

BRIEF REPORT

Childhood Conscientiousness Relates to Objectively Measured Adult Physical Health Four Decades Later

Sarah E. Hampson, Grant W. Edmonds,
and Lewis R. Goldberg
Oregon Research Institute, Eugene, Oregon

Joan P. Dubanoski
Kaiser Permanente Center for Health Research, Hawaii,
Honolulu, Hawaii

Teresa A. Hillier
Kaiser Permanente Center for Health Research, Hawaii, Honolulu, Hawaii and
Kaiser Permanente Center for Health Research, Northwest

Objective: Many life span personality-and-health models assume that childhood personality traits result in life-course pathways leading through morbidity to mortality. Although childhood conscientiousness in particular predicts mortality, there are few prospective studies that have investigated the associations between childhood personality and objective health status in adulthood. The present study tested this crucial assumption of life span models of personality and health using a comprehensive assessment of the Big Five traits in childhood (M age = 10 years) and biomarkers of health over 40 years later (M age = 51 years). **Methods:** Members of the Hawaii Personality and Health Cohort ($N = 753$; 368 men, 385 women) underwent a medical examination at mean age 51. Their global health status was evaluated by well-established clinical indicators that were objectively measured using standard protocols, including blood pressure, lipid profile, fasting blood glucose, and body mass index. These indicators were combined to evaluate overall physiological dysregulation and grouped into five more homogeneous subcomponents (glucose intolerance, blood pressure, lipids, obesity, and medications). **Results:** Lower levels of childhood conscientiousness predicted more physiological dysregulation ($\beta = -.11, p < .05$), greater obesity ($\beta = -.10, p < .05$), and worse lipid profiles ($\beta = -.10, p < .05$), after controlling for the other Big Five childhood personality traits, gender, ethnicity, parental home ownership, and adult conscientiousness. **Conclusions:** These findings are consistent with a key assumption in life span models that childhood conscientiousness is associated with objective health status in older adults. They open the way for testing mechanisms by which childhood personality may influence mortality through morbidity; mechanisms that could then be targeted for intervention.

Keywords: Big Five traits, global health status, physiological dysregulation, life span models

Supplemental materials: <http://dx.doi.org/10.1037/a0031655.supp>

The relation between conscientiousness traits and mortality risk has now been demonstrated in at least 20 studies (Kern & Friedman, 2008). These findings indicate far-reaching influences of this personality trait and have been largely responsible for the recent

interest in a life span approach to investigating mechanisms linking personality and health with a view toward targeting these mechanisms for interventions (e.g., Chapman, Roberts, & Duberstein, 2011; Hill, Turiano, Hurd, Mroczek, & Roberts, 2011).

Many life span models of personality and health, whether they invoke health-behavior, stress, genetic, or other mechanisms, rely on the underlying principle that personality traits influence mortality through morbidity (major exceptions being models for sudden death because of accidents or homicide). Studies have associated personality and health outcomes using self-reports of health status and disease diagnoses (e.g., Goodwin & Friedman, 2006; Hampson, Goldberg, Vogt, & Dubanoski, 2007) and objective measures of health, such as physicians' ratings (Chapman, Lyness, & Duberstein, 2007), biomarkers (e.g., Sutin et al., 2009; Vollrath, Landolt, Gnehm, Laimbacher, & Sennhauser, 2007), or clinically determined disease progression (O'Leirigh, Ironson, Weiss, & Costa, 2007). Support for life span personality-health models also comes from short-term (Räikkönen, Matthews, Sutton-Tyrell, & Kuller, 2004) and long-term (Petersen, Seligman, & Vaillant, 1988) prospective studies within adulthood using clinically assessed health outcomes.

This article was published Online First March 25, 2013.

Sarah E. Hampson, Grant W. Edmonds, and Lewis R. Goldberg, Oregon Research Institute, Eugene, Oregon; Joan P. Dubanoski, Kaiser Permanente Center for Health Research, Hawaii, Honolulu, Hawaii; Teresa A. Hillier, Kaiser Permanente Center for Health Research, Hawaii, Honolulu, Hawaii, and Kaiser Permanente Center for Health Research Northwest, Portland, Oregon.

This research was supported by grant AG020048 from the National Institute on Aging, National Institutes of Health. The authors thank all past and present members of the Lifestyle, Culture and Health team at the Kaiser Permanente Center for Health Research, Hawaii, and the team at Oregon Research Institute for their many efforts that led to this report.

Correspondence concerning this article should be addressed to Sarah E. Hampson, Oregon Research Institute, 1715 Franklin Boulevard, Eugene, OR 97403-1983. E-mail: sarah@ori.org

However, only a few studies to date have the longitudinal data necessary to examine associations between childhood personality traits and objective measures of health status in adulthood. The Dunedin study demonstrated associations between self-control assessed in childhood and a physical health index at age 32 composed of metabolic abnormalities, airflow limitation, periodontal disease, sexually transmitted infection, and C-reactive protein level, (Moffitt et al., 2011). The study of Cardiovascular Risk in Young Finns related childhood negative temperament to carotid artery intima media thickness 21 years later (Keltikangas-Järvinen, Pulkki-Raback, Puttonen, Viikari, & Raitakari, 2006).

The present study adds to past research by using a comprehensive measure of childhood personality and biomarkers of health status assessed over four decades later. It was hypothesized that lower levels of childhood conscientiousness would be associated with poorer health status on a global measure of physiological dysregulation and each of its subcomponents, after controlling for the other childhood Big Five traits, adult conscientiousness, an indicator of childhood socioeconomic status, gender, and ethnic group.

Method

Participants

In the 1960s, a community sample of over 2,000 children representing entire classrooms in elementary schools on the Hawaiian islands of Oahu and Kauai were comprehensively assessed on their personality characteristics by their teachers. Since 1998, 1,942 (84%) of 2,321 members of this cohort have been located. Of the 1,904 located and available for recruitment, 1,380 (73%) have so far agreed to participate in further studies, and 807 have completed a medical and psychological examination at the research clinic. Here, the clinic subsample comprised the 753 participants (368 men, 385 women; M age = 51 years) who were missing none or only one of the biomarkers. Compared with the full adult sample, the clinic subsample included more Japanese Americans (36% vs. 28%) and fewer Caucasians (16% vs. 23%) and Native Hawaiians or other Pacific Islanders (20% vs. 26%). Clinic participants had marginally higher mean scores on childhood conscientiousness (.10 of an SD) and higher educational attainment, but did not differ on self-reported general health.

Measures

Personality traits. Teacher assessments of personality were obtained in 1965 and 1967 when participants were in Grades 1, 2, 5, or 6 (M age = 10 years). Using a fixed 9-step quasi-normal distribution, teachers rank-ordered all the children in their classroom on each of a comprehensive set of personality attributes. The number of attributes differed slightly between Oahu and Kauai schools and ranged from 43–49, with a common core of 39 items. Definitions of each attribute, developed by focus groups of teachers, were provided (e.g., “Persevering: Keeps at his or her work until it is completed; sees a job through despite difficulties, painstaking and thorough”). Orthogonal factor scores for the Big Five childhood personality factors (extraversion, agreeableness, conscientiousness, emotional stability, and intellect/imagination) were

derived for each participant on the basis of all the attributes available (Goldberg, 2001).

Control variables. Adult conscientiousness factor scores were obtained from self-ratings on the Big Five Inventory (John & Srivastava, 1999). Retrospective reports of parental home ownership across four periods up to age 18 were used as an indicator of childhood socioeconomic status (Cohen, Doyle, Turner, Alper, & Skoner, 2004), and ethnicity was determined from self-identified cultural/ethnic group in adulthood.

Adult clinical assessment of health status. The examinations were conducted by qualified staff following standard protocols at the Kaiser Permanente Center for Health Research, Hawaii in Honolulu and medical clinics on the islands of Kauai and Hawaii between 2003 and 2011. Height was measured using a stadiometer and weight by a balance beam scale. Waist circumference was measured at the midpoint between the lowest rib and the iliac crest, and hip circumference was measured at the greatest protrusion of the gluteal muscle. After 5 min of rest in a seated position, blood pressure was measured twice, 1 min apart, by a sphygmomanometer with an appropriate sized cuff. A fasting blood draw and a urine sample were collected and sent to the lab for analysis.

We constructed a composite variable of physiological dysregulation comprising biomarkers of the cardiovascular and metabolic systems indicative of allostatic load (Seeman, McEwen, Rowe, & Singer, 2001; Seplaki, Goldman, Gleib, & Weinstein, 2005): systolic and diastolic blood pressure (mean of two measurements), HDL cholesterol (reversed), total cholesterol/HDL ratio, fasting triglycerides, fasting blood glucose, body mass index (BMI; kg/m²), waist/hip ratio, urine protein (log transformed), and whether or not the participant was taking medications for cholesterol or blood pressure (for all variables, high scores indicated poorer health). Physiological dysregulation scores were constructed by standardizing each measure across both men and women and summing the SD s from the mean (positive deviations above the mean plus negative deviations below the mean). Higher scores on this measure indicated greater dysregulation (i.e., poorer health status). This measure is related to lower self-rated health, depressive symptoms, and several health behaviors (Hampson, Goldberg, Vogt, Hillier, & Dubanoski, 2009). Summing the SD s assumes that extremely low scores on each biomarker are healthier, which is not necessarily the case for BMI, blood pressure, triglycerides, and fasting blood glucose. However, only 1.2% or fewer of the sample had scores in the extremely low range on these biomarkers. When these few scores were recoded as unhealthy, the corrected version of dysregulation correlated .98 with the original version, so the original version was retained (Seplaki et al., 2005).

Scores (means) for five subcomponents identified by factor analysis and consisting of two or three correlated biomarkers were also examined: glucose intolerance (fasting blood glucose, urine protein), blood pressure (systolic blood pressure, diastolic blood pressure), obesity (BMI, hip/waist ratio), lipid profile (HDL cholesterol reversed, total cholesterol/HDL ratio, triglycerides), and medication (for high blood pressure and/or cholesterol).

This study was approved by the institutional review boards of both Oregon Research Institute and Kaiser Permanente Center for Health Research Hawaii. Informed consent for the clinical assessment was obtained in person.

Results

These participants exhibited the somewhat poor cardiovascular and metabolic health typical of a community sample of this age (biomarker means, *SDs*, and ranges are provided in Table S1 of the online supplement). Indeed, 31% meet the National Cholesterol Education Program criteria for metabolic syndrome (Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults, 2001). Men scored significantly worse than women on 9 of the 11 biomarkers and on the dysregulation composite. The correlation between metabolic syndrome (dichotomous) and physiological dysregulation was $r = .60$, confirming that the dysregulation composite was a global, but not necessarily unitary, measure of cardiovascular and metabolic health.

Children rated by the teachers as less conscientious had worse global health status in adulthood. Childhood conscientiousness, as the single predictor in a regression analysis, was significantly associated with adult dysregulation, $F = 43.71$, $df = 1,744$, $p < .001$, $\beta = -.24$, $p < .001$. In an analysis controlling for gender, ethnicity, parental home ownership, adult conscientiousness (which correlated $r = .22$, $n = 712$, with child conscientiousness in this sample), and the other childhood Big Five factors, childhood conscientiousness was the only childhood Big Five factor to predict physiological dysregulation (Table 1). Being male and self-identifying as Native Hawaiian or Pacific Islander also predicted higher levels, while self-identifying as Japanese American predicted lower levels of physiological dysregulation. Low childhood conscientiousness was the only childhood trait to predict any of the subcomponents of dysregulation, predicting greater obesity ($\beta = -.10$, $p < .05$) and worse lipid profiles ($\beta = -.10$, $p < .05$) after controlling for all other predictors (see Tables S3 and S4 in the online supplement). Gender did not moderate the effect of childhood conscientiousness in any of these analyses so the models presented here did not include this interaction.

Discussion

This study tested a key principle of many life-course models of personality and health: that childhood personality traits influence mortality through morbidity. To the best of our knowledge, this is the first study in which all the Big Five personality traits assessed in childhood have been used to predict objective health status assessed by multiple biomarkers over 40 years later in older adulthood. Lower childhood conscientiousness predicted greater physiological dysregulation, greater obesity, and worse lipid profiles in adulthood. This association was independent of the other Big Five childhood traits, adult conscientiousness, an indicator of childhood socioeconomic status, ethnicity, and gender. This finding is consistent with life span models of personality and health models that propose that childhood personality traits result in life-course pathways leading through morbidity to mortality.

Consistent with previous research, men had poorer health than women (Goldman et al., 2004), as did those who described themselves as Native Hawaiian or other Pacific Islander (Liu, Blaisdell, & Nia Aitaoto, 2008). However, none of the other childhood Big Five traits predicted the health outcomes. No biomarkers of hypothalamic-pituitary-adrenal axis functioning (i.e., stress) were available, which may account for the absence of other trait associations, particularly for neuroticism. Important variables such as educational attainment, socioeconomic status after childhood, and health behaviors or stressful events over the life course were not examined here. These variables are likely to influence the association between childhood personality traits and health outcomes through complex moderating and mediating mechanisms unfolding over the life span and warrant extensive evaluation.

The investigation of mechanisms underlying the associations observed here constitutes an important agenda for life span approaches to personality and health with possible implications for interventions. For example, childhood conscientiousness was associated with obesity and lipid profiles, suggesting its

Table 1

Results of Multiple Regression Analysis to Predict Physiological Dysregulation From Childhood Conscientiousness Controlling for Gender, Ethnicity, Parental Home Ownership, Adult Conscientiousness, and the Other Big Five Childhood Personality Factors

Outcome	Adjusted <i>R</i>	<i>F</i>	<i>df</i>	β	<i>t</i>
Physiological dysregulation	0.45	12.977***	11, 505		
Predictors					
Gender				-0.36	-8.32***
Native Hawaiian or Pacific Islander				0.11	2.28*
Japanese American				-0.11	-2.22*
Caucasian				-0.09	-1.95
Parental home ownership				-0.03	-0.66
Adult conscientiousness				-0.03	-0.85
Child extraversion				-0.00	-0.03
Child agreeableness				-0.00	-0.10
Child conscientiousness				-0.11	-2.50*
Child emotional stability				0.01	0.32
Child intellect/imagination				0.05	1.38

Note. All predictors were entered at the same step. Sample size was reduced for these analyses as a result of listwise deletion: 7 participants were missing the childhood personality factor scores, 41 were missing adult conscientiousness, and 236 were missing parental home ownership. Excluding parental home ownership from the model resulted in a larger sample size and produced a similar pattern of results with differences only on which ethnicity variables were significant (see Table S2 in the online supplement). Males = 0, Females = 1.

* $p < .05$. *** $p < .001$.

effects on adult global health may be the result of potentially modifiable mechanisms related to weight gain. Different personality mechanisms may be more relevant at different points in the life span. In childhood when personality is least stable, intervening to increase conscientiousness (e.g., by teaching broadly applicable self-control strategies) may lead to a wide range of downstream benefits on health. In adulthood, when traits are less malleable, training specific behaviors to compensate for low levels of conscientiousness may be more effective (e.g., posting reminders to take medications).

References

- Chapman, B. P., Lyness, J. M., & Duberstein, P. (2007). Personality and medical illness burden among older adults in primary care. *Psychosomatic Medicine*, *69*, 277–282. doi:10.1097/PSY.0b013e3180313975
- Chapman, B. P., Roberts, B., & Duberstein, P. (2011). Personality and longevity: Knowns, unknowns, and implications for public health and personalized medicine. *Journal of Aging Research*, *2011*, 24 pages. doi:10.4061/2011/759170
- Cohen, S., Doyle, W. J., Turner, R. B., Alper, C. M., & Skoner, D. P. (2004). Childhood socioeconomic status and host resistance to infectious illness in adulthood. *Psychosomatic Medicine*, *66*, 553–558. doi:10.1097/01.psy.0000126200.05189.d3
- Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults. (2001). Executive summary of the third report of the National Cholesterol Education Program (NCEP) expert panel on detection, evaluation, and treatment of high blood cholesterol in adults (Adult Treatment Panel III). *Journal of the American Medical Association*, *285*, 2486–2497. doi:10.1001/jama.285.19.2486
- Goldberg, L. R. (2001). Analyses of Digman's child-personality data: Derivation of Big-Five factor scores from each of six samples. *Journal of Personality*, *69*, 709–743. doi:10.1111/1467-6494.695161
- Goldman, N., Weinstein, M., Cornman, J., Singer, B., Seeman, T., & Chang, M-C. (2004). Sex differentials in biological risk factors for chronic disease: Estimates from population-based surveys. *Journal of Women's Health*, *13*, 393–403. doi:10.1089/154099904323087088
- Goodwin, R. D., & Friedman, H. (2006). Health status and the five-factor model of personality in a nationally representative sample. *Journal of Health Psychology*, *11*, 643–654. doi:10.1177/1359105306066610
- Hampson, S. E., Goldberg, L. R., Vogt, T. M., & Dubanoski, J. P. (2007). Mechanisms by which childhood personality traits influence adult health status: Educational attainment and healthy behaviors. *Health Psychology*, *26*, 121–125. doi:10.1037/0278-6133.26.1.121
- Hampson, S. E., Goldberg, L. R., Vogt, T. M., Hillier, T. A., & Dubanoski, J. P. (2009). Using physiological dysregulation to assess global health status: Associations with self-rated health and health behaviors. *Journal of Health Psychology*, *14*, 232–241. doi:10.1177/1359105308100207
- Hill, P. L., Turiano, N. A., Hurd, M. D., Mroczek, D. K., & Roberts, B. W. (2011). Conscientiousness and longevity: An examination of possible mediators. *Health Psychology*, *30*, 536–541. doi:10.1037/a0023859
- John, O. P., & Srivastava, S. (1999). The Big Five trait taxonomy: History, measurement, and theoretical perspectives. In L. A. Pervin & O. P. John (Eds.), *Handbook of personality: Theory and research* (2nd ed., pp. 102–138). New York, NY: Guilford.
- Keltikangas-Järvinen, L., Pulkki-Raback, L., Puttonen, S., Viikari, J., & Raitakari, O. T. (2006). Childhood hyperactivity as a predictor of carotid artery intima media thickness over a period of 21 years: The Cardiovascular Risk in Young Finns Study. *Psychosomatic Medicine*, *68*, 509–516. doi:10.1097/01.psy.0000227752.24292.3e
- Kern, M. L., & Friedman, H. (2008). Do conscientious individuals live longer? A quantitative review. *Health Psychology*, *27*, 505–512. doi:10.1037/0278-6133.27.5.505
- Liu, D. M. K. I., Blaisdell, R. K., & Nia Aitaoto, N. (2008). Health disparities in Hawai'i: Part 1. *Hawai'i Journal of Public Health*, *1*, 5–13.
- Moffitt, T. E., Arseneault, L., Belsky, D., Dickson, N., Hancox, R. J., Harrington, H., . . . Caspi, A. (2011). A gradient of childhood self-control predicts health, wealth, and public safety. *Proceedings of the National Academy of Sciences, USA*, *108*, 2693–2698. doi:10.1073/pnas.1010076108
- O'Leirigh, C., Ironson, G., Weiss, A., & Costa, P. T., Jr. (2007). Conscientiousness predicts disease progression (CD4 number and viral load) in people living with HIV. *Health Psychology*, *26*, 473–480. doi:10.1037/0278-6133.26.4.473
- Peterson, C., Seligman, M. E. P., & Vaillant, G. E. (1988). Pessimistic explanatory style is a risk factor for physical illness: A thirty-five-year longitudinal study. *Journal of Personality and Social Psychology*, *55*, 23–27. doi:10.1037/0022-3514.55.1.23
- Räikkönen, K., Matthews, K. A., Sutton-Tyrell, K., & Kuller, L. H. (2004). Trait anger and the metabolic syndrome predict progression of carotid atherosclerosis in healthy middle-aged women. *Psychosomatic Medicine*, *66*, 903–908. doi:10.1097/01.psy.0000143638.31297.11
- Seeman, T. E., McEwen, B. S., Rowe, J. W., & Singer, B. H. (2001). Allostatic load as a marker of cumulative biological risk: MacArthur studies of successful aging. *Proceedings of the National Academy of Sciences, USA*, *98*, 4770–4775. doi:10.1073/pnas.081072698
- Seplaki, C. L., Goldman, N., Gleib, D., & Weinstein, M. (2005). A comparative analysis of measurement approaches for physiological dysregulation in an older population. *Experimental Gerontology*, *40*, 438–449. doi:10.1016/j.exger.2005.03.002
- Sutin, A. R., Terracciano, A., Deiana, B., Naitza, S., Ferrucci, L., Uda, M., . . . Costa, P. T., Jr. (2009). High neuroticism and low conscientiousness are associated with interleukin-6. *Psychological Medicine*, *40*, 1485–1493. doi:10.1017/S0033291709992029
- Vollrath, M. E., Landolt, M. A., Gnehm, H. E., Laimbacher, J., & Sennhauser, F. H. (2007). Child and parental personality are associated with glycaemic control in Type 1 diabetes. *Diabetic Medicine*, *24*, 1028–1033. doi:10.1111/j.1464-5491.2007.02215.x

Received January 27, 2012

Revision received July 24, 2012

Accepted August 6, 2012 ■