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A New Twist on Old Questions: A Lifespan Approach to the Trait Concept

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Abstract

Objective—We examine three cardinal concerns in personality psychology from a lifespan perspective: trait structure, trait stability, and trait mechanisms that account for the predictive utility of traits. We draw on previously published and new findings from the Hawaii Longitudinal Study of Personality and Health, as well as work by others.

Method—The Hawaii study provides a unique opportunity to relate a comprehensive assessment of participants' childhood personality traits (over 2,000 children, mean age 10 years) to their adult personality traits and other self-report outcomes in their 40's, 50's and 60's, and their clinically assessed health at mean age 51.

Results—Our analyses have demonstrated that the Big Five can be used to describe childhood personality in this cohort. The stability of the Big Five from childhood teacher assessments to adult self or observer reports is modest and varies from Big Five trait to trait. Personality mechanisms of lifespan health behavior and lifespan trauma experience explain some of the influence of childhood conscientiousness on adult health outcomes.

Conclusions—A lifespan approach highlights the dynamic nature of traits and their long-term predictive utility, and offers numerous directions for future research.

Keywords

Hawaii Longitudinal Study of Personality and Health; trait theory; trait structure; trait stability; trait mechanisms

Trait theories assume that people differ reliably from one another in their stable patterns of behavior across situations and time. Personality traits describe these individual differences in terms of characteristic thoughts, feelings, and behaviors (Funder, 2001). It is widely agreed that individual differences in personality can be captured by five broad trait dimensions, here referred to as the Big Five: extraversion, agreeableness, conscientiousness, emotional stability (versus neuroticism), and openness to experience/intellect (John, Naumann, & Soto, 2008; McCrae & Costa, 2008). In this article, we provide a new twist on some old questions about personality traits by examining several enduring theoretical issues in trait theory from a lifespan perspective.

Declaration of Interests

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Lifespan Personality Trait Theory

What are personality traits? The richness and diversity of approaches to personality traits are well-illustrated by this special issue. One of the authors of this contribution (Hampson) has long regarded traits as linguistic concepts that refer to individual variation in observed patterns of behavior and inferred patterns of thoughts and feelings (Hampson, 1988). We can study individual variation described by these concepts from a number of perspectives, including genes, biological systems, brain structure and function, and lay perceptions of personality. These perspectives all have contributions to make to our understanding of human personality, and may one day be integrated in a highly complex overarching model. For example, the Big Five trait structure represents the convergence of traits as categories used in everyday (lay) personality description, with traits as dimensions representing systematically analyzed individual variation: both approaches yield a Big Five structure (Hampson, 1988). The choice of theoretical emphasis (e.g., social, biological, genetic) will determine the kinds of research questions to be investigated. However, arguably the most important question to ask of personality traits, which transcends theoretical perspectives, is – do these ways of construing people have predictive power? That is, are they useful?

In this article, we address the question of predictive utility within a lifespan context. Drawing on the lifespan approach to developmental psychology (Baltes, Reese, & Lipsitt, 1980), our approach places no age limits on the potential for personality trait development, and examines trait change in relation to other developmental changes across the life course. The predictive utility of traits is investigated across life stages (e.g., child to adult) as well as within (e.g., early adulthood to mid-life). A lifespan approach to trait theory also takes ideas from life course epidemiology (Kuh & Ben-Shlomo, 1997; Krueger, Caspi, & Moffitt, 2000; Lynch & Davey Smith, 2005). One such idea is the notion of “exposure.” An external factor can change the course of development, particularly if that exposure occurs during a sensitive or critical period. For example, exposure to lead in the water adversely affects children’s brain development. The concept of exposure can also be applied to internal factors such as personality traits. Being “exposed” to certain traits during development may have long-lasting effects. For example, a teenager with high levels of sensation seeking may drive recklessly and suffer permanent injuries in a traffic accident. In this sense, trait levels may be viewed as a form of exposure that can occur at a critical or sensitive period in development, or there can be cumulative effects of exposure to a trait over the life course (Hampson & Friedman, 2008).

There are several enduring issues for any trait theory that are intimately connected with the question of predictive utility, including the optimal trait structure for predictive purposes, trait stability or change, and mechanisms to account for the predictive utility of traits. These three issues: trait structure, trait stability, and trait mechanisms, will be the main topics to be addressed here from a lifespan perspective. First, however, we introduce the Hawaii Longitudinal Study of Personality and Health, because we shall be drawing on both published and new findings from this study.

The Hawaii Longitudinal Study of Personality and Health

The Hawaii longitudinal study of personality and health, hereafter referred to as the Hawaii study, is an ongoing investigation of 1st – 6th grade elementary school children who were first assessed on their personality traits between 1959 and 1967. The personality assessments of over 2,000 children were directed by John (Jack) M. Digman, when he was a professor at the University of Hawaii. He recruited elementary school teachers on the Hawaiian islands of Oahu and Kauai to rank-order all the children in their classrooms on 43 – 63 trait terms using a 9-step quasi-normal distribution. A detailed description of the childhood subsamples is provided by Goldberg (2001).

Work to find and conduct follow-up assessments on these children began in 1998, when they were middle-aged adults, and is ongoing (Hampson et al., 2001). To date, we have found 84% of the original childhood cohort, which is remarkable given that the only information attached to the child assessments are the child's first name and last name, and the name of their elementary school. Of those we have found, and who are not already deceased, 73% have agreed to participate in follow-up studies. They are mailed questionnaires, and are invited to attend a half-day in-person clinic examination that includes medical and psychological assessments and collection of blood and urine. The questionnaires have included repeated assessments of adult personality, and measures of self-reported physical and mental health and functional status, health behaviors, and trauma experience, as well as numerous other variables.

Strengths of the Hawaii study include the comprehensive personality assessment in childhood, the ethnic diversity of the sample (which includes primarily those of Japanese, Native Hawaiian or Pacific Islander, or European ancestry), and the length of follow-up. A limitation is the gap of 40 years between the childhood personality assessment and the beginning of the follow-up studies. However, the Hawaii study is ideal for research questions concerning the predictive utility of childhood personality, and it becomes more valuable with every additional assessment as the cohort moves into old age.

The Optimal Trait Structure for Childhood Personality

Identifying the optimal trait structure in childhood is critical because children's traits are used to predict their later outcomes. Ideally, we would like to use the same trait structure across the lifespan so that we can be confident that we are referring to parallel traits at different life stages (Roberts, Wood, & Caspi, 2008). We will focus on two theoretical issues concerning trait structure in childhood that continue to be controversial and are of importance for a lifespan approach: first, whether the Big Five trait structure found in adults is applicable to children and predicts later outcomes (Shiner & DeYoung, 2013); second, whether structures based on person-centered analyses have advantages over variable-centered analyses when describing childhood personality (Asendorpf, 2015).

The Big Five in Childhood

The evidence that the Big Five structure can be used to describe childhood personality is compelling. The Big Five trait structure has been identified in parent, teacher, or self-ratings

of school-age children from first grade on up (Digman, 1989; Halverson et al., 2003; John, Caspi, Robins, Moffitt, & Stouthamer-Loeber, 1994; Mervielde & De Fruyt, 2000). Furthermore, the Big Five structure can be identified in 5-year olds' self-descriptions (Measelle, John, Ablow, Cowan, & Cowan, 2005), and observers' descriptions of children as young as 3 years (Tackett et al., 2012).

Digman's (1989) pioneering studies of child personality structure used some of the subsamples of the Hawaii cohort. He originally set out to replicate the larger set of factors identified by Cattell and Coan (1957), so his variable selection was not pre-structured to reflect the adult Big Five, which at that time had not been widely identified. Nevertheless, he repeatedly found a five-factor structure in teacher assessments of elementary school children that later came to be known as the Big Five. More recently, Goldberg (2001) conducted a comprehensive analysis of the entire set of childhood personality data in the Hawaii study. These analyses formed the basis for deriving Big Five factor scores in childhood for the Hawaii participants that we have used to predict numerous adult outcomes.

In examining the predictive utility of these childhood traits, our focus has been on predicting health outcomes. One or more of childhood extraversion, agreeableness, and conscientiousness predicted self-reported smoking, alcohol use, body mass index, or self-rated health assessed 40 or more years after the teacher assessments of childhood personality (Hampson, Goldberg, Vogt, & Dubanoski, 2006). Conscientiousness was the only trait in childhood to predict membership in the trajectory class of decreasing self-rated health (compared to membership in stable self-rated health classes) measured over six occasions across a 14-year period in middle-age (Hampson, Edmonds, Barckley, Goldberg, Dubanoski, & Hillier, 2016). Childhood conscientiousness was also the only childhood trait to be associated with objectively measured health (a combination of biomarkers of cardiovascular and metabolic health obtained at a clinic visit) at average age 51, even after controlling for adult conscientiousness (Hampson, Edmonds, Goldberg, Dubanoski, & Hillier, 2013).

These associations across 40 or more years between childhood personality traits and adult health outcomes demonstrate the utility of the childhood Big Five trait structure for predicting outcomes that matter. Our findings are consistent with or extend those from the few other longitudinal studies showing that childhood Big Five traits predict consequential adult outcomes (Ozer & Benet-Martinez, 2006; Roberts, Kuncel, Shiner, Caspi, & Goldberg, 2007). For example, Friedman et al. (1993), using data from the Terman Life-Cycle Study, found that conscientiousness assessed in childhood (age 11) predicted lower risk of mortality across the lifespan. In the Dunedin study, Moffitt et al. (2011) demonstrated that self-control (related to conscientiousness) in childhood (age 3 – 11) predicted a physical health index at age 32 formed from objective assessments of biomarkers. Looking beyond the physical health domain, using data from Project Competence, Shiner and Masten (2012) found that all the Big Five assessed at age 10 predicted one or more aspects of adult competence measured at age 20 (e.g., academic attainment, social competence), and conscientiousness and agreeableness predicted one or more kinds of competence at 30.

Although the Big Five can be identified in young children, and children's Big Five traits can predict consequential adult outcomes, the Big Five factor structure does not necessarily

emerge as cleanly (in terms of cross-loadings) as it does in comparable studies of adults (Lamb, Chuang, Wessels, Broberg, & Hwang, 2002; Measelle et al., 2005; Roberts et al., 2008; Soto, John, Gosling, & Potter, 2008). While Big Five structures can be discerned at every developmental period in the lifespan, structural differences at each age may hinder the development of longitudinal data on personality change. Different rater perspectives, while also providing Big Five structures, are often only correlated modestly, and it is unclear how much changes in coherence over time are confounded with different rater scenarios, and different rater characteristics. For example, Soto et al. (2008) demonstrated that for adolescents, personality structure increased in coherence over a period of ten years. This may be due to developmental changes in personality over this time period, but is just as likely due to cognitive changes in adolescence, where verbal abilities are increasing, and meta-cognitive capacities for self-evaluation are also rapidly developing. Evidence for reduced coherence in childhood personality can be seen in teacher and parent ratings of children when compared with self-and peer-ratings of adult targets. Accordingly, integrating measures across rater perspectives and developmental ages represents a challenge. To date, no measurement model has seamlessly integrated parent and teacher ratings of children with their own self-ratings, either in childhood, adolescence, or adulthood. What is missing is a measurement structure that allows for measurement equivalence, and/or models deviating from this, spanning childhood and later developmental periods. In the service of achieving this goal, a more optimal trait structure for children may be one that identifies fewer, broader traits at a higher hierarchical level than the Big Five (Tackett et al., 2012).

Digman (1997) energized the debate over optimal hierarchical levels in trait structure by demonstrating a reliable 2-factor structure in both adult and child samples, including some of the subsamples of the Hawaii cohort. He labeled them alpha, the combination of agreeableness, conscientiousness, and emotional stability (lack of neuroticism), and beta, the combination of extraversion and openness. More recent studies have produced similar, but not necessarily identical, higher-order factors. In a cross-cultural study conducted in five countries, Tackett et al. (2012) examined the hierarchical structure of parental ratings of children's personality. The same two-factor structure, which contrasted the combination of openness and extraversion with agreeableness and neuroticism, emerged across cultures. Using the California Child Q set, Wilson, Schalet, Hicks, and Zucker (2013) were also able to derive two broad personality dimensions, which they labelled adaptive socialization and anxious inhibition. Adaptive socialization was most strongly associated with higher conscientiousness and agreeableness, whereas anxious introversion was most strongly associated with lower extraversion.

Similar two-dimensional characterizations of personality and motivation have appeared with regularity in the psychological literature (e.g., agency and communion, intimacy and power), and higher-order factors provide a way to integrate these broad constructs with more narrow traits (John, Hampson, & Goldberg, 1991). A broad, two-dimensional structure may have advantages over five factors for some purposes. It may be more straightforward to trace the biological underpinnings of two broad constructs than of more specific traits at the five-factor level (De Young, 2006; Read et al., 2010), and the hierarchical approach to trait structure may accommodate both normal and abnormal personality traits (Markon, Krueger, & Watson, 2005). In factor analytic work across cultures, a similar two factor structure has

been found to be highly replicable (Thalmayer & Saucier, 2014). Higher-order factor structures may also be more consistent across ages (Tackett et al., 2012), and further might be useful in lifespan studies in which the childhood personality assessment was not based on a comprehensive, five-factor approach.

Person-centered Approaches to Childhood Personality

A variable-centered (inter-individual) approach describes the covariation of personality characteristics in the population whereas a person-centered approach describes the covariation of these characteristics within the individual. Big Five trait theory is a variable-centered approach. In contrast, the person-centered (intra-individual) approach describes replicable groups of individuals who share the same profile of personality characteristics traits, referred to as personality types. The person-centered approach has proved valuable in lifespan research. Most notably, Block (1971) identified the over-controlled, under-controlled, and resilient personality types and used these to predict long-term outcomes. Subsequently, this typology and its utility has been replicated in other studies (Asendorpf, Borkenau, Ostendorf, & Van Aken, 2001; Caspi & Silva, 1995; Robins, John, Caspi, Moffitt, & Stouthamer-Loeber, 1996; Van den Akker, Deković, Asseher, Shiner, & Prinzie, 2013; Wilson et al., 2013). Nevertheless, the merits and demerits of person-centered approaches have been debated (Asendorpf, 2003; 2006; 2015; McCrae, Terraciano, Costa, & Ozer, 2006), and the optimal number of personality types has been questioned (Herzberg & Roth, 2006).

Chapman and Goldberg (2011) empirically derived the three personality types for the Hawaii cohort using children's scores on the Big Five traits as their starting point. Overcontrolled was defined primarily by low extraversion and openness, undercontrolled by low agreeableness and conscientiousness, and resilient by low neuroticism and higher scores on the other Big Five. These child personality types predicted self-reported health outcomes 40 years later, particularly when degree of similarity to the type was taken into account. For example, resilient types reported better general health and were less likely to report high cholesterol or stroke. Although a variable-centered approach (i.e., using scores on each of the Big Five) to predict these outcomes yielded comparable results, Chapman and Goldberg (2011) concluded the type approach is more parsimonious so may have advantages in some contexts. For example, there is increasing interest in interactions among the Big Five as predictors of health outcomes (e.g., Turiano, Whiteman, Hampson, Roberts, & Mroczek, 2012). A type approach may prove a more efficient way to model certain combinations of traits that are both predictive of health outcomes and common in the general population.

When Chapman and Goldberg (2011) related the three childhood personality types to adult health, they only examined self-reported outcomes. For this article, we related similarity to the childhood types to measures of objective health status assessed at a clinical examination at mean age 51. These measures were summed to produce an index of dysregulation assessed by nine metabolic and cardiovascular biomarkers (systolic and diastolic blood pressure, total cholesterol, triglycerides, fasting blood glucose, body mass index, waist/hip ratio, medications for cholesterol and/or high blood pressure; Hampson, Goldberg, Vogt, Hillier, & Dubanoski, 2009). Consistent with the self-report associations, less similarity to

the resilient type was associated with more dysregulation ($r = -.08$, $N = 676$, $p = .033$, controlling for gender), but similarity to neither the undercontrolled nor the overcontrolled type was related to dysregulation. The association between the resilient type and objective health status 40 or more years later demonstrates some utility to the childhood types, although no clear advantage over the Big Five traits.

Trait Stability across the Lifespan

Fundamental to trait theory is the assumption that traits are relatively stable. Without some level of observable stability in people's patterns of thoughts, feelings, and behaviors, there would be no everyday vocabulary of personality description to capture these individual differences, and no need for trait theories postulating their underlying biological and environmental origins. Despite being so fundamental, there is a surprising level of disagreement about the extent to which traits are stable or change, and conflicting views on when in life personality reaches maturity (Griffin, Mroczek, & Wesbecher, 2015; Specht et al., 2014). We examine two theoretical questions about trait stability that are well-suited to a lifespan approach. Is there observable personality stability from childhood to adulthood? When in adulthood, if ever, does personality reach maturity and then remain stable?

Trait Stability from Childhood to Adulthood

Children's psychological and physical characteristics develop rapidly, hence test-retest correlations are smaller for children and adolescents than adults across the same time period (Roberts & DelVecchio, 2000). Nevertheless, if there is some enduring quality captured by traits, then it should be possible to find modest associations between assessments of child and adult traits, even across long time intervals (Fraleley & Roberts, 2005). In the Hawaii cohort, the range of stability estimates (rank-order correlations), based on teachers' assessments in childhood (at mean age 10 years) and self- and observer-reports about four decades later in adulthood, using various rating instruments, differed across traits. Stabilities were highest for extraversion (.20 to .29), conscientiousness (.20 to .25), and intellect/openness (.16 to .25), followed by agreeableness (.06 to .09), and neuroticism (emotional stability) (−.06 to .04), (Edmonds, Goldberg, Hampson, & Barckley, 2013; Hampson & Goldberg, 2006). These results suggested that the processes contributing to personality stability and change may differ across traits. The magnitude of these correlations, particularly for agreeableness and neuroticism, are lower than the expected 40-year rank-order stability coefficient of .25 estimated in Roberts and DelVecchio's (2000) meta-analysis. However, they analyzed studies conducted across various time spans within adulthood (from age 20 onwards), whereas stability from childhood to adulthood is expected to be lower. Any one rating perspective has its own limitations. An advantage of teacher ratings is that, unlike parents, teachers are familiar with entire classrooms of children and so can better judge where to place a child on a fixed distribution, which was the rating method in the Hawaii study. However, teachers are not exposed to all aspects of a child's personality. De Raad (1996) found that traits of extraversion, conscientiousness, and intellect/openness were viewed as being of greater relevance in an educational context by teachers and lay persons than agreeableness and emotional stability. Teachers may be more accurate at assessing these aspects of personality, resulting in higher stability estimates.

Differences in stability among the Big Five have not been emphasized in previous research (Caspi, Roberts, & Shiner, 2005; Roberts et al., 2008). These differences may be unique to the Hawaii cohort, but the unusually high quality of the childhood personality assessment in this study compared to others speaks in favor of the wider generality of these findings. Accordingly, at least when examining trait stability from childhood to adulthood, potential differences among the Big Five should be evaluated.

Personality Change in Adulthood

Personality develops from childhood to adulthood, which raises a second question about personality stability: when, if ever, does personality reach maturity or stabilize in adulthood? Costa and McCrae (1994) argued that personality stabilizes at age 30, whereas Roberts and DelVecchio (2000) concluded that rank-order correlations appear to reach a peak and remain stable sometime after age 50. A weakness of many longitudinal studies of trait stability is that they only have two times of assessment, and so confound measurement error and true change (Fraley & Roberts, 2005). At least three assessments, preferably more, are desirable and allow for nonlinear change.

Participants in the Hawaii study provided self-ratings on the Big Five Inventory (BFI; John et al., 2008) on three occasions over approximately 12.6 years. Their mean age was 46 at T1, 48 at T2, and 58 at T3. The mean time interval between completion of the T1 and T2 measures was 2.8 years, and the mean time interval between T2 and T3 was 9.8 years. For this article, we examined the trajectories for each trait across this age span. Although the traits differ on their intercepts, it is clear from Figure 1 that change was only modest across this age span. The trajectories of extraversion and openness were flat, whereas those for the other three traits showed only very modest increases over time. These observations were confirmed in latent growth analyses. These findings tend to support the view that during the forties and fifties, the Big Five traits remain relatively stable, most clearly for the beta traits (extraversion and openness), and somewhat less so for the alpha traits (agreeableness, conscientiousness, and emotional stability).

The multiple adult assessments enabled us to test the hypothesis advanced by Fraley and Roberts (2005) that trait maturity would be marked by stability coefficients reaching a non-zero asymptote or plateau. The correlations between the childhood Big Five and the three BFI adult assessments are shown in Table 1. If trait stability is achieved during this age range (46–58), then the three child-to-adult correlations for each trait should be similar. The differences among the pairs of correlations were tested for each trait, and all were non-significant, suggesting that all traits had reached a plateau. Contrary to Fraley and Robert's (2005) assumption of similar asymptotes across the Big Five, the asymptote was higher for the alpha traits (around .20) than for two of the beta traits (around .06), with conscientiousness falling between them, providing further evidence of likely differences among the Big Five traits in the processes of personality change.

Given the scarcity of long-term longitudinal personality studies, investigations conducted on different age groups provide a valuable alternative for examining developmental trends in mean trait levels across the lifespan (Roberts, Walton, & Viechtbauer, 2006; Srivastava,

John, Gosling, & Potter, 2003). Marsh, Nagengast, and Morin (2013) used Big Five self-ratings from over 14,000 participants in the British Household Panel Survey to study changes in mean trait levels for three broad age groups: 15–30, 31–60, and 61–99 years. They identified considerable trait change in late adulthood, which they called “the dolce vita” effect: in old age there is less focus on responsibilities and more on enjoying life (e.g., decreased conscientiousness, increased agreeableness). Their oldest group included participants who were older than those in previous studies that had not found evidence of reduced conscientiousness later in life (Allemand, Zimprich, & Hendriks, 2008; Soto, John, Gosling, & Potter, 2011).

Reflecting the theoretical shift away from assuming that at some point in adulthood personality traits will stabilize, a recent special issue of the *European Journal of Personality* was devoted entirely to personality development in adulthood (Specht et al, 2014). The contributors concluded that personality development occurs at all ages, but change appears to be most marked prior to age 30 and after age 60. This conclusion highlights a need for more studies of trait change in young and older adulthood. We need to study trait trajectories that encompass younger adulthood to identify when the rate of change begins to slow down, whether this differs by trait, and whether there are individual differences in these patterns (e.g., Wängqvist, Lamb, Frisén, & Hwang, 2015).

Studies of trait trajectories in older adulthood also indicate different patterns of trait change. In a pioneering study, Mroczek and Spiro (2007) related high and increasing neuroticism to mortality risk among older men. More recently, Möttus, Johnson, Starr, and Deary (2012) studied personality change in the ninth decade measured over two assessments (age 81 and age 87) using a latent trait approach (to address measurement error). At the mean level, declines in all Big Five traits except emotional stability were observed. However, there were also individual differences in personality change. Declines in conscientiousness were associated with declines in physical fitness. These studies illustrate the potential for personality change in old age as an early indicator of deterioration in physical and mental health. Personality change can result from health change but it may also signal pre-clinical health changes (Terracciano et al., 2013). Longitudinal studies will illuminate the causal direction in these associations. The Hawaii cohort is now entering its seventh decade, and we plan to study personality change in old age and relate trait change to health outcomes as the cohort ages.

The current emphasis on personality change across the lifespan contradicts the continuity in the experience of the self. We may be aware of some personality changes over the years but we do not necessarily feel we have changed as much as research now suggests we have. To explain the subjective sense of continuity despite objective trait change, we find it useful to invoke McAdams’ idea of the life narrative, which is the story we construct for ourselves that unites our traits, goals and values over the life course, including their changes, into our experience of being the same person (McAdams & Manczak, 2015; McAdams this issue).

Lifespan Trait Mechanisms

The Big Five traits in childhood and adulthood, measured on one occasion, as well as changes on the Big Five, predict consequential outcomes across the lifespan (Ozer, & Benet-Martínez, 2006; Mroczek & Spiro, 2007; Roberts et al., 2007). For the most part, the research reviewed up to this point has not directly addressed the underlying mechanisms that may explain these personality-outcome associations. However, now that the predictive utility of traits has been amply demonstrated, researchers are investigating the processes by which traits affect outcomes (Hampson, 2012).

Trait processes are the actions or reactions that unfold over time to produce the outcomes associated with those traits. Two kinds of processes, instrumental and reactive, reflect distinct theoretical mechanisms that have been proposed to explain trait-outcome associations. Instrumental trait processes describe the proactive tendency to create opportunities to experience certain thoughts, feelings, behaviors, and outcomes. For example, a more conscientious person who gets sick may adhere more closely to a treatment regimen than a less conscientious person and consequently experience greater health benefits. In this case, the effect of the trait (conscientiousness) on the outcome (health status) is mediated by health behaviors (adherence). Reactive trait processes, the tendency to experience certain thoughts, feelings, and behaviors in response to events, tend to be more passive. For example, a neurotic person may experience more distress in response to a family crisis than a less neurotic person. In this case, the association between the predictor (family crisis) and outcome (distress) is moderated by neuroticism. We have examined both kinds of trait processes in the prediction of health outcomes from childhood personality traits in the Hawaii study.

Health Behavior Mechanisms

We have seen that the Big Five trait of conscientiousness, measured in childhood, predicts outcomes such as health status at midlife (Hampson et al., 2013) and mortality across the lifespan (Friedman et al., 1993). An instrumental account for these associations is that conscientious children and adults are more likely to engage in health-enhancing behaviors such as eating healthy food, exercising, and seeking medical advice than their less conscientious counterparts. There is already considerable evidence that conscientiousness is associated with health behaviors (Bogg & Roberts, 2004), and health behaviors have been studied as mediators of the effects of adult conscientiousness on mortality (Turiano et al., 2012). In the Hawaii cohort, we have examined the role of health behaviors in explaining the effects of childhood conscientiousness on both self-reported and objective health outcomes in adulthood (Hampson, Edmonds, Goldberg, Dubanoski, & Hillier, 2015; Hampson, Goldberg, Vogt, & Dubanoski, 2007). In these models, we examined hypothesized chains of influence (Shanahan, Hill, Roberts, Eccles, & Friedman, 2014) from the childhood trait to the adulthood outcome that included health behaviors and educational attainment (also related to childhood conscientiousness) and controlled for adult conscientiousness. Our findings support an instrumental process relating higher levels of childhood conscientiousness to health outcomes through lower levels of health-damaging behavior performed over decades, as well as through educational attainment and cognitive ability

(Hampson et al., 2015). In a novel feature of that study, we extended previous findings by demonstrating that accumulated health-damaging behaviors performed across the lifespan, not simply health-damaging behaviors assessed at one time point, were involved in these chains.

Trauma and Stress Mechanisms

The experience of trauma has been associated with later adverse health outcomes (Felitti et al., 1998) and hence may be another mechanism involved in the relation between childhood personality and adult health. Trauma may affect health directly by disrupting biological processes related to stress regulation, and indirectly by increasing unhealthful behaviors such as over-eating and substance use. The Hawaii cohort was administered a retrospective measure of traumas experienced in childhood, adolescence, and adulthood (Goldberg & Freyd, 2006). The traumas varied from high betrayal events, such as sexual abuse from a close family member, to low or no betrayal such as being in an earthquake. We hypothesized that childhood personality traits would be associated with traumas through instrumental processes. That is, the victim's traits and related behaviors may elicit trauma, or place the victim in environments more conducive to traumatic events. We also hypothesized that, through reactive trait processes, children and adults with certain traits (e.g., those who are more neurotic) may respond more strongly to the experience of trauma, which may influence subsequent personality development (e.g., they may become more neurotic as a result of experiencing trauma). We also expected that trauma experience would lead to poorer health outcomes. The retrospective measurement of trauma is vulnerable to biased reporting (e.g., Hepp et al., 2006), therefore we analyzed trauma reports residualized with respect to vulnerability, the facet of adult neuroticism most highly correlated with trauma reporting in this sample. We found evidence for both instrumental and reactive processes in the Hawaii study (Hampson et al., in press). Trauma experienced in adolescence and adulthood mediated the association between childhood conscientiousness and objective health status at age 51. Furthermore, the experience of trauma was associated with neuroticism and openness in adulthood but not in childhood, suggesting that trauma may have led to changes on these traits in accordance with reactive processes. Changes on these traits are consistent with both dissociation and PTSD, two outcomes of severe trauma.

In another study of the effects of trauma, we related childhood trauma experience to leucocyte telomere length (LTL) assessed at age 51, and tested for a moderating effect of childhood conscientiousness on this association (Edmonds, Hampson, Côté, Hill, & Klest, in press). Telomeres are protective caps on the ends of chromosomes that shorten with cell division contributing to cell death. As such, they are markers of biological cell aging. Telomere shortening reflects the accumulation of cellular wear and tear over time and so is a potentially important outcome for lifespan personality research (Edmonds, Côté, & Hampson, 2015). We found that higher rates of childhood betrayal trauma predicted shorter telomeres at midlife. We predicted that more conscientious children would enjoy some protection from the effects of betrayal trauma on telomere length. However, we found the reverse. The association between childhood betrayal traumas and LTL was larger for those higher on conscientiousness in childhood. A possible explanation is that the problem-

focused coping associated with conscientiousness is ineffective against betrayal trauma, leading to poorer outcomes for these children.

Conclusions and Future Directions

A lifespan approach to trait theory offers a number of future directions for research. Given that traits develop and change throughout life, further theoretical developments are needed to explain trait change and mechanisms of dynamic trait influence. Existing theories to account for trait change (Specht et al., 2014) encompass the strongly biological position of McCrae and Costa (McCrae & Costa, 2008; McCrae this issue), the genes-by-environment approach of sociogenomic theory (Roberts & Jackson, 2008; and this issue), and the more environmentally driven neo-socioanalytic approaches (Roberts & Wood, 2006; Bleidorn see this issue). There is also growing interest in interventions to change personality traits (Chapman, Hampson, & Clarkin, 2014), and self-induced personality development (Hennecke, Bleidorn, Denissen, Wood, 2014).

The dynamic nature of traits is changing our way of thinking about traits as predictors. If a trait measured at one time predicts a later outcome, what if that trait subsequently changes and is no longer associated with the outcome at a later time? We have evidence of this phenomenon in the Hawaii cohort. The trait of conscientiousness shows only moderate stability from childhood to adulthood ($r = .20-.25$ depending on measurement method). Childhood conscientiousness predicted adult health status over 40 years later assessed at a clinic exam. However, adult conscientiousness, assessed within 10 years of the clinical assessment, was unrelated to adult health status (Hampson et al., 2013). Specifically, when both child and adult conscientiousness were entered in a regression analysis, along with gender, ethnicity, education, and the other childhood Big Five traits, childhood conscientiousness was the only significant trait predictor. This pattern of results may be construed as consistent with the concept of a critical or sensitive period (Lynch & Davey-Smith, 2005). For participants in the Hawaii study, possessing (i.e., exposure to) lower levels of conscientiousness at age of 10 may have had an enduring effect on health through a subsequent chain of influence involving mechanisms that unfold over the lifespan (e.g., health behavior patterns, trauma experience). The measure of health status at midlife was composed of biomarkers of cardiovascular and metabolic disease. These are conditions that take years to develop and hence it makes sense that they would not be predicted by a more proximal measure of personality. Instead, they may reflect the life-long consequences of early exposure to low conscientiousness. Similarly, in the Dunedin study, childhood low self-control predicted involvement in adolescent smoking, leaving school with no qualifications, and teenager parenthood (Moffitt et al., 2011). The concept of critical or sensitive periods to trait exposure suggests several questions for future research. Across what ages in childhood and adolescence does this sensitive period span? Do sensitive periods differ with respect to different Big Five traits and different outcomes? Can the effects of early trait exposure be reversed later in life by trait change?

The concept of critical or sensitive periods can be difficult to separate clearly from the concept of accumulation. According to accumulation, the effects of risk factors add up over the life course and have a dose-response relation with the outcomes. Accumulation suggests

that those with consistently low levels of conscientiousness over the life course would have poorer health than those who experienced high levels of conscientiousness at some stage in their lives. In the Terman Life Cycle sample, Friedman et al. found the lowest mortality risk for those with higher levels of conscientiousness in both childhood and adulthood (Martin, Friedman, & Schwartz, 2007). This is consistent with accumulation, but could also be attributed to a childhood critical period because the effect remained even when controlling for adult conscientiousness.

Although a lifespan perspective is more concerned with development in the context of decades than months, weeks or even days, the rate of change in both traits and outcomes can be fast or slow, and there is a place for short-term studies that identify processes of change. Long-term personality change, over decades, most likely reflects maturational processes that tend to lead to increases in socially desirable traits over time (Roberts, Walton, & Viechtbauer, 2006). In the shorter term, such trends can be studied as responses to changing social roles (Roberts & Wood, 2006; van Scheppingen et al., 2016). Over even shorter time periods, such as days or weeks, individual variation in response to daily events can be studied by experience sampling methods that provide a fine-grained analysis of the context in which personality change occurs (Blackie et al., 2016; Fleeson, 2001).

Ideally, the field will accumulate results across multiple samples, giving estimates of change at different points in the life course, and across a wide variety of intervals. Integration of data of this nature would give the best picture of the character of trait change, whether gradual or punctuated, and could further allow for tests of which types of change are most consequential for life outcomes.

A major challenge to conducting research on personality over the lifespan is the cost and length of time involved in conducting longitudinal investigations. Moreover, a limitation of any one longitudinal study is that the findings may be specific to that cohort. For these reasons, there is increasing interest in using existing longitudinal datasets instead of embarking on a new study, and attempting replication across different datasets to test the generality of findings across cohorts (Friedman, Kern, Hampson, & Duckworth, 2014). The increasing use of the Big Five approach to trait measurement will be helpful for integrating findings across datasets. We have conducted one such integrative study by harmonizing measures of the childhood Big Five across the Hawaii study and the Terman Life-Cycle Study. The harmonized measures predicted dysregulation in the Hawaii study and mortality in the Terman study, which helps build the case that childhood personality leads to midlife poor health which results in reduced longevity (Kern, Hampson, Goldberg, & Friedman, 2014).

Archiving longitudinal datasets in repositories accessible to researchers is an important way to reap the benefits from the hefty investment made in such studies. The National Archive of Computerized Data on Aging, supported by the National Institute on Aging, is one such archive, and data from the Hawaii study are being deposited there. As the Hawaii cohort ages, and new rounds of data are collected, the number of possible research questions about the effects of childhood personality on long-term life outcomes is increasing geometrically. We encourage interested researchers to contact us to regarding access to the Hawaii data,

and to make use of other archived longitudinal data to conduct their own studies of personality traits over the lifespan.

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Figure 1.
Trajectories for each of the Big Five Based on Three Assessments Over 13 Years

Table 1

Correlations Between Child and Adult Traits Across Three Assessments (T1, T2, and T3) in Adulthood

Child Traits	Adult Traits			Mean <i>r</i> (Fisher's <i>z</i>)
	T ₁ (<i>n</i> = 1,323)	T ₂ (<i>n</i> = 922)	T ₃ (<i>n</i> = 825)	
Extraversion	.24 **	.23 **	.20 **	.23
Agreeableness	.05	.08 *	.05	.06
Conscientiousness	.18 **	.18 **	.13 **	.16
Emotional Stability	.07 *	.03	.08 *	.06
Openness/Intellect	.21 **	.19 **	.21 **	.20

*
Note. $p < .05$,**
 $p < .01$