospective data are from 569 individuals followed from birth into adulthood. ***Main Outcome Measures:*** Outcomes include two different measures of adult health: self-rated general health, and number of illnesses in adulthood. ***Results:*** Childhood personality attributes related to attention and distress were significantly associated with adult health, with stronger effects evident among women. Children with high attention reported better self-rated health ($b = 0.12$, $p < .05$) and fewer illnesses ($b = -0.09$, $p < .01$) as adults; more distress-prone children reported worse self-rated health ($b = -0.15$, $p < .05$) and more illnesses ($b = 0.07$, $p < .09$) as adults. ***Conclusion:*** Associations between child personality attributes with both general self-rated health and number of illnesses in adulthood were maintained after taking account of childhood social environment and child health. Findings indicate that early emerging personality and related processes influence adult physical health, and suggest the potential value of interventions targeting early life development.

Keywords: personality, childhood, adult health, gender, lifecourse

Links between personality and health have been described throughout history. In Hippocratic times, personality was believed to reflect the predominance of one of four bodily humors: blood, black bile, yellow bile, or phlegm. Later work by Galen extended this idea beyond temperament, and argued that an imbalance among the humors lead to ill health (Allport, 1961). The prevailing humor in a person was thought to produce a predisposition toward a particular emotion, while the excess of a humor led to disease. Medical diagnosis no longer relies on the theory of humors, but the notion of a link between personality and disease has survived (Friedman & Booth-Kewley, 1987; Scheier & Bridges, 1995). Numerous studies have demonstrated a significant association between multiple indicators of health and measures of personality, using both larger dimensions like the Big Five personality traits, as well as more specific personality traits like optimism (see, e.g., Chapman, Lyness, & Duberstein, 2007; Martin et al., 2002).

A Life Course Perspective on Personality and Health

Personality theorists have long argued that early emerging personality characteristics may set the stage for later social, emotional, and personality development (Rothbart, Ahadi, & Evans, 2000). Theoretical perspectives on how personality might influence health include a life span health behavior model and models that consider the dynamic interplay between personality and emotion (Hampson, Goldberg, Vogt, & Dubanoski, 2007; Scheier & Bridges, 1995; Smith & Spiro, 2002). Individuals with certain personalities (such as those who are more hostile or more anxious) are hypothesized to be vulnerable to disease in part because they are less able to cope with the challenges life presents (Friedman et al., 1993; Smith & MacKenzie, 2006). This can result in processes that, over time, directly affect health because they evoke potentially pathophysiological processes (e.g., recurring activation of the sympathetic nervous system), and indirectly because they influence health-related behaviors and other psychological resources. For example, a large body of research has found evidence of an association between hostility and coronary heart disease (Miller, Smith, Turner, Guijarro, & Hallet, 1996). Hostility is considered a personality trait which predisposes individuals to experience more episodes of anger, suspicion, and cynicism than other individuals (Smith & Frohm, 1985). Hostile individuals seem to respond to potential stressors with stronger activation of the sympathetic nervous system and hypothalamic-pituitary-adrenal axis, which can increase the risk of developing heart disease and lower the threshold for cardiac ischemia, arrhythmias, and sudden cardiac death (Matthews, Gump, Harris, Haney, & Barefoot, 2004). Other work has linked hostility with biological alterations associated with development of heart disease, including endothelial dysfunction (Gottdiener et al., 2003), atherosclerosis

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(Raikkonen, Matthews, Sutton-Tyrrell, & Kuller, 2004), and inflammation (Suarez, 2004). In addition, hostile individuals are more likely to engage in more health-damaging behaviors (Everson et al., 1997), and are more likely to be exposed to interpersonal stress and poorer social support, factors that have consistently been linked with poor health (Smith, Glazer, Ruiz, & Gallo, 2004).

These ideas are incorporated as part of a larger framework developed by Taylor Lerner, Sage, Lehman, and Seeman (2004) that considers how early family environment influences health. This perspective suggests that development of personality and related emotional processes early in childhood are critically important for negotiating the environment, managing threats, and regulating stress. Inadequate or poorly regulated responses to stress may lead to accumulating biological and psychological damage, and ultimately poor health outcomes (Repetti, Taylor, & Seeman, 2002). Thus, early emerging characteristics may contribute to establishing future patterns of development and adjustment, and thereby begin to set up either protective or adverse trajectories in relation to health (National Research Council and Institute of Medicine, 2000).

Work on early personality processes in relation to health is particularly relevant in light of epidemiologic studies that increasingly point to the importance of early life influences on adult health (Wadsworth & Kuh, 1997). Individual personality or temperamental qualities which are predictive of later health may emerge relatively early and persist over the life course. Several studies have provided evidence of the continuity of personality, reporting that behavioral characteristics in early childhood are associated with personality in adulthood (Caspi & Silva, 1995; Kubzansky, Martin, & Buka, 2004; Martin, Friedman, & Schwartz, 2007). Demonstration of a link between early emerging personality traits with adult health would provide support for life course theories of health (Kuh & Ben-Shlomo, 1997; Repetti et al., 2002), as well as give some insight into childhood processes that may subsequently influence health.

Evidence for a Relationship Between Personality and Health Over the Life Course

While the association between personality and health has been demonstrated in a variety of studies, the majority have been cross-sectional. Of the prospective studies, most have measured both personality and health in adulthood (e.g., Aldwin, Spiro, Levenson, & Cupertino, 2001; Shipley, Weiss, Der, Taylor, & Deary, 2007; Weiss & Costa, 2005). One intriguing finding came out of a recent study of 9,239 men who attended Glasgow University between 1948 and 1968 (McCarron, Gunnell, Harrison, Okasha, & Davey-Smith, 2003). Measures of temperament reflecting instability and distress in young adulthood (age 20) were associated with a significant increase in premature mortality over 41 years of follow-up. Only limited research has been able to examine the personality-health link beginning in childhood. This prospective life course framework has several advantages in that it preserves the temporal order between childhood personality and adult health, avoids recall bias inherent in retrospective designs, and can also better identify the processes whereby these early factors may exert their influence.

Using data from the Terman Life-Cycle Study of Gifted Children, Friedman and colleagues (Friedman et al., 1993) found that individuals with the highest levels of conscientiousness at age 11 had approximately a 25% reduced likelihood of dying in any given year, compared to those with the lowest levels of conscientiousness in childhood. Other personality factors (such as mood permanence and cheerfulness) were also weakly associated with longevity. Follow-up work in this sample with 14 years of additional mortality data confirmed these initial findings and found conscientiousness measured during both childhood and adulthood was associated with mortality (Martin et al., 2007). Additional work with the Terman Study and also in the Hawaii Personality and Health cohort has indicated that child personality traits may influence adult health status partially through effects on health behaviors (Bogg & Roberts, 2004; Friedman et al., 1995; Hampson, Goldberg, Vogt, & Dubanoski, 2006; Hampson et al., 2007). This is consistent with other studies that have found an association between early temperament and health risk behaviors at the age of 21 (including alcohol dependence, violent crime, unsafe sex, and dangerous driving habits) which is mediated by personality traits at age 18 (Caspi et al., 1997). However, these health behaviors do not appear to fully explain effects of childhood personality on adult health status (Hampson et al., 2007; Martin et al., 2002).

Some investigators have raised concerns that apparent relationships between psychological factors and health may be spurious because adverse childhood environments, which often co-occur with negative psychological states and traits, also lead to poor health outcomes (Macleod & Davey Smith, 2003). A related concern is that child health status may influence both personality and behavior. Studies that can control for early health status or child social environment might help to ease such concerns, but few studies of childhood personality attributes and adult health have addressed these issues of potential confounding. Finally, some studies of personality and health have based their conclusions primarily on findings with self-rated health. Such measures are often subject to concerns about negativity bias. More negatively oriented individuals may be more likely to report poor health regardless of their actual health status (Larsen, 1992). However, it is worth noting that while biological measures in adulthood (e.g., blood pressure, cholesterol) may differentiate among individuals at higher risk for poor health outcomes, such measures are frequently unavailable in large-scale observational studies that were not originally designed to examine health. Moreover, other objective health measures (e.g., clinical endpoints) that differentiate across health status in midlife are difficult to obtain given that adults at this time are largely healthy.

The Present Investigation

Using longitudinal data and multiple measures of health status, the present investigation is able to address some of these concerns and considers whether specific childhood personality characteristics are associated with health during middle adulthood. We hypothesize that specific childhood personality attributes including distress proneness, behavioral inhibition, and ability to stay focused on a task, will be associated with adult health status in a socioeconomically diverse sample of men and women, taking into account both child health status and aspects of the childhood social environment. While extensive measures of the social environment are not available, a detailed measure of the child's socioeconomic status derived from parents' education, income, and occupational

levels was prospectively assessed, and may be used as a general indicator of social disadvantage. In addition, we consider childhood personality in relation to two different measures of adult health, self-rated general health and number of illnesses in adulthood. Consistent associations of child personality attributes with both measures may provide some reassurance that relationships with health are not primarily due to negativity bias in reporting. This study takes advantage of one of the strongest study designs available for this type of research, using longitudinal epidemiologic data with extensive information on child personality characteristics, adult health (obtained when participants were age 35), and measures of early life potential confounding variables, all obtained from multiple reporting sources.

Method

Study Sample

Data are from a subsample of the Providence cohort of the National Collaborative Perinatal Project (NCPP). The NCPP originated in the late 1950s as a prospective multisite investigation of approximately 60,000 pregnancies through the first 7 years of life, designed to investigate factors in the prenatal, perinatal, and early childhood periods that were thought to negatively influence subsequent health and development (Niswander & Gordon, 1972). The cohort from the Providence Center NCPP included 4,140 pregnancies studied prospectively from the prenatal period through age 7. A follow-up to the Providence NCPP study was conducted using a subsample of the original birth cohort (Buka, Satz, Seidman, & Lipsitt, 1998). Participants were included for selection if their Full Scale IQ at age 7 was 80 or above (n = 2,743). Subjects were selected based on their classification as having learning difficulties or having attentional problems (n = 567), or randomly selected normal controls (n = 495). Controls were matched on sex, race, birth date, Full Scale IQ, maternal age, and maternal education. For follow-up, 1,062 subjects were available (for further description see, Buka et al., 1998). Seven hundred twenty participants (67.8%) were successfully located and completed an interview in 1996 when participants were approximately age 35. Trained interviewers administered a 4-hr battery, including structured interviews and self-report questionnaires. Interviewers had no information regarding subjects' histories.

Of the 720 subjects who were interviewed at both age 7 and age 35, 555 subjects were White, and 139 were Black, and 26 subjects were of other racial/ethnic backgrounds. Because of small numbers and limited power, these 26 subjects from other racial/ethnic backgrounds were excluded from analyses. Additionally, subjects were also excluded due to missing data on relevant covariates (n = 125), resulting in a final analytic sample of 569 subjects. Thus, the final sample was comprised of approximately 40.4% women and 20.4% Black participants.

Measures

Demographics. Child social environment is measured using family socioeconomic status (SES). Family SES for the child was measured by an index adapted from the Bureau of the Census and is a continuous measure ranging from 0 (low) to 97.0 (high). It is a composite index derived from the education and occupation of the head of household along with household income (Myrianthopoulos & French, 1968), and was assigned to each pregnancy. Gender (coded 0 = male; 1 = female) and child race/ethnicity (coded 0 = White; 1 = Black) were reported by the mother.

Child health. From birth to age 7, child health conditions were reported by mothers, extracted from medical records, and diagnosed by study pediatricians based on physical examinations. From these, a record of health conditions experienced between birth and age 7 was compiled by study pediatricians, and a summary measure of child health was derived. Following prior work, chronic health conditions were considered the most salient component/element of child health (Case, Lobotsky, & Paxson, 2002). Only 10.7% of the sample reported any illness (n = 61) with 9.1% reporting one condition (n = 52). As a result of this skewed distribution, a dichotomous measure of child health status was based on whether the child ever had a chronic health condition by age 7 years (yes/no).

Early personality attributes. Although numerous methods are available today for assessing temperament and personality, in 1966 when the first of the NCPP participants was 7 years old, few well-developed measures were available. Methods of data collection in the NCPP are summarized elsewhere (Broman, Nichols, & Kennedy, 1975). Behavioral assessments were conducted at the research site by trained psychologists at age 7, a key developmental period (Rothbart, Ahadi, Hershey, & Fisher, 2001). Mothers or caregivers were not present during the testing session. Each psychologist rated the child on 15 different behaviors. In previous work we described the development and validation of summary indices of early personality characteristics based on these original NCPP behavior ratings (Kubzansky et al., 2004). Three derived measures include *attention* – defined as the ability to stay focused on a task and persistence in problem solving; *distress-proneness* – defined as affectively charged negative reactions; *behavioral inhibition* – defined as shy, withdrawn, and difficulty communicating. These personality attributes were found to be strongly orthogonal, with few individuals scoring high on multiple attributes. Prior work with these measures suggest they are reliable (internal consistency reliability coefficients ranging from 0.70 to 0.81) and valid. All measures were standardized with a mean of 0 and standard deviation of 1.

Self-rated health in adulthood. As part of the adult follow-up interview, subjects reported on their general health. Individuals were asked: "During the last 12 months, would you say that your general health has been excellent, good, fair, or poor?" This question is often used in major health surveys and is a commonly used outcome measure in health research. Self-rated health summarizes a broad range of health-related information available to the individual including medical diagnosis, functional limitations, and behavioral characteristics (Martikainan, Aromaa, & Heliovaara, 1999), and is a valid measure of health (Idler & Angel, 1990) and health care utilization (Fylkesnes, 1993). Scores range from 1 to 4, and higher scores indicate better health. Following prior literature in this area, we consider this measure as a continuous outcome, and also dichotomized defining good health as excellent or good and poor health as fair or poor.

Adult illness. During the follow-up interview, information was collected on nine conditions representing a range of illnesses that can be considered serious. In a similar format to the National Health and Nutrition Examination Survey Epidemiologic

Follow-Up Study (Madans et al., 1986) subjects were asked "Have you ever been told by a physician/osteopath that you had. . .?" Diseases included heart disease, diabetes, cancer, asthma, arthritis, stroke, bleeding ulcer, tuberculosis, and hepatitis. Subjects who answered "yes" to any of the questions were then asked their age at first diagnosis. An open-ended option to write in other diagnoses was also included, but few of the write-in responses represented clear medical diagnoses, and the frequency of each condition was low. Hence, we did not include responses to the "other" conditions here. Among subjects in the analytic sample, 59 subjects were excluded from analyses with this outcome, either because they did not provide responses to the question on diagnosed illnesses ($n = 4$) or because they reported an illness of interest diagnosed before their 18th birthday ($n = 55$). This last group was excluded to ensure that the measure of child personality attributes preceded the onset of disease, and because we are interested in adult health outcomes. Because participants were comparatively young and the prevalence of each illness was low, a count of the number of illnesses was created (Martin, Fitzmaurice, Kindlon, & Buka, 2004). We also considered a simple dichotomous measure indicating the presence of any of the conditions listed above.

Analyses

Using chi-square and ANOVA tests, we first examined whether there were significant differences between the 125 participants excluded and 569 participants included in the current analyses. Next, multiple linear regression techniques were used to examine the relationship between childhood personality attributes and health in adulthood. Measures of adult health include the continuous version of both self-rated health and number of illnesses. Unless stated otherwise, multivariable models controlled for potential confounders including gender, race (white, black), learning disability status, SES at birth, and child health status. Effect sizes for multiple linear regression analyses are reported as Cohen's f^2 statistic, calculated as $R^2/(1-R^2)$. Small, medium, and large effects sizes for $f^2$are estimated as .02, .15, and .35, respectively (Cohen, 1992). Because the distribution on the health outcomes is somewhat skewed, we also examined relationships of dichotomized self-rated health or any illness with childhood personality attributes using multiple logistic regression, with multivariable models controlling for the same suite of potential confounders identified above. Prior work, however, has suggested possible effect modification by gender, where the magnitude of effects of personality on health may differ across men and women. As a result, we conducted analyses testing for possible interactions with gender in all models, by creating an interaction term between gender and each personality attribute. We also tested the possibility of interactions between personality attributes and either race/ethnicity or SES but none were evident. Linear regression analyses were conducted to determine whether any association between childhood personality attributes and adult health might be explained by a common association with child health status.

Results

Descriptive Analyses

A comparison of the 569 individuals included in the analytic sample and the 125 participants excluded due to missing data indicated no significant differences between included and excluded participants for gender, race/ethnicity, SES at birth, or on selection variables. Table 1 summarizes demographic and other key characteristics of the 569 subjects included in the analytic sample. The final sample comprised 59.6% men and 40.4% women, with 79.6% White and 20.4% Black participants. Adult health was positively skewed with approximately 76% of the sample reporting themselves in good or excellent health, and only 18% of the sample reporting any adult illnesses. We considered the association between adult self-rated health and adult illnesses, and found they were strongly associated after controlling for gender, race/ethnicity, SES, and learning disability. Individuals with higher self-rated health were approximately half as likely to report any illness (odds ratio [OR] = 0.48, 95% CI = 0.36–0.63, $p < .0001$) and likely to report significantly fewer illnesses ($b = -.17$, $p < .0001$, $f^2 = 0.11$) compared to individuals with worse self-rated health.

Given the possibility that child health may contribute to both personality and adult health, we examined whether child health was associated with child personality attributes. After controlling for gender, race/ethnicity, childhood SES, and learning disability status, child health was weakly associated with distress proneness (b = 0.13, $p = .06$, $f^2 = 0.01$), but not with behavioral inhibition or attention. Though associations were not robust, to be conservative we controlled for child health status in all analyses with adult health measures.

Child Personality Attributes and Adult Self-Rated Health

In multivariable analyses two childhood personality attributes were significantly associated with adult self-rated health (see Table 2). Individuals with high attention at age 7 reported significantly better adult health ($b = 0.12$, $p < .05$, $f^2 = 0.05$) while those with higher levels of childhood distress were more likely to report

Table 1
Characteristics of Individuals in the Analytic Sample

Characteristic	Analytic sample
Sex	
Male (%)	339 (59.6)
Female (%)	230 (40.4)
Race	
White (%)	453 (79.6)
Black (%)	116 (20.4)
Child health	
Any condition (%)	61 (10.7)
No condition (%)	508 (89.3)
Self-rated health	
Excellent (%)	168 (29.5)
Good (%)	265 (46.6)
Fair (%)	107 (18.8)
Poor (%)	29 (5.1)
Adult illness	
Any illness (%)	94 (18.4)
No illness (%)	418 (81.6)
	Mean (*SD*)
SES at birth	43.6 (20.1)
Attention	−0.02 (0.73)
Distress-proneness	−0.02 (0.51)
Behavioral inhibition	−0.07 (0.50)

Table 2
Linear Regression Predicting Adult Health

Child personality attributes	Self-rated health b (s.e.)	Number of adult illnesses b (s.e.)
Attention	0.12 (0.05)*	−0.09 (0.03)**
Female	−0.26 (0.07)**	0.21 (0.05)**
Black	−0.14 (0.09)	−0.09 (0.06)
SES at birth	0.01 (0.02)	−0.01 (0.01)
Learning disability (yes)	0.02 (0.07)	0.02 (0.05)
Child health status	0.01 (0.11)	−0.02 (0.08)
Effect size (f^2)	0.05	0.06
Distress-proneness	−0.15 (0.07)*	0.07 (0.04)^
Female	−0.27 (0.07)**	0.21 (0.05)**
Black	−0.15 (0.09)	−0.09 (0.06)
SES at birth	0.02 (0.02)	−0.01 (0.01)
Learning disability (yes)	0.03 (0.07)	0.01 (0.05)
Child health status	0.04 (0.11)	−0.03 (0.08)
Effect size (f^2)	0.04	0.05
Behavioral inhibition	−0.10 (0.07)	0.04 (0.04)
Female	−0.26 (0.07)**	0.20 (0.05)**
Black	−0.14 (0.09)	−0.09 (0.06)
SES at birth	0.01 (0.02)	−0.01 (0.01)
Learning disability (yes)	0.02 (0.07)	0.01 (0.05)
Child health status	0.02 (0.11)	−0.02 (0.08)
Effect size (f^2)	0.04	0.05

Note. Self-rated health is coded as continuous with lower values indicating poorer health.
* $p < .05$. ** $p < .01$. ^ $p < .1$.

worse health ($b = -0.15$; $p < .05$, $f^2 = 0.04$). Beyond the personality attributes, only gender was strongly associated with adult self-rated health, with women significantly more likely than men to report worse health.

To assess whether the effects of childhood personality attributes on adult health differ for men and women, we examined the interaction between gender and each childhood personality attribute on adult self-rated health. While the interaction term was not significant for inhibition or attention, the interaction term was highly significant for distress-proneness ($p < .01$). Further stratified analyses controlling for the previously specified covariates suggested that distress-proneness was strongly associated with adult self-rated health among women ($b = -0.56$, $p < .01$, $f^2 = 0.10$) but not among men ($b = -0.05$, $p = .46$, $f^2 = 0.01$). See Table 3.

Child Personality Attributes and Adult Illness

Similar to analyses with self-rated health, attention and distress-proneness were significantly associated with number of adult illnesses after controlling for relevant covariates (see Table 2). Individuals with high attention at age 7 reported significantly fewer illnesses as adults ($b = -0.09$, $p < .01$, $f^2 = 0.06$), while individuals with higher levels of childhood distress reported marginally more adult illnesses ($b = 0.07$; $p < .10$, $f^2 = 0.05$). Again, beyond the personality attributes, only gender was strongly associated with adult illness, with women reporting significantly more illnesses.

We examined whether the effects of early personality attributes on number of illnesses differed for men and women. A marginally significant interaction term was evident for behavioral inhibition ($p = .09$) and attention ($p = .09$), and a significant interaction was present with distress-proneness ($p < .05$). Stratified analyses controlling for other previously specified covariates showed consistently stronger associations between early personality attributes and adult illness among women, with some attenuated associations evident among men (see Table 3).

Additional Analyses

Results were similar when considering dichotomized measures of either self-rated health or illness in adulthood. There was no association with behavioral inhibition but attention (OR = 0.72, 95% CI: 0.56–0.92) was strongly protective, while distress proneness was associated with approximately 60% increased risk for poor adult self-report health (OR = 1.62, 95% CI: 1.14–2.30). Results were similar but somewhat attenuated when considering a dichotomized measure of adult illness (any vs. none). For instance, individuals with high attention scores at age 7 were at 30% reduced risk of any illness in adulthood (OR = 0.72; 95% CI 0.54–0.95, $p < .05$). Individuals who scored higher on the distress-proneness scale at age 7 were at nonsignificantly greater risk for illness in adulthood (OR = 1.29; 95% CI: 0.87–1.92, $p = .2$). No relationship was observed between inhibition and a dichotomous measure of adult illness. Results were also similar but weakly attenuated when controlling for onset of illness prior to age 18 rather than excluding individuals on that basis.

Other work with this sample has considered these measures of child personality attributes as defining discrete qualitatively distinct subgroups, and defined the highest 15% for each attribute as

Table 3
Linear Regression Predicting Adult Health Separately Among Men and Women

Child personality attribute	Self-rated health		Number of adult illnesses	
	Women b (s.e.)	Men b (s.e.)	Women b (s.e.)	Men b (s.e.)
Attention	0.18 (0.08)*	0.08 (0.05)^	−0.17 (0.07)*	−0.05 (0.03)^
Distress-proneness	−0.56 (0.16)**	−0.05 (0.07)	0.27 (0.13)*	0.03 (0.04)
Behavioral inhibition	−0.13 (0.11)	−0.09 (0.09)	0.14 (0.09)^	−0.02 (0.05)

Note. All analyses control for race/ethnicity, childhood SES, learning disability status, and child health status. Self-rated health is coded as continuous with lower values indicating poorer health.
* $p < .05$. ** $p < .01$. ^ $p < .15$.

children with extreme values for a particular personality characteristic. We examined whether our findings with self-rated health and adult illness would be similar to those reported above when child personality attributes were considered according to distinct subgroups (high vs. medium/low). The pattern of findings was strikingly consistent and yielded similar effect magnitudes. Finally, we conducted all analyses reported above in the subset of 357 individuals who did not evidence childhood learning difficulties, to check that findings were not a function of the select nature of the follow-up sample. Despite the reduced power, findings were virtually identical (data not shown), and proved very robust. In several instances, the strength of the relationships identified above was even stronger in this control sample.

Discussion

One implication of a life course perspective is that early emerging personality attributes may lead to patterns of emotional functioning and behaviors that ultimately influence adult health outcomes. The present study was conducted to test the initial hypothesis that childhood personality attributes are associated with adult health. The results provide strong evidence for this relationship above and beyond effects related to either early socioeconomic circumstances or child health status. Findings were consistent across two different measures of adult health. Individuals with high levels of attention at age 7 and low levels of distress-proneness were significantly more likely to report better general health and fewer illnesses approximately 30 years later. An interaction effect with gender was evident. While the direction of effects was similar for both men and women, the magnitude of the effects of early emerging personality attributes on adult health was significantly greater among women. Moreover, in overall analyses of the relation between behavioral inhibition and adult health, no association was apparent, but gender-stratified analyses indicated trends whereby women with higher levels of childhood behavioral inhibition were more likely to report poorer health in adulthood. These gender-related findings were highly consistent across both health outcomes.

Prior work in this sample has reported that child personality attributes do not significantly differ across boys and girls (Kubzansky et al., 2004). Thus, why the relationship between childhood personality attributes and adult health was stronger among girls in the current study is not clear. While some studies of personality and health have found gender differences (Friedman et al., 1993), the direction of effects is not consistent across studies, and still other work has failed to find gender differences at all (Hampson et al., 2007). Too few longitudinal studies have been conducted to reach any firm conclusions about the stability of these gender differences. Gender differences in health more generally have sometimes been explained by biological differences whereby the physiologic systems that facilitate pregnancy and childbirth (e.g., more robust immune system, higher estrogen levels) contribute to greater longevity (but not less morbibity; Bird & Rieker, 1999). However, these biological differences would also have to be tied to temperament and personality attributes to explain findings reported here and we know of few studies on this. It may be worth noting that other studies of psychosocial factors and health in adulthood have reported that social and affective factors have a stronger effect on major health outcomes (e.g., coronary heart disease) for women versus men (e.g., Thurston, Kubzansky, Kawachi, & Berkman, 2005). Investigators have posited that this may be because psychosocial risk factors (e.g., low social status, single parent, risk of mood disorder) are more likely to co-occur among women, and possibly because the interplay between social and biological factors differs across men and women. It may also be useful to consider our findings in light of known gender differences in adolescent and adult depression and anxiety (Kessler, 2003). Early distress may have different developmental trajectories for boys and girls which in turn differentially influence subsequent health.

Recent work in personality has suggested that personality attributes identified among youths may fit within the framework provided by the Five-Factor Model (FFM) of personality (Markey, Markey, & Tinsley, 2004). For example, distress-proneness is characterized by negative affect and emotional instability which is congruent with the FFM factor of neuroticism. Attention, characterized by persistence and ability to stay focused may correspond to the FFM factor conscientiousness, while behavioral inhibition, characterized by shyness and withdrawn behavior may be linked with the FFM factor of low extraversion. Both conscientiousness and neuroticism have been linked to health outcomes as well (Friedman et al., 1995, 1993; Shipley et al., 2007), suggesting that the roots of adult health may be evident relatively early in life.

Findings from this study are consistent with theory and empirical work suggesting that temperament and personality show meaningful continuities across time. A number of forms of person-environment interactions have been hypothesized to be instrumental in promoting this continuity, whereby individuals either evoke, react to, or select environments in ways that lead to the recreation of similar conditions (Caspi & Elder, 1988). As a result, early individual differences may be elaborated across the life course, leading to recurring emotional and behavioral experiences which cumulatively influence health in adulthood. In an earlier study, we investigated whether these childhood personality attributes were associated with adult emotional functioning also using the Providence NCPP data (Kubzansky et al., 2004). Attention and distress-proneness were strongly associated with levels of distress in adulthood. Viewed in conjunction with a growing body of research providing evidence that adult distress may increase risk for adverse health outcomes (Kiecolt-Glaser, McGuire, Robles, & Glaser, 2002; Rozanski, Blumenthal, Davidson, Saab, & Kubzansky, 2005), these studies suggest that an important mechanism by which personality may influence health is via effects on emotional functioning. Unfortunately, we could not fully test this model in the present study as adult emotional functioning was measured either simultaneously or after the occurrence of the available health outcomes. Regardless of the specific mechanism, evidence that early emerging personality attributes can influence adult health suggests that health risk and resilience factors may be identified and targeted for intervention in childhood, far in advance of possible consequences.

This study had several limitations. The childhood personality attribute measures available in this sample clearly do not capture some key dimensions of early emerging personality. For example, there was no available measure of a dimension relating to agreeableness or intellect-imagination which has predicted health status

in other studies. Moreover, we were unable to evaluate how changes in personality might influence health. Although we have prospective data with personality attributes measured in childhood and health measured in adulthood, true causality cannot be firmly established. It is possible for example, that genetic factors might contribute to both child personality and adult health. Finally, the self-report illness measure included only a limited set of diagnoses; it is possible that individuals had other illnesses not reported.

Strengths of this study include its long follow-up period spanning almost 30 years, the large diverse community sample of children, multiple data sources, and information on the early childhood environment. This study has several features that mitigate potential concerns as to whether measures of self-rated health may be subject to negativity bias, thereby inflating any apparent association between personality and health. Child personality was not self-reported, but rather was assessed by trained observers, making it less likely that results can be solely attributed to method bias that can arise when both predictor and outcome are self-reported. Moreover, we had two different measures of adult health. While general reports of how one is feeling may be negatively biased depending on mood or other individual characteristics, reports of illnesses like heart disease, cancer, and diabetes have been found to be highly accurate (Heliovaara et al., 1993; Martin et al., 2004). The strong association between and consistent findings across both outcomes in relation to the early personality attributes provide further reassurance for the validity of our findings. We were also able to control for several potential confounding variables in the relation between childhood personality characteristics and adult health, including SES and child health status, and therefore we expect that the internal validity of this study is high. Moreover, the robustness of the findings among only the group without learning difficulties suggests that findings may be generalizable to populations similar to the original Providence cohort.

The present study tests and finds support for one of the key relationships proposed in a life course model of personality and health. This perspective dovetails nicely with other research on personality and health which has posited cumulative effects via biological pathways, effects on stress, coping, and emotional responses, and health or illness behaviors (Friedman et al., 1993; Krantz & Hedges, 1987). In their discussion of theoretical formulations of the personality-health relationship, Scheier and Bridges (1995, p. 265) argue that "unless an acute state recurs frequently over time, the putative characteristic simply may not be present . . . long enough to affect outcomes that take a long time to transpire. In contrast, predictors such as personality predispositions tend to be present for both the short and long run. It follows that they should affect all types of outcomes." In the present study, health effects of early personality attributes were evident in midlife and in relation to multiple health outcomes. If early emerging characteristics contribute to the formation of long-term trajectories that influence health, this has important implications for strategies of disease prevention and intervention.

The magnitude of our findings are somewhat modest, but highly consistent with other research looking at the relation of childhood temperament or personality with adult psychopathology (Caspi, Moffitt, Newman, & Silva, 1996) and physical health (Friedman et al., 1993). Kagan (2002) has argued that while early childhood characteristics may constrain or restrict a particular set of future outcomes, they do not set individuals on an unvarying developmental course. This is because these child characteristics can be shaped and guided by social, family, and peer influence. Thus, early interventions may succeed in altering the course of development. While interventions in adulthood are certainly worthwhile, adult behaviors and styles of responding are difficult to change. In addition, it is unclear whether cumulative effects can be reversed as a result of intervention. Taken together, findings indicate that early emerging personality and related processes influence adult physical health, and suggest the potential value of interventions targeting early life development.

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