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Conscientiousness, Health, and Aging: The Life Course of Personality Model

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The Conscientiousness (C) of the self and significant others influences health by way of mediational chains involving socioeconomic attainment, the avoidance and neutralization of stressors, the promotion of health behaviors and the minimization of risk behaviors, and the management of symptoms and diseases. Yet, meta-analyses reveal that these associations are moderated by factors that are not well understood. We propose the Life Course of Personality Model (LCP Model), which comprises a series of hypotheses that suggest how such mediational chains are subject to 2 sources of contingency. First, the mechanisms by which C translates into health and the avoidance of risk change from early childhood to late adulthood, involving processes that are specific to phases of the life course; also, however, C influences health by way of continuous processes extending over many decades of life. Second, C may be more consequential in some social contexts than in others, and when accompanied by some constellations of personality characteristics than by others. That is, the mediational processes by which C translates into health and the avoidance of disease are likely moderated by timing, social context (including the C of others), and other aspects of the individual's personality. We consider methodological implications of the LCP Model.

Keywords: conscientiousness, health, life course, aging

As Reiss, Eccles, and Nielsen (2014) have observed, conscientiousness (C) stands out as a singularly striking predictor of health across the decades of life. Associations between C and diverse aspects of health are unsurprising given that C reflects constructs that are indicative of deliberative, self-controlled, and goal-directed behaviors, including impulse control, planning, the delay of gratification, orderliness, and the propensity to follow social norms and rules (see Roberts, Lejuez, Krueger, Richards, & Hill, 2014). In adult populations, C has been associated with reduced risk for many illnesses (e.g., Goodwin & Friedman, 2006) and biomarkers indicative of health (Chapman et al., 2011; Sutin et al., 2010). With respect to older adults, C has been associated with the onset of functional limitations (Krueger, Wilson, Shah, Tang, & Bennett, 2006) and health-related quality of life (Chapman, Duberstein, Sörensen, & Lyness, 2006). Much of the impetus behind this very large literature traces to research showing that, across the life course, C is negatively associated with mortality (for a meta-analytic review, see Kern & Friedman, 2011). These associations—between C and health behaviors, morbidity, and mortality—likely reflect processes occurring over many decades of life, suggesting the utility of a life course perspective.

Hundreds of studies have now examined C, diverse aspects of health, and their linking mechanisms. Significantly, however, recent meta-analyses and reviews are consistent on one point: These associations are likely moderated by factors that are not yet well understood (Bogg & Roberts, 2004; Carver & Connor-Smith, 2010; Hampson, 2012; Ozer & Benet-Martinez, 2006; Poropat, 2009; Prinzie, Stams, Dekovic, Reijntjes, & Belsky, 2009). We propose three sources for these moderating factors: C-driven processes that influence health differ (1) across the phases of life, (2) across social contexts (including the C of significant others), and (3) in combination with other personality traits. In short, the C

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behaviors of the self and significant others likely influence health through complex mediational chains, and C's effects may be subject to moderation by issues of timing, social context, and other psychological factors.

Extant research on C, diverse aspects of health, and their linking mechanisms typically adopts a simple trait approach in which C is explicitly or implicitly assumed to have unmoderated, direct effects on health outcomes. In contrast, we propose the Life Course of Personality Model (LCP Model), which posits a series of hypotheses about how the effects of C may be moderated not only by age, but also by the social context and other features of personality. As part of our model-building strategy, we draw on suggestive research on socioeconomic status (SES) and health disparities. C, like SES, is a "flexible resource" that influences health by way of diverse mechanisms. In turn, several hypotheses that have informed the study of SES and health may also inform studies of C and health.

We consider these sources of contingency in three steps, drawing selectively on contemporary research and discussing methodological implications. First, many studies suggest mediating mechanisms by which C translates into diverse aspects of health, including SES, the neutralization of stressors, health behaviors, and disease management. These relationships have been reviewed elsewhere (e.g., Chapman, Duberstein, & Lyness, 2007; Friedman, 2011; Hampson & Friedman, 2008); here, we suggest that C's specific facets (i.e., lower-order, constituent features of C, such as industriousness and orderliness; see Roberts et al., 2014, Table 1) may drive specific aspects of these mediating processes; the mechanisms by which these mediational chains influence (or fail to influence) health have not been thoroughly studied; and future research should consider non-linearities in the effects of C. Testing these possibilities will require large, diverse samples, extensively longitudinal data, and increased attention to the complexities of causality.

Second, these mediational processes are likely moderated by issues of timing and the C of significant others. Accordingly, C and the C of significant others is associated with health processes across the life course (possibly excepting very old populations), but the mechanisms by which C translates into health and the avoidance of risks changes through the age phases. Additionally, C may influence health by way of relatively continuous processes the effects of which accumulate over many decades. (See Table 1 for a summary of proposed hypotheses.)

And third, these mediational processes are also conditioned by social context and other personality factors. That is, C may be more consequential in some settings than in others, and when accompanied by some constellations of personal characteristics than by others. Research suggests several intriguing, sometimes alternative possibilities concerning how the "health returns" on C change across different contexts and configurations of personality; how these differential returns can affect subsequent levels of C by way of feedback mechanisms; but also how social context may correlate with initial levels of C, making these interactions more or less likely (a mechanism termed "amplification"). (See Table 2 for a summary of proposed hypotheses.) Nevertheless, research that examines interactions involving C and social context and other personality traits is presently uncommon.

Perhaps reflecting their roots in "classical" theories of personality psychology, extant studies of C and health tend to view C as a relatively stable, "inner resource" that propels the individual's behaviors (Prinzie et al., 2009 , p. 351). Although not mutually exclusive, the LCP Model reflects a life course perspective, according to which C is a measureable dimension of personal agency, defined as the individual's capacity to influence circum-

Table 1
LCP Model: Phase-Specific and Continuous Processes Linking Conscientiousness and Health

Process type	Hypotheses
A. Phase-specific processes	
1. Childhood	1. Parental C is positively associated with the parenting skills and school readiness, and the avoidance of accidents, exposures to toxins, and extreme stressors.
	2. Child self-control is negatively associated with adolescent snares.
2. Adolescence	3. Parental C and child's C promote authoritative parenting, effective limit-setting, and engagement in academics and extracurricular activities, which decrease the likelihood of adolescent snares.
	4. Peer C is negatively associated with risky behaviors and exposure to risks.
	5. Mid-adolescent C promotes better choices with respect to school, work, and family roles in young adulthood.
3. Adulthood	6. Significant other's (e.g., spouse's) C decreases the likelihood of engagement in risky behaviors.
	7. By mid-adulthood, C promotes the management of challenges to one's health.
	8. By late-adulthood, C promotes effective responses to symptoms and diseases, including medical adherence.
B. Continuous processes	
1. Cumulative disadvantage	9. Through adulthood, individual differences in C increasingly distinguish health trajectories in the population, reflecting the accumulation of day-to-day experiences of health behaviors and risks.
2. Social investment and niche models	10. C promotes involvement in social roles, settings, and relationships that are beneficial to health.
	11. In turn, these experiences encourage future C behaviors (positive feedback).
3. Age-as-leveler	12. Because of biological senescence, the effect of C on health dissipates in old age.
	13. Because of psychological maturation, the effect of C on risky behavior dissipates by young-to-mid adulthood.

Note. LCP Model = Life Course of Personality Model; C = Conscientiousness.

Table 2
LCP Model: Moderating Hypotheses Involving Social Context and Personality

Factor	Hypotheses
A. Social context	
1. Health resource-deprived settings	
(a) Disablement	1. The effect of C on health will attenuate in the absence of resources that promote health.
(b) Marginalized group disablement	2. The effect of C on health will be smaller in socially marginalized than groups.
(c) Double disablement	3. In turn, future C behaviors become less likely (negative feedback).
2. Health resource-rich settings	
(a) Accumulation	4. The effects of resources that promote health will be accentuated by C.
(b) Positive feedback	5. In turn, future C behaviors become more likely.
(c) Positive amplification	6. People who possess abundant, health-promoting resources will have high C.
3. Settings missing important health resources	
(a) Resource substitution	7. The effect of C on health increases in the absence of other, important health resources.
(b) Positive feedback	8. In turn, future C behaviors become more likely.
(c) Negative amplification	9. However, people missing such resources are less likely to have high C.
4. Demanding situations	
(a) Stressful	10. C will attenuate the effects of serious, potentially controllable stressors on indicators of distress.
(b) Moderately challenging	11. C will accentuate the effects of moderate challenges to one's health (e.g., treatment regimes; preventive behaviors).
(c) Novel, ambiguous	12. C will serve as a protective factor in new and/or ambiguous situations that might otherwise be risky.
(d) Positive feedback	13. When C promotes health in demanding situations, future C behaviors become more likely.
B. Personality	
1. Negative emotions	
(a) Neuroticism	14. Negative emotions associated with Neuroticism combined with low C may be especially disadvantageous to health.
(b) Age-grading of C × Neuroticism	15. In old age, a combination of high Neuroticism and C may promote health.
2. Positive emotions and people skills	
(a) Extraversion and Agreeableness	16. Positive emotions and people skills associated with Extraversion and Agreeableness compensate for low C in the prediction of social supports and health.

Note. LCP Model = Life Course of Personality Model; C = Conscientiousness.

stances and one's biography, including long-term patterns of health and well-being. Consistent with empirical research and theory on personal agency in the life course (Elder & Shanahan, 2006; Hitlin & Elder, 2007; Shanahan, 2000), C's influence on health is likely contingent on timing and the individual's social context and other attributes of personality. The LCP Model suggests research that contrasts notably with much extant work, which focuses on C and health processes with little or no reference to timing and context. The "next generation" of research may profit from extensions of these mediational and moderational models and also from increased attention to how timing and social and personal context amplify or attenuate the effects of C on health and health-related processes. Understanding such complexities may, in turn, inform the design and implementation of increasingly efficacious interventions.

Mediating Processes Connecting Conscientiousness and Health

Why is C related to diverse measures of morbidity and mortality? The study of personality and health necessarily raises the issue of the specific behaviors that translate relatively stable reactive and proactive behavioral propensities into health. Well-studied associations between C and social contextual factors that bear on health include (1) socioeconomic attainment (particularly education; see Poropat, 2009), with its many health-promoting consequences (Phelan, Link, Diez-Roux, Kawachi, & Levin, 2004); (2) health behaviors and the avoidance of risky behaviors (Bogg & Roberts, 2004); (3) the avoidance and neutralization of stressors (Kern & Friedman, 2011); and (4) the management of symptoms, illnesses, and disabilities. Although several review articles discuss the evidence for these associations (e.g., Chapman et al., 2007; Friedman, 2011; Hampson & Friedman, 2008), the present discussion highlights emerging themes. Specifically, a growing number of studies suggest that attention to both global C and its specific facets may clarify these linking mechanisms; that too much C may sometimes be counterproductive; and that future research should attend to specific aspects of C that are associated with specific linking mechanisms.

1. Socioeconomic Attainments

SES reflects educational attainment, income, and occupational prestige, all of which are likely associated with C. Many studies show that C predicts grade-point average (GPA), likely reflecting goal-setting, perseverance, and desire to conform to social norms and expectations. Indeed, a recent meta-analysis reports that the magnitude of the C–GPA association (Cohen's $d = 0.46$) is similar in magnitude to that observed between IQ and GPA, and the C–GPA correlation is largely unaffected when controlling IQ (Poropat, 2009). Among all mechanisms that explain C's association with heath, the magnitude of C's association with education appears to be the largest. Given that educational attainment is a central and powerful predictor of health processes throughout

adulthood (e.g., Phelan, Link, & Tehranifar, 2010), a focus on C and its education-based mechanisms is clearly warranted.

Income and, perhaps more importantly, total wealth are difficult to measure with accuracy, but recent evidence based on Social Security data suggests that C is related to both wealth and income (Duckworth & Weir, 2010). Data from MIDUS likewise show that a composite measure of SES—reflecting income, total assets, education, and occupational prestige—is strongly associated with being in the top quintile of C (Chapman, Fiscella, Kawachi, & Duberstein, 2010; cf. Sutin, Costa, Miech, & Eaton, 2009). Consistent with this finding, task persistence at age 14 was related to adult income and occupational prestige in a Swedish sample (Andersson & Bergman, 2011; see also Kern, Friedman, Martin, Reynolds, & Luong, 2009).

Presently, however, mediational chains involving C, education, and health are only partially understood. Lodi-Smith et al. (2010) reported that, across two cross-sectional samples, C predicted self-rated health in adulthood by way of education and preventive behaviors (e.g., regular medical examinations and obeying traffic rules). These mediational patterns were observed controlling for a path from education to preventive behaviors, suggesting that the C-education-health pathway includes preventive or risky behaviors, but other mechanisms as well. Similarly, in a longitudinal sample spanning 40 years, Hampson, Goldberg, Vogt, and Dubanoski (2007) found that teacher ratings of C predicted educational attainment, which in turn was associated with self-rated health at midlife (mean age of 45). Although mediational tests were not conducted, these results suggest that the C-educational attainment-health pathway may be partially explained by physical activity, smoking, and eating habits. Controlling for these mechanisms, however, a direct path from C to self-rated health remained, which is notable given the separation of teacher's ratings of C and the person's self-rated health by several decades. Thus, beyond preventive behaviors, health behaviors, and the avoidance of health risks, there are likely other mechanisms that link C, education, and health.

Indeed, many of the mechanisms by which education influences health have not been considered in relation to C. As Phelan et al. (2010) observed, SES translates into "flexible resources"—money, power, prestige, knowledge, and social connections—that in turn can be used to prevent, delay, and treat many disease states. Because C is impressively associated with education, and because education is a primary determinant of access to these flexible resources, C may influence health through these mechanisms as well.

For example, knowledge about health-related patterns and the adoption of new medical treatments have yet to be studied with respect to C and education, although research suggests that it links education with mortality. Glied and Lleras-Muney (2008) observed that education is positively associated with knowledge about new medical technologies (including drugs), a positive assessment of these new treatments, identification of care-providers who offer new technologies, and more efficacious use of them. Indeed, their analyses showed that more-educated individuals have a greater survival advantage for diseases for which there has been more health-related technological progress (as indicated by, for example, newly approved active ingredients in medications). Thus, C's influence on health, indirectly through education, may reflect the early adoption and effective use of emerging medical knowledge and technologies.

Beyond this example, the many flexible resources by which high status people live healthier lives—including access to social settings that differ dramatically in risk profiles and the availability of protective factors (Phelan et al., 2010)—have not been studied with reference to C. How C and education are related to these flexible resources is unclear but several models are plausible. First, C may predict education, which in turn fosters flexible resources (i.e., a fully mediational model). Second, there may be some mediation, but C may also predict both education and flexible resources (in which case, the link between education and flexible resources is more or less spurious). And third, C may moderate the association between education and flexible resources (discussed below). As conceptual models, these possibilities are not mutually exclusive, raising the possibility of simultaneous mediation and moderation.

2. Avoidance and Neutralization of Stressors

Research on personality and the stress process examines exposure to stressors, perceptions of stressors, and reactions to stressors. Extant research suggests surprising complexity in how C relates to these stages and indeed no simple conclusions are presently warranted. First, evidence suggests that C may not be associated with exposure to *diverse* chronic and acute stressors, life-events, and daily hassles. However, it may be related to socioeconomic stressors and specific facets of C may be associated with specific types of stressors. Second, studies show that C is related to perceptions of stressors, but it may be that some facets of C (e.g., orderliness) lead to heightened perceptions of stressors that then mobilize the person to action. And third, although C is related to more active, effective coping styles, C does not uniformly decrease the effects of stressors on distress (i.e., it is not a reliable stress buffer) and may even increase distress caused by socioeconomic failures (Boyce, Wood, & Brown, 2010). Overall, these nuances suggest increased attention to the facets of C and the meaning of stressors in people's lives.

(a) Exposure to stressors. With respect to daily hassles, a recent daily diary study found that C and its facets were unrelated to reports of daily hassles (O'Connor, Conner, Jones, McMillan, & Ferguson, 2009). With respect to acute life-events, results from the German Socioeconomic Panel suggest that C is largely unrelated to the subsequent experience of life-events (Specht, Egloff, & Schmukle, 2011). In contrast, in a 4-year prospective longitudinal study of German university students, conscientiousness predicted experiencing more positive life events and events that had to do with accomplishing academic and work-related goals (Lüdtke, Roberts, Trautwein, & Nagy, 2011). The mixed results may be surprising since a sense of responsibility and organization should systematically prevent exposure to stressors because of anticipatory, preventive actions. On the other hand, C people are goal-driven and ambitious and sometimes the drive to achieve may bring with it higher levels of stress associated with the anticipation or experience of failure.

In any event, studies that examine global C and stress exposure scales (which often sum diverse types of experiences) may be obscuring important patterns in three respects. First, evidence suggests that C may well prevent stressors that are associated with socioeconomic attainment processes. Thus, although C was gen-

erally unrelated to life-events in the German Socioeconomic Panel, it was related to starting one's first job and becoming unemployed (Specht et al., 2011), and C is consistently associated with job performance (Hampson, 2012; Ozer & Benet-Martinez, 2006). It may be, though, that results from this large German sample would not generalize to the United States, where a larger percentage of the population is marginalized (e.g., impoverished) and thus more susceptible to the occurrence of life-events and their negative effects. With respect to chronic stressors, some evidence suggests that adolescent C decreases self-reported economic pressures in young adulthood (Donnellan, Conger, McAdams, & Neppl, 2009). And Vollrath (2000) reported that C is related to school-specific hassles among university students (e.g., nagging insecurity about one's choice of major). Thus, C is likely related to many stressors associated with wealth, education, and employment.

Second, some research suggests that a facet-specific approach to C may be warranted, and attention should be paid to non-linearities in the effects of C. Aspects of C that might decrease exposure to stressors include deliberation, responsibility, self-discipline, and a lack of impulsivity. On the other hand, facets such as achievement-striving, orderliness and perseverance may be counter-productive when the social situation calls for flexibility or presents high levels of ambiguity. Consistent with this line of reasoning, one well-executed study shows that total C did not predict daily hassles, but self-discipline substantially decreases their likelihood (O'Connor et al., 2009). Similarly, C is positively associated with job performance and its major facets (Chiaburu, Oh, Berry, Li, & Gardner, 2011; Dudley, Orvis, Lebiecki, & Cortina, 2006), but these associations may reflect unique patterns among specific facets of C.

Recent evidence also suggests that C may have a curvilinear relationship to job performance, such that higher levels of C decrease task performance and organizational citizenship behavior (e.g., helping coworkers), while increasing counterproductive work behaviors (Le et al., 2011). The curvilinear pattern is thought to reflect the tendency of high C people toward rigid, inflexible, and compulsive behaviors (see also Dudley et al., 2006). However, the evidence for pervasive curvilinear effects of C is presently less than compelling (e.g., Walton & Roberts, 2004). It is possible that the perception that people possess too much C may in actuality be a misattribution to the combination of moderate levels of C combined with high levels of neuroticism—a combination we consider below.

And third, C may not deter the occurrence of many life-events that, although taxing, are nonetheless important opportunities in life (e.g., marriage, securing a mortgage, birth of a child). Similarly, many daily hassles at school and work and in the family occur as people pursue longer-term goals that they view as highly desirable if nonetheless stressful (better grades, job promotions, and parental investments in children). Because of their ambitious nature, high C people in Western cultures may not experience fewer such stressors than low C people. These considerations suggest heightened attention to the meaning of stressors in people's lives. Whether the same holds true for other cultures has not been studied.

(b) Perceptions of stressors. C appears to be associated with perceptions of stressors and one's capacity to react effectively, although once again a facet-based approach may be more revealing than sole reliance on total C. Penley and Tomaka (2002) examined perceptions of "situation demand" and "coping ability," as well as emotional reactions and coping strategies, among college students who delivered speeches. C was negatively associated with assessments of task demand and positively associated with perceived coping ability. Additionally, C students were less likely to report fear and more likely to express positive emotions and engage in active forms of coping, such as focusing on the task and planning.

However, a recent study drawing on daily diary data and examining both total C and its facets revealed an interesting nuance. Gartland, O'Connor, and Lawton (2012) examined primary (including perceptions of threat and demand) and secondary (the extent to which one can change the situation) appraisals of significant daily hassles occurring during the past week. C people tended to view circumstances as *more* threatening, an association that apparently reflected the individual's orderliness and sense of industry. Sense of responsibility was positively associated with secondary appraisals; in other words, responsible individuals tended to view the situation as changeable and manageable. Gartland et al. speculated that the organized, ambitious qualities of C people actually lead them to view stressors as more disruptive to their goal-directed behaviors, and hence more stressful. In turn, this increased activation could promote more effective coping.

(c) Neutralization of stressors. Evidence consistently shows that total C (perhaps largely reflecting the sense of responsibility) mobilizes individuals encountering stressors to respond in active, constructive ways that may be accompanied by positive emotions (see also O'Brien & DeLongis, 1996; see Flynn & Smith, 2007, showing that C predicts active health care decision-making among adults).

Are C people actually more efficacious in dealing with stressors? As Carver et al. (2010) noted, the literature on personality and coping is quite large, but meta-analyses support two conclusions. First, C is positively associated with primary control engagement (attempts to control the stressor itself) and problem-solving and is negatively associated with disengagement, denial, and expressions of negative emotion (for a supporting meta-analysis, see Connor-Smith & Flachsbart, 2007). In turn, these types of coping, particularly engaged forms, are related to better physical and mental health in the face of adversities. And second, the primary advantage of C may be less the initial selection of coping strategy than the element of persistence (Carver & Connor-Smith, 2010). It is likely that these advantages will be particularly important during times in the life course when stress is normatively higher than average, for example, during the transition into secondary school when biological, psychological, and social processes are changing rapidly and peer influences encourage engagement in risky and health compromising behaviors, particularly in Western industrialized countries.

Research on the buffering effects of C (i.e., the possibility that C attenuates the relationship between a stressor and a form of distress) is not extensive but suggests that C is not always an effective buffer. Pai and Carr (2010) reported that C lessens the effect of spousal loss on depressive symptoms among adults. Drawing on daily diary data, O'Connor et al. (2009) reported that C did not moderate the effects of daily hassles on health-related behaviors, but several facets of C did have significant effects. For example, orderliness predicted an increase in the likelihood of exercise when respondents were confronted with daily hassles. However, among individuals who smoked, those with higher self-discipline smoked *more* on days with daily hassles and, generally,

drank more caffeine. The authors speculated that self-disciplined individuals might smoke more cigarettes as part of a strategy to remain focused on their challenges. Boyce et al. (2010) suggested a "dark side" to C, namely that C people react more severely to failures, especially socioeconomic ones. Indeed, they show that after 3 years of unemployment, high C people (one standard deviation above the mean) experience a substantial decrease in life satisfaction when compared to low C people.

Thus, across the stages of the stress process, C is not invariably a resource that minimizes distressful outcomes. Future research should attend to specific facets and non-linear aspects of C and thoroughly specified models and measures of stressors, reactions to stressors, and forms of distress. Indeed, some evidence suggests that specific facets of C—especially at very high levels—could lead to more stressors and be associated with more perceived stressors.

3. Healthy Behaviors and Avoidance of Risky Behaviors

As Bogg and Roberts (2004) noted, C is thought to influence health-promoting behaviors and the avoidance of risky behaviors principally through orderliness, responsibility, conventionality (or traditionalism), and self-control (i.e., a lack of impulsivity). Indeed, their meta-analysis showed that C is moderately, negatively associated with excessive alcohol use, drug use, risky driving, and violent acts, with smaller associations with risky sex, suicide, and unhealthy eating. Further, self-control and traditionalism appeared to be more important facets of C than industriousness and order. These possibilities have not been studied from a developmental perspective, however, and so it unclear whether these relationships hold from adolescence through adulthood.

Research is now shifting focus to the mechanisms by which facets of C or related constructs are associated with health behaviors. Central to such studies are processes of effortful control, constraint, and instrumental processes involved in planning and reaction to threats (see Hampson, 2012). Such processes may be especially difficult to measure to the extent that inhibitory processes occur outside of awareness. Teng and Mak (2011) proposed a Health Action Process Approach (HAPA), according to which motivational (or preintentional) and volitional (or postintentional) processes are analytically distinct. The motivational phase includes risk perceptions, outcome expectancies, and self-action efficacy; the volitional phase includes action planning (specific steps to be taken) and coping planning (steps to overcome challenges to reaching the goal). As applied to condom use among men, they found that all three facets of motivation predict intention to use a condom, which in turn predict planning and actual use. The HAPA is one of several social-cognitive health models that may elucidate how facets of C translate into actual behaviors that result in health-related behaviors and the avoidance of risk (see also Bogg, Voss, Wood, & Roberts, 2008). Once again, these types of processes should be particularly protective during adolescence and at other points in the life course when individuals are experiencing dramatic changes in their social support systems or in their likely exposure to health compromising experiences.

4. The Management of Diseases

C is very likely associated with the constructive management of diseases. Research on chronic diseases for which symptoms and disease progression can be managed or even reversed is especially relevant, including obesity, asthma, HIV, and patients on hemodialysis, which collectively affect a substantial proportion of adults. For such conditions, successful management depends on adherence to medical advice, medication, and medical treatments, which should reflect the dutiful, organized, and responsible facets of C. For the elderly, who often face many health-related challenges, the maintenance of health appears to implicate many of the same processes (Hill & Roberts, 2011). Unsurprisingly, among adults, C is related to greater self-care in the management of renal disease, high cholesterol, and diabetes, largely because of adherence behaviors, and this C-adherence association may be stronger among older adults (see Hill & Roberts, 2011). Among HIV-seropositive adults, C is associated with subsequent increases in CD4 cell numbers and decreased viral load (indicating better management) over a 1-year period, with possible mediators including higher medication adherence, active coping, and lowered depression and perceived stress (O'Cleirigh, Ironson, Weiss, & Costa, 2007). Coping and adherence behaviors are thought to encompass the use of medications, engagement in medical care (keeping frequent medical appointments, adherence to broader medical regimens), and monitoring and responding appropriately to side-effects and symptoms.

5. Methodological Caveats

As intuitively plausible as these associations appear, mediational processes involving C are not presently well understood for several reasons. First, many studies have examined associations between C and these mediators (e.g., a health behavior such as smoking) or between C and specific forms of health (e.g., functional limitations), but far fewer studies have examined mediational chains involving all three sets of variables. Thus, C is related to health behaviors and to mortality, but the extent to which health behaviors mediate the association between C and mortality is largely unexamined (Kern & Friedman, 2008).

Second, studies that draw upon appropriate longitudinal data to examine mediational chains frequently do not examine or report appropriate statistical tests of mediation. Not uncommonly, the attenuation in the C-health association in the presence of the putative mediator is reported, although this percent change can be misleading (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002).

Third, a substantial proportion of studies—indeed, perhaps the vast majority—are cross-sectional designs that rely on small samples whose population is unspecified or notably limited in its scope. Such studies are especially unsuitable for testing mediational and moderational hypotheses because the putative causal agents are not assessed before the predicted outcomes; there is a lack of adequate statistical power; and there is also a lack of adequate diversity of social experiences among the respondents.

Fourth, such studies encounter the typical challenges of non-experimental designs, including the distinct possibility that C is endogenous, reflecting genetic (see South & Krueger, 2014), sociological, and psychological factors that also predict health outcomes. Partial solutions to this problem—the extensive use of

controls in large, diverse samples, panel models, and counterfactual strategies—have not been employed to date (but see Heckman, 2011). Finally, and perhaps most importantly for this article, few of the studies have been informed by the life course perspective, which highlights how timing and context may moderate these associations, a point considered in the next two sections.

Conscientious Processes and Timing in the Life Course

The life course perspective highlights the timing of experiences and their interconnectedness across the phases of life. We review evidence for the importance of C and health-related processes separately for the major age phases of the life course, but also emphasize that the C-health associations also reflect continuous process. The premise of this section is that different opportunities and demands will arise at different ages and therefore C may influence health in different ways at different ages. The life course perspective also highlights the social embeddedness of development and, consistent with this theme, research suggests that the C of significant others should also be considered, beginning with parental C in childhood but extending to the C of caregivers in old age. We refer to the main effect of a significant other's C as "alter C" and propose "compensatory C" to describe situations in which alter's C influences ego's health when ego's C is low (i.e., alter's C compensates for ego's low C; Roberts, Smith, Jackson, & Edmonds, 2009; see also Chapman et al., 2011). The proposed hypotheses are summarized in Table 1.

1. C Processes in Childhood

C during childhood could promote health and well-being by way of several mechanisms. First, parental C may directly affect the health of children. For example, parents who are higher in C are less likely to have children who injure themselves (van Aken, Junger, Verhoeven, van Aken, Dekovic, & Denissen, 2007). Second, parental C could affect children's health indirectly through positive parenting, the avoidance of health risks and extreme stressors, the management of their children's behaviors in ways that socialize healthy behaviors patterns, and the management of children's chronic diseases. Parental C could also facilitate the beginning of the educational career, which would promote health by way of the flexible resources discussed earlier. A strong start at school often places students in upper tracks (as a matter of explicit policy or, increasingly, *de facto*), which, in turn, promotes educational achievements independent of the children's "inherited" aptitudes, preferences, and temperaments (Entwisle, Alexander, & Olson, 2004). Eisenberg, Duckworth, Spinrad, and Valiente (2014) noted the central role that children's self-regulation plays in the emergence of C. Given this developmental pattern, it is unsurprising that children's self-control and self-regulatory skills predict health later in life through a variety of pathways including decreasing the likelihood of succumbing to "adolescent snares," increasing the likelihood of engaging in a wide variety of health promoting behaviors throughout childhood and adolescence, and fostering the emergence of robust psychological, social and cultural capital.

(a) Parental C. Adult C may be related to central indicators of parenting—including warmth, more effective behavioral control, and autonomy support, as well as family management—all of which might decrease children's exposure to stressors and increase their ability to cope with stress (Prinzie et al., 2009). In turn, the specific behaviors in which C parents engage may lead to health-promoting family contexts (Huver, Otten, de Vries, & Engels, 2010), and some evidence suggests that the caregiver's C is especially salient in the management of risk. Maternal C, for example, is positively associated with the consistent tracking of children in naturalistic settings (Kochanska, Friesenborg, Lange, & Martel, 2004), which could decrease the likelihood of accidents and injuries, a leading cause of morbidity and mortality in childhood. Consistent with this heightened sense of monitoring, Hampson and her colleagues have examined the role of parental C and dual exposure to tobacco smoke and radon gas, which interactively increase the likelihood of lung cancer; results showed that perceived risks from these exposures are associated with restrictive household rules on smoking only among conscientious adults, particularly women (Hampson, Andrews, Barckley, Lichtenstein, & Lee, 2000; Hampson et al., 2006). Thus, some evidence suggests that C parents may manage risks for accidents and other potentially detrimental exposures.

Parental C may also be negatively related to children's exposures to extreme psychosocial stressors, including parental alcoholism, violent acts, substance abuse, economic stressors, and conflictual marital relationships (Roberts, Walton, & Bogg, 2005). Given that such experiences may well have long-lasting effects on health through biological embedding mechanisms, the avoidance of such experiences may be especially important in decreasing the likelihood of inflammatory conditions in adulthood, perhaps including cardiovascular disease, diabetes, and depression (Miller, Chen, & Parker, 2011; Shanahan & Hofer, 2010; Taylor, 2010). That is, low parental C during childhood may have life-long health consequences by increasing the likelihood of exposure to extreme stressors, which may lead to heightened stress reactivity and chronic inflammation.

Also, parental C may be especially salient for the management of children's chronic diseases, such as asthma and diabetes (Orrell-Valente & Cabana, 2008), and both learning and socio-emotional disabilities. A growing body of evidence suggests the importance of family routines in the management of such conditions, which refer to the clear organization of roles in the family and instrumental communication and behaviors focused on tasks that require attention (e.g., Fiese & Wamboldt, 2000). Family routines would thus appear to have a strong connection to the organized, dutiful, and responsible facets of C. Indeed, among youth with diagnosed asthma (9–16 years of age), family routines decreased the production of stimulated IL-13 (a central biomarker of inflammatory response) over an 18-month period, and this association was substantially accounted for by medication use (Schreier & Chen, 2010; see also Greening, Stoppelbein, Konishi, Jordan, & Moll, 2007, for an association between family routines and the management of Type I diabetes). The family's management of childhood asthma—as reflected in, for example, adherence to medications and effective preventive and reactive strategies—is also associated with increasing eosinophil counts, an indicator of allergic response commonly used in the assessment of asthma's severity (Walker & Chen, 2010; see also Vollrath, Landolt, Gnehm, Laimbacher, & Sennhauser, 2007, showing that maternal C predicts glycemic control in diabetic children).

Family management of other aspects of children's experiences are also critical for children's development, particularly if the families live in high risk neighborhoods or the children experience particular challenges to their development, such as getting their child help in school, moving schools, picking peers groups, and getting into their child into peer groups that will maintain positive trajectories through other developmental periods (Furstenberg, Cook, Eccles, Elder, & Sameroff, 2000). Parents' with high C may be better at this type of family management as well.

(b) Childhood self-control. Adolescent and adult C likely emerge from childhood temperament, especially sense of constraint, effortful control, and the inhibition of impulsive tendencies, as well as exposure to C behaviors in parents and other socializers (Eisenberg et al., 2014; Hampson, 2012). A substantial body of evidence suggests that childhood disinhibition and impulsivity are associated with externalizing behaviors, including life course persistent antisocial behaviors, and alcohol and substance use beginning in adolescence (see Roberts et al., 2009, for an overview).

Moffit et al. (2011) reported that childhood self-control—a composite reflecting multiple sources of measures of impulsivity, lack of control, persistence, and hyperactivity between ages 3 and 11—has manifold direct and indirect associations with health in early adulthood. "Self-control gradients" (i.e., linear trends extending across the range of the self-control construct) were observed for a physical health index, substance dependence, socio-economic status, wealth and management of one's finances, single-parenthood, and criminal conviction at age 32. Indeed, staff-ratings of self-control between ages 3 and 5 predicted the same outcomes, albeit less strongly. To a substantial degree, these associations were mediated by "adolescent snares," including smoking, leaving school before degree completion, and out-of-wedlock parenthood. Drawing on different data and a sibling-fixed-effect model, Moffitt and her colleagues also reported similar patterns between staff-ratings of self-control at age 5 and smoking, poor school performance, and antisocial behaviors at age 12. Thus, childhood precursors to C may well promote the avoidance of adolescent risks that can "derail" teenagers from positive trajectories of health behaviors and investments in their human capital.

2. C Processes in Adolescence

C may be especially consequential during adolescence in two respects. First, the research by Moffitt and her colleagues highlights the potentially derailing effects of adolescent snares that greatly decrease the likelihood of educational continuation and increase the likelihood of the initiation of unhealthy behavioral patterns. It is likely that parental and peer C during adolescence and adolescent C contribute to these patterns as well, although the evidence is not extensive. Second, C in adolescence may promote better choices with respect to the transition to adulthood, which in turn can have life-long implications for health by way of educational attainment, family life, and stressors in the workplace.

(a) C processes and the avoidance of snares. Maternal C may well be associated with less externalizing behaviors in adolescence and this relationship is mediated by parental limit-setting (Oliver, Markland, & Hardy, 2010). Effective limit-setting, as opposed to either too lax or too rigid parental control and psychological manipulation, reflects the type of developmentally appropriate behavioral control and regulation of one's child that is typically associated with authoritative parenting and that avoids the negative control cycles associated with deteriorating parent–child relationships. Although a connection between parental C and limit-setting is intuitively appealing, it may be that child C is correlated with authoritative parenting, because the child models the parental personality and/or because of an evocative correlation (i.e., the child's C elicits or facilitates authoritative parenting; Prinzie et al., 2009). Thus, the avoidance of adolescent snares, such as those identified by Moffit and her colleagues, may involve a "web" of parental and child C, which in turn jointly facilitates authoritative parenting and more effective monitoring and limit-setting. Indeed, the apparent increase in risk-taking in adolescence may reflect, in part, decreases in monitoring from adults, raising the possibility that, among high-C parents, risk-taking does not increase at this time.

The avoidance of snares, in turn, likely promotes better peer relationships. Indeed, adolescent C may be associated with better peer relationships, largely by decreasing externalizing problems and, to a lesser degree, improving attentional processes (Jensen-Campbell & Malcolm, 2007). Parental and child C may also have independent effects on attitudes toward school, and father's and mother's C (the latter, for girls only) predicted academic performance, controlling adolescent C (Heaven & Newbury, 2004). Thus, extant research suggests that parental C in adolescence decreases exposures to psychosocial risks, although it is unclear whether this dynamic involves alter and/or compensatory C.

(b) C processes and positive youth development. Over the past two decades, scholars and practitioners interested in youth have turned their focus to positive youth development in addition to a focus on prevention (Mahoney, Larson, & Eccles, 2005). These scholars have argued that preventing bad things from happening to youth does not guarantee that they will be fully prepared for later life (Eccles & Gootman, 2002). Getting a good education is one example of the advantages of being more fully prepared, but there are other positive characteristics (skills, and habits of body and mind, as well as social capital) that likely facilitate good health during the rest of one's life. Soft skills, for example, are known to facilitate success in the labor market (Eccles & Goodman, 2002). High levels of intellectual, musical, and athletic skills may also contribute to better health through their association with career trajectories as well as with quality of life and resources that may facilitate coping with stress. Acquiring and perfecting such skills requires participation in activities and settings that allow one to practice these skills in safe and encouraging contexts. Middle childhood and adolescence are the periods in life when one is best able to take the time to perfect such skills. Both the C of one's parents and one's own C increase the likelihood of middle childhood and adolescent youth participating regularly in contexts that help individuals to acquire and perfect such skills, although this possibility has not been studied.

Eccles and her colleagues showed that early adolescent youth who have had extensive opportunities to excel in music, theater, and athletics are very strategic about honing these skills as they begin to plan for their futures (Fredricks et al., 2002). By age 13, these youth acknowledge the need to specialize in one or two talent domains if they are to develop their talent sufficiently to be eligible for college scholarships or for life long careers. Some youth decided not to seek a career that makes use of their particular

music or athletic talents but that they did wish to be good enough to be able to use their talent to entertain their families and help them cope with stress in their later lives. They also discussed how engagement in such practice has taught them how to lead conscientious, well-planned, and orderly lives—skills and habits of body and mind that should help them cope with health problems later in their lives. The extent to which these processes reflect C has not been studied, however.

(c) Adolescent C and the transition to adulthood. Adolescent facets of C may be especially consequential in promoting a successful transition to adulthood by enhancing decisions and commitments made with respect to school, work, and family—that is, the avoidance of young adult snares but also improvement in decisions about roles and plans. Research in the fields of both motivational psychology and career development has documented the importance of early educational choices and long-term planning on the successful transition to adulthood. Clausen (1991) proposed that "planful competence" at mid-adolescence is especially decisive in making good choices with respect to these role involvements, which then have lasting consequences through adulthood. According to his formulation, planful competence refers to the deliberative, assertive (including persistent), and self-controlled processes by which youth make choices with respect to interpersonal relationships and institutional involvements as these choices reflect the pursuit of life-long goals. The construct was originally identified from a component analysis of California Q-sort data from the Bay Area Studies and Clausen's measure comprised self-confidence, self-reflective (or "cognitively committed"), and dependability facets. An inspection of the items used to measure the construct reveals that it is an amalgam of facets of C (responsibility, persistence, self-control) but also openness and low Neuroticism (with respect to interpersonal relationships).

Drawing on longitudinal data from the Bay Area samples, Clausen (1991) found that planful competence during high school predicted educational attainment and occupational prestige in adulthood (between 53 and 62 years of age), controlling for parental SES and intelligence. The findings were driven primarily by the dependability facet, which encompassed self-control and responsibility and is thus tapped elements of C. Analyses also suggested that planful competence at mid-adolescence was associated with marital careers (with fewer marriages among the planfully competent and higher marital satisfaction) and occupational attainment. Associations with marital careers were stronger for women and reflected, to a large degree, the facet of dependability, suggesting the selection of a well-suited spouse and perhaps perseverance in the face of marital challenges. Thus, just as Moffitt and her colleagues proposed that childhood self-control promotes the avoidance of adolescent snares, Clausen's work raises the possibility that adolescent C promotes better decisions about school, work, and family, and thus a more salutary transition to adulthood.

3. C Processes in Adulthood

(a) Alter and compensatory C in adulthood. The work of Rutter and his colleagues and of Sampson and Laub—showing that marriage is associated with criminal desistance—originally inspired the concept of compensatory C (Roberts et al., 2009). Although they did not examine C, Sampson and Laub's research suggested that the C of spouses and other intimate partners promote the avoidance of adult snares and perhaps improved choices with respect to family, work, and health behaviors. Partner C may also facilitate the management of chronic diseases and disabilities and medical adherence throughout adulthood. Indeed, Roberts et al. (2009) showed that spousal C predicts self-rated health and functional limitations in the Health and Retirement Survey (mean age about 67), controlling for the target's C. This relationship held regardless of levels of C of either spouse (consistent with alter C). Finally, the C of adult caregivers may improve health-related outcomes among the elderly. Given the small evidentiary base, however, the full significance of alter and compensatory C through adulthood is presently not well studied.

(b) C processes during stages of adulthood. As youth make the transition to adulthood, C may facilitate better choices with respect to school, work, and family, which, in turn, have obvious implications for health. As noted, C is associated with socioeconomic processes, health behaviors and the avoidance of health risks, and effective coping styles. The developmental nature of these associations—perhaps coalescing with increased autonomy in adolescence and strengthening into young adulthood—has not been examined. However, C at mid-adulthood has been hypothesized to be especially salient in the management of one's health as aging processes introduce new challenges (e.g., slower metabolism, typically resulting in higher body mass index [BMI]). Toward the end of mid-adulthood, C may be especially important in planning for one's retirement with respect to when and how one disengages from an occupational career, remains active and socially connected, and prepares for possibilities of long-term care (cf. Sörensen, Duberstein, Chapman, Lyness, & Pinquart, 2008).

In later adulthood, C may become especially consequential to several health-related processes, largely because the maintenance of health becomes increasingly challenging in the population. For example, C predicts reduced levels of functional limitations among adults over the age of 65 (Chapman et al., 2007). Perhaps this association is weaker in earlier adulthood simply because limitations are far less common and may reflect distinct mechanisms (e.g., debilitating accidents, as opposed to wear-and-tear). Likewise, C positively predicts self-rated health and this association is mediated by adherence to physician advice and medications, but the latter pathways (medication adherence) only holds for adults over 51 years of age (Hill & Roberts, 2011). Such a pattern may reflect the fact that following one's medication regimen becomes especially consequential in later adulthood. The possibility that C is important throughout adulthood but that its salient mechanisms change with age has not been studied.

Here again, parental C is likely to be important as well. Parents provide a model of coping with all stages of adulthood. To the extent that C influences the passage through adulthood, children of high C parents will be exposed to more competent and thus more successful models of a "planful" adult life trajectory.

4. Critique of Phase-Specific Models

The foregoing suggests that C plays diverse roles in the promotion of health and avoidance of disease across the life course, and that specific mechanisms are unique to specific age phases. Unfortunately, such hypotheses are difficult to establish empirically for two interrelated reasons. First, C must be especially predictive

of the health process during the phase *when compared* to the effect of C prior to and after the phase. Thus, for example, the effect of parental monitoring on the prevention of accidents must be stronger in early childhood than in later childhood. It may be, however, that parental C prevents accidents to the same degree throughout childhood and indeed, into adolescence, after which one's own C becomes more influential. In any event, evidence for a true sensitive phase relationship requires "before and after" assessments of C and the health process, which is an uncommon feature of most studies.

Second, plausible mechanisms must be identified that link C during a phase to the health process. The requirement of a causal mechanism may be especially challenging for models positing that C during one phase influences health-related processes many years later. In the case of childhood C and adolescent snares, for example, mechanisms must be identified that link, for example, self-control before age eight and likelihood of teen pregnancy. In the alternative, it may be that C before age eight is predictive of adolescent snares, but not explanatory; rather it correlates highly with adolescent C, which is mechanistically associated with the avoidance of snares. Put in counterfactual terms, a phase model would hypothesize that high childhood C decreases the likelihood of adolescent snares irrespective of adolescent C. If so, what are the multilevel mechanisms that underlie such an association?

New theoretical work on cascade effects provides one insight into this question. Perhaps childhood C influences peer group membership during adolescence through its immediate impact on elementary school achievement and positive non-academic skill acquisition. Having such skills, as well as the peer networks related to the acquisition and maintenance of such skills, should change the probability of getting involved with risky peers groups in adolescence, as well as predicting increases in adolescent C. One needs large sample sizes and comprehensive measures to test such hypotheses.

5. Continuous Processes Involving C

C may also influence health by relatively continuous processes that are not phase-specific. Importantly, however, the two perspectives are not mutually exclusive: It may be that C influences health by way of both phase-specific and continuous processes. Research on health and aging often distinguishes between cumulative disadvantage and age-as-leveler hypotheses, both of which would suggest long-term continuous processes by which C might influence health.

O'Rand (2006) has proposed a cumulative disadvantage model according to which early disadvantages initiate path dependent exposure to risks, a "chain of insults" (Hayward & Gorman, 2004) that extends across the phases of life. In contrast, people with advantageous early circumstances encounter a path dependent sequence of enriched environments marked by high levels of social capital (i.e., interpersonal relationships that facilitate the attainment of goals). Although the model was formulated to explain trajectories of SES disparities in health, advantage and disadvantage may be considered in terms of C. Accordingly, the cumulative effects of C will give rise to diverging pathways of health through adulthood as C increasingly distinguishes people because of the accumulation of day-to-day choices that they make with respect to, for example, smoking, activity, diet, and social contacts. As DiPrete and Eirich (2006) have explained, such a model is akin to financial returns based on compound interest, with initial differences magnifying through time according to exponential rates of change.

The prediction of divergence (although not necessarily reflecting a power function) is likewise suggested by niche and social investment models, although these perspectives additionally emphasize mutually reinforcing transactions between C and one's settings (i.e., positive feedback). According to the niche model, people build a "personal niche" composed of primary roles—at school and work, and in the family and community—that fits their psychological profile (Roberts & Robins, 2004). In turn, reciprocal, reinforcing relationships are created between social settings and personality. Shiner and Caspi (2003) distinguished among several niche-building mechanisms, including environmental elicitation (personality evokes reactions from others), selection (people chose settings based on their personality), and manipulation (people change their environments based on personality). In these ways, C people create settings that reflect their C, and such settings further encourage these traits.

Similarly, according to the social investment model, C people invest in the conventional roles of work and intimate relationships that, in turn, increase C through young and middle adulthood (see Roberts, Wood, & Smith, 2005; Woods & Hampson, 2010, for occupations and occupational characteristics), a proposition for which there is considerable support. For example, young adults who remain committed to their romantic partners show increases in traits such as conscientiousness and emotional stability (Lehnart, Neyer, & Eccles, 2010). Similarly, people who maintain high levels of or increase in their social investment to work increase in conscientiousness and agreeableness (Hudson, Roberts, & Lodi-Smith, 2012). In contrast, adults who do not invest in conventional roles and behaviors (e.g., continue to smoke marijuana into middle adulthood) exhibit less signs of personality maturation (Roberts, Walton, Bogg, & Caspi, 2006). Thus, all three models—cumulative advantage, niche, and social investment—highlight the role of C in shaping settings and making choices that, over many years, influence health.

Empirical research has not yet examined how C might influence health by way of day-to-day decision-making, but several studies are suggestive. C people have lower BMIs, and this reflects, to a substantial degree, their capacity to override impulses to eat unhealthy food (Sutin, Ferrucci, Zonderman, & Terracciano, 2011); C is also related to eating more fruit and, in general, healthier diets (de Bruijn et al., 2009). Because adult BMI likely reflects long-term experiences, connections between C and BMI may well reflect long-term patterns in self-control with respect to avoiding unhealthy food and responsible choices with respect to, for example, fruits and vegetables. (In the alternative, it is also possible that C influences food choices in adolescence and early adulthood, which then become largely habitual). Similarly, C predicts lower rates of Alzheimer's disease among those over 72 years of age, and this association likely reflects self-care—encompassing diet, activity levels, and social and cognitive engagements—across many years (Duberstein et al., 2011).

The age-as-leveler hypothesis holds that the benefits of advantages, such as SES, diminish with age, thus leading to converging patterns of health across levels of C in later adulthood. Although the leveler hypothesis was formulated to explain decreases in SES

disparities with aging, it may likewise apply to C such that health advantages that were accruing to people because of C would dissipate in later adulthood. For example, biological processes of aging may "over-ride" any benefits that were accruing to C individuals, attenuating connections between C and health (Baltes, 1997). Phelan et al. (2004) found that socioeconomic differentials in mortality disappear in the 80s, and suggested that this leveler pattern reflects the fact that diseases and death at this time are often unpreventable and untreatable. Similarly, it may be that C becomes less decisive as morbidity and mortality increasingly reflect unpreventable, untreatable conditions.

In addition to biological aging, adults may mature such that mean C increases and its variance decreases, and that mean levels and variances of risk behaviors also decrease through adulthood; in turn, because of these distributional changes, links between C and health could attenuate. The variance in C may also decrease because individuals with low C have higher mortality rates across the adolescent and adulthood years, leading to a decline in their representation in the population. In fact, Bogg and Roberts's (2004) meta-analysis supports this speculation, showing that connections between many health behaviors and C attenuate greatly when comparing adults under and over the age of 30 (including excessive alcohol use, drug use, unhealthy eating, risky driving, and tobacco use). For example, the average correlation between C and activity was .21 for people under the age of 30, and was .03 for people over the age of 30. "Maturing out" (increases in C and decreases in Neuroticism) is also related to decreases in alcohol consumption from 21 to 35, even when controlling social roles such as marriage and parenthood (Littlefield, Sher, & Wood, 2010).

Thus, biological aging suggests a leveler pattern in late adulthood with respect to morbidity, mortality, and functional limitations, but psychological maturation suggests a leveler pattern already in the 20s and 30s with respect to risk factors and health behaviors.

6. Critique of Continuous Process Models

A leveler pattern in late adulthood is difficult to test because of selective mortality: Less C people die at younger ages, possibly resulting in a group of survivors comprising individuals with high C or with low C but robust health. (The same problem is encountered in studies of educational disparities and health: Education is a major predictor of mortality, potentially creating a "select" group of survivors.) Thus, observed effects of C (and education) on health in old age may be biased by selective mortality. Identifying the unbiased effect of C necessitates (imperfect) statistical strategies that account for this selection mechanism. In the context of education, this selective mortality does not fully explain decreasing education-based inequality (i.e., leveling) in old age (Herd, 2006). However, studies of C-disparities in mortality have apparently not adjusted for this source of potential bias.

Thus far, we have considered cumulation and leveler hypotheses as contrasting mechanisms, but the distinction is not clear-cut. Cumulative disadvantage theory posits individual variations in age-related change, while the leveler hypothesis depends on selective mortality (Dupre, 2007). That is, "the age-as-leveler pattern describes the population aggregation of the individual differences in the timing of mortality, and cumulative disadvantage describes the individual-level processes" (Dupre, 2007, p. 3) that produce these differences. In fact, he observes that educational differences in disease prevalence are greatest at mid-life and then decline and, consistent with expectations, that disease incidence and mortality increase with age at a greater rate among the less educated. Similarly, it may be that C-gradients in health increase through mid-life and then decline and, as Dupre observed for educational disparities, that morbidity and mortality increase at a greater rate in later adult among low C people.

Conscientiousness Processes in Social and Personal Context

In addition to issues of timing, the LCP Model also directs attention to the processes by which social and personal circumstances condition the effects of C on health. Although very few published studies have tested hypotheses involving interactions between C and social context, several hypotheses may be formulated based on research on SES and health and personality theory. These hypotheses—summarized in Table 2—concern "health returns on" C in differing situations; how such differential returns would alter the likelihood of future C behaviors (by way of feedback mechanisms); and how initial levels of C may differ by context, making interactions and feedback more or less likely (a process called "amplification").

1. The Disabling and Double Disablement Hypotheses

Several strands of evidence suggest that social context can "disable" the efficacy of C behaviors because social circumstances do not provide access to resources that could otherwise promote health. In turn, this disabling effect may decrease the likelihood of future C behaviors, double disablement.

Although they did not assess C, Lutfey and Freese's (2005) ethnographic study of diabetic patients at high and low SES clinics suggests this possibility. They focused on adult diabetic patients because of the extensive self-management necessary to manage this disease, including daily injections of insulin, regulation of food intake, the monitoring of glucose levels (often including journal entries), and daily life-style choices. Indeed, abundant research shows that the successful management of diabetes requires high levels of C (Lawson, Bundy, Belcher, & Harvey, 2010; Skinner, Hampson, & Fife-Schaw, 2002; Vollrath et al., 2007). Yet, their study points to diverse mechanisms by which C behaviors likely yield more efficacious management of diabetes in the upper/middle-class clinic ("Park Clinic") than in the working-class/uninsured clinic ("County Clinic"), illustrating how social circumstances apparently moderate the impact of C behaviors, and also the value of such ethnographic studies.

Some of the differences in the efficacy of C behaviors originate in the organization of the clinics themselves. First, Park Clinic provided greater continuity of care when contrasted with County Clinic, which relied on more physicians with diverse types of expertise and on more residents who rotated out of the clinic after a short period. Consequently, the care-providers at Park Clinic were better-informed about medical histories and knew their patients familial and work circumstances more thoroughly. In turn, communication between care-provider and patient—particularly patient disclosure of failures regarding their self-management—

was generally much better at Park Clinic when compared to County Clinic. Second, Park Clinic included an educational center and patients met with an educator after every clinic visit to assist and encourage them. Third, because County Clinic relied heavily on medical residents, the patients spent far less time with their care-providers (overall and at each visit) when compared to patients at Park. Thus, C behaviors would likely be more efficacious at Park than at County Clinic.

Lutfey and Freese (2005) also identified a series of "external constraints" faced by low SES diabetic patients, constraints that undermined their C efforts at self-management. Because patients at County Clinic face greater financial pressures, they tested their blood glucose levels less frequently and could not always afford foods that were suitable for a diabetic diet. County Clinic patients were also more likely to work swing shifts or at manual labor, which posed considerable complications to self-monitoring. It was not uncommon, for example, for manual laborers to use glucose more intensely and irregularly, which increased risks of hypoglycemia and, in turn, accidents resulting from disorientation. Social supports were much less available for County patients, compared to Park patients, because the former's social network included more single parents, parents of larger families, and friends who had to work long hours to make ends meet. Finally, the costs of self-management were greater in the low SES group in myriad ways. For example, compared to Park Clinic patients, County Clinic patients waited extensively longer at appointments (roughly 60–90 min vs. 10 min); faced higher transportation times, unpaid work hours, and childcare costs; faced greater logistic difficulties in filling prescriptions (which could only be submitted at one hospital pharmacy); and were less able to afford many gadgets that facilitated day-to-day self-management.

Lutfey and Freese's (2005) ethnography identifies many mechanisms by which the C of low SES diabetic patients would not result in highly efficacious self-management of their diseases. Indeed, because of such experiences, it would hardly be surprising if the C of low SES patients decreased, which would further undermine their health, consistent with the negative feedback cycle posited by White's (1959) original model of "effectance motivation," a pattern that we refer to as "double disablement." This case study also raises questions about cross-national differences in health care policies: To the extent that national policies result in uneven access to care and quality of care, the C of patients with less access and quality may be less efficacious and, in turn, discourage future C behaviors. Thus, health policies with respect to access to and quality of care may well impact health "returns" on C.

Beyond the possibility that low SES can disable the efficacy of C in the management of chronic diseases, other research suggests that combinations of minority statuses—involving sex and race/ethnicity—synergistically alter the likelihood of exposures to risks and access to health care. Thus, for example, Warner and Brown (2011) showed that age-graded patterns of functional limitations of Black women are distinct from other race/sex groups, patterns that suggest "accelerated disablement" through the mid-60s. The authors speculated that such differences reflect a lifetime of chronic stressors, including discrimination, social marginalization, and segregation in disadvantaged neighborhoods. Similarly, Geronimus (1992) has proposed the "weathering hypothesis," which posits that African American women experience biological senescence at faster rates than their White counterparts because of differential exposures to risk and protective factors, perhaps even extending to differential exposures in prior generations. Such studies raise the distinct possibility that C will be less efficacious among marginalized groups in a society or that higher levels of C will be needed to achieve the same results or that, despite equal returns on C, differential exposures to risks will nonetheless result in poorer health.

Although the possibility that social context can disable C with respect to health has received little research attention, research on planful competence suggests that the efficacy of planful competence across the life course may be subject to moderation. Drawing on the Terman Sample of Gifted Children, Shanahan and colleagues (Shanahan & Elder, 2002; Shanahan, Elder, & Miech, 1997) distinguished between men born between 1904 and 1920 (the older cohort) and those born between 1921 and 1927 (the younger cohort). The older cohort of men experienced the Great Depression as they were entering the labor market, as well as disruptions in family and work with entry into the military service. Many men from the younger cohort, in contrast, entered the labor market and started a family during the economic boom following World War II. In the younger cohort only, planfulness in adolescence increased civic engagement and decreased divorce in adulthood. In the older cohort, even planfully competent men experienced marital instability, and, together with career difficulties, these experiences likely made civic involvements less likely. Thus, the positive effects of planful behaviors were disabled by social and economic circumstances.

2. Resource Accumulation and Positive Amplification Hypotheses

A related hypothesis holds that C accentuates the benefits of health resources. The disablement and resource accumulation hypotheses are not mutually exclusive but nor does one necessitate the other. There is presently little evidence for resource accumulation but it may be that C people experience higher returns on their material resources than lower C people, and these higher returns further encourage C behaviors (positive feedback). Further, people with abundant health resources may have higher initial levels of C, making this interaction and feedback likely (positive amplification). Given the strong evidence that C predicts education and income, these hypotheses suggest a cycle by which C increases material resources, C people experience greater returns on these resources, and they are consequently encouraged to higher levels of C. Boyce and Wood (in press) reported that the effects of income on life satisfaction are more pronounced among the highly C. Drawing on data from the German Socio-Economic Panel Study, they show that, for example, moderately C men (one standard deviation above the mean) benefit from increases in income by about 20% more than men with average C, and this effect size is somewhat greater for women (about 30%). It may also be that people who possess abundant health resources are also high in C, which we term "positive amplification," but this possibility has not been examined.

3. Resource Substitution and Negative Amplification Hypotheses

Mirowsky and Ross (2003) have proposed the resource substitution hypothesis, which states that resources will have more

beneficial effects on health among people with fewer alternative resources. In contrast to the disabling hypothesis, which is premised on a deprivation of resources, resource substitution depends on the availability of alternative resources that can promote health.

The idea was proposed with reference to educational attainment patterns of parents and their adult children: One's own educational attainment, if sufficiently high, may compensate for the low education of one's parents. In such cases, those with fewer resources (such as low parental education) are more dependent on their own education, which substitutes for the "missing" resource. As a corollary to this hypothesis, they propose a second mechanism, negative amplification, which posits that the missing resource increases the likelihood that the person will also not possess the substituted resource, and thus resource substitution is unlikely (Ross, Mirowsky, & Pribesh, 2001). As applied to educational patterns, high "educational attainment makes low parental education less harmful to health, but low parental education tends to result in lower personal educational attainment" (Ross & Mirowsky, 2011, p. 592). These patterns in turn suggest that low education in both generations will result in cumulating disadvantage, but that one's own education could disrupt the cumulation of risks and thus improve one's health. Positive feedback may also be possible, such that people who can substitute a missing resource with their C behaviors are encouraged to engage in future C behaviors. Again, feedback has not been examined.

Indeed, Ross and Mirowsky (2011) found support for both hypotheses in a study of physical impairments. Among adults with a college degree, parental education did not predict impairment. However, among people who did not receive a high school diploma, parental education was a strong predictor of impairment. Further, parental education was, as suggested by the negative amplification hypothesis, moderately correlated with a person's education, making the compensatory pattern associated with resource substitution less likely. Furthermore, consistent with the model of cumulating disadvantage, among the poorly educated, the negative health effects of their parents' low education worsen over time.

Although formulated with reference to education, both resource substitution and negative amplification processes may well apply to C as well. First, some of the compensatory effects of education are likely due to C behaviors. Ross and Mirowsky (2011) suggested that one's own education is compensatory because it fosters cognitive skills (such as analytic reasoning) and self-efficacy, but also the capacity to develop plans and implement them by way of C behaviors such as planning, engagement in goal-directed behaviors, and perseverance. In turn, these mechanisms link education with better health-related behaviors and the probability of being in health-promoting social environments. (Such an argument may be true to some extent, but is also complicated by the fact that C students do better in school and it is not presently clear the extent to which schooling increases one's C. However, it is likely that schooling increases the knowledge base available to high C adults, as well as the likelihood of both being in high C peer networks and having a high C spouse.)

Second, irrespective of one's educational attainment, C may compensate for lower parental education. Indeed, the study of functional impairment revealed that parental education mattered among the poorly educated because they were more likely to smoke and to be overweight, both of which are associated with high C, controlling education. Indeed, the first author's calculations examined BMI in young adulthood among groups defined by paternal education (high school or less vs. others) and C (split at the median). The pattern was consistent with resource substitution: Among people whose fathers had a low level of education, highly conscientious individuals were 13% less likely to be obese compared with those who were not. Indeed, low paternal education/low C was associated with the highest BMI. Individuals whose fathers had high education and who were conscientious were 32% less likely to be obese compared with the low father's education/low conscientiousness group. Moreover, some evidence suggests that C can compensate for one's own socioeconomic disadvantages. Kern et al. (2009) reported that C was most protective against mortality among men with the least successful careers.

However, the extent to which C may compensate for psychosocial disadvantages—perhaps involving hostile, insensitive parenting, neighborhood violence, exposures to extreme stressors at a young age, and so forth—has not been studied. The case of extreme stressors is interesting because it may be associated with heightened stress responses—behavioral and physiological—later in life, increasing the likelihood of inflammatory, chronic diseases (for a review, see Miller et al., 2011). Could C be protective in such circumstances because it is associated with delay of gratification, responsibility, and a desire to conform to expectations? If it is protective, is it nevertheless the case that exposure to extreme stressors decreases the likelihood of C (i.e., disablement)? C can only be compensatory when the individual, despite the absence of important resources, still is reasonably conscientious and has access to resources and opportunities to improve one's health.

4. Demanding Situations and Positive Amplification Hypotheses

Some evidence suggests that C is more protective in demanding than in less challenging circumstances. "Demand" refers to several features of the situation, including high levels of stress, moderate challenge (i.e., difficulty of task compliance), and novelty/ambiguity. Accordingly, C is most protective against health risks in situations characterized by high levels of one or more of these characteristics of the situation. In turn, as people engage in C behaviors to successfully face demanding circumstances, their likelihood of future C behaviors may increase (positive feedback).

(a) Stressful circumstances. Although direct empirical evidence for the stress-buffering effects of C (i.e., a Stressor × C interaction) is surprisingly meager, studies of coping and the workplace suggest several mechanisms by which C may well be effective in decreasing distress in highly stressful circumstances. With respect to coping, low-grade stressors generally are associated with less variability in coping (Carver & Connor-Smith, 2010), likely reflecting relatively clear lines of action that are required. Thus, for example, flat tires and broken copy-machines will evoke problem-solving and instrumental support coping strategies in most people, irrespective of personality. In contrast, life-threatening illness, divorce, and chronic pain evoke a wide-range of coping strategies, from engaged strategies (such as problem-solving) to various forms of disengagement (e.g., denial, substance use).

In fact, Connor-Smith and Flachsbart's (2007) meta-analysis of personality and coping suggests that C is more strongly associated

with constructive forms of coping, particularly those involving social support (including seeking help and comfort from others) in these types of highly stressful circumstances. Given the importance of these forms of coping, C may be more efficacious when stressors are controllable as opposed to not responsive to coping. C may also be more highly associated with cognitive restructuring (e.g., viewing the circumstances as an opportunity for personal growth, identifying possible benefits) in high stress situations, possibly reflecting the longer temporal horizon that is thought to characterize high C people (Carver & Connor-Smith, 2010). All of these associations may be more pronounced in early to middle adulthood rather than other life periods due to convergence of cognitive maturity, frontal lobe maturation, and good physical health.

Additional evidence may be found in several studies suggesting that C buffers the effects of stressors in the workplace on job satisfaction and various forms of distress. Typically, results suggest that C differentiates workers on these outcomes in situations of high work stress (e.g., role ambiguity or conflict; Grant & Langan-Fox, 2007), with highly C workers experiencing fewer negative outcomes. Although C workers also generally report fewer stressors in the workplace, this is not always the case. As noted, very high levels of C can lead to problems in the workplace, especially when situations call for flexibility and supportive collaborations with co-workers. C is also positively associated with engagement in the workplace (encompassing dedication and absorption in work), which is associated with greater work–family conflicts. Among highly C people, however, the negative effects of work engagement on work–family interference are attenuated (Halbesleben, Harvey, & Bolino, 2009). Thus, although highly C people are more engaged in their work (a demanding situation the increases work–family conflict), they actually experience fewer work–family conflicts.

(b) Moderately challenging circumstances. Some situations are not traditionally considered stressful (i.e., characterized by stressors) but nonetheless present moderate challenges. This may be especially applicable to situations involving adherence to medical advice and treatment regimes. C is generally related to compliance, although studies tend to examine this relationship among people with serious conditions and complex treatment regimens (such as HIV and End-Stage Renal Disease as treated by hemodialysis). One unique study suggests that C is associated with adherence for regimes that are demanding. Elfhag, Finer, and Rossner (2008) compared the effects of two long-term prescription medications—sibutramine (taken once per day) and orlistat (taken three times a day in conjunction with major meals, which must not exceed 30% fat content)—on weight loss. Sense of order, deliberation, and self-discipline were associated with weight loss only for the orlistat, which requires more effort on the part of the patient. Indeed, patients who were most persistent at maintaining fat content under 30% of total intake lost the most weight. Intriguingly, it may be that C does not explain adherence for simple, less demanding regimes simply because they do not require C-driven behaviors. Jerant, Chapman, Duberstein, Robbins, and Franks (2011) also reported that C did not predict adherence to medications in older adults when the medication was experimental and the efficacy was not yet established.

(c) Novel and ambiguous situations. A demanding situation may also involve novelty and ambiguity. This possibility was proposed by Caspi and Moffitt (1993), who argued that people seek to "transform novel, ambiguous, and uncertain circumstances into familiar [i.e., consistent with their personalities], clear, and expectable social encounters" (p. 247). Cooper (2010) examined the extent to which risky behaviors associated with sexual intercourse reflected interactions between personality attributes (of relevance here, impulsivity) and characteristics of the relationship indicative of novelty (first vs. subsequent sexual encounter, stranger/causal vs. engaged/married encounters). Interactions were quite consistent for impulsivity such that it more strongly differentiated risk behavior in novel than in established relationships. For example, in first sexual encounters, highly impulsive persons had an estimated probability of condom use of .6, compared to .7, for low impulsive persons, with less difference between the groups when engaged in subsequent sexual encounters. Such research suggests that C may be especially important in the avoidance of risk during novel situations, which might include, for example, geographical moves, entry into a new school system, and transition to a care facility.

5. C and Other Personality Traits

Reported interactions involving C and other facets of personality are presently uncommon but suggest several intriguing possibilities. Neuroticism is strongly associated with negative emotions, raising the possibility that low C and high Neuroticism may be an especially disadvantageous combination. Indeed, Carver and Connor-Smith's (2010) review noted that low C and high Neuroticism predict especially high stress exposure and threat appraisals, reflecting a "double disadvantage." On the other hand, low Neuroticism plus high C predict especially low stress exposure and threat appraisals, reflecting the positive effects of C without the Neurotic tendencies for anxiety, moodiness, and distress.

As found in many studies, Axelsson, Brink, Lundgren, and Lotvall (2011) reported that C was related to medication adherence in a large Swedish epidemiological study. This positive association was small in magnitude, however, and began to decline at higher levels of C. The finding is notable because the downward trend for the population began at C values of 37 with a population mean of about 34 and standard deviation of 6. Further analyses revealed that adherence was lower among people who were high on both C and Neuroticism. That is, adherence was lower for a notable percentage of high C people, who were also high on Neuroticism. The authors speculate that this pattern reflects, in part, the sense among very high C people that they can manage their own lives in a proactive way (e.g., adjusting their dosages, etc.) and also their proneness to worry and anxiety. Extant evidence is too sparse to draw any conclusions but the simple idea that high Neuroticism with low C is risky is just one of several plausible possibilities.

The meaning of Neuroticism for health and its relation to C may change with age. For example, Neuroticism contributes to poor health and mortality in young adulthood and midlife, but then provides some protection in old age (Lee, Wadsworth, & Hotopf, 2006). Similarly, the interactive pattern with C may change with age, such that those high in both may be better off in old age but at particular risk during adolescence when sensitivity to peer acceptance and rejection is particularly high. Consistent with this perspective—that the worried, yet C person may be healthier—Roberts et al. (2009) found that C and Neuroticism synergistically

combined to predict self-reported health: Older individuals who were higher on both C and Neuroticism reported higher health. Interestingly, the synergistic effect of C and Neuroticism extended to one's spouse. Women who were married to men who were both conscientious and Neurotic reported higher health even while controlling for their own trait levels.

Personality traits associated with people skills may also interact with C. Chapman et al. (2010) examined the Big Five Factor Model and mortality with the MIDUS data and reported that C was protective at high levels of Agreeableness, whereas high Agreeableness coupled with low C significantly increased risk of mortality. They propose two profiles to explain this pattern. Because of their high C, "effective altruists" engage in self-disciplined, responsible behaviors that promote health, and these behaviors are socially reinforced and facilitated because of their harmonious relationships with other people, reflecting their Agreeableness. In contrast, heightened risk of mortality is associated with the "well-intentioned," who seek social harmony but lack self-discipline. Thus, C, agreeable people can foster their health through their own actions and by eliciting supportive actions from other people. However, evidence did not support a simple pattern of agreeableness compensating for high C.

In addition to the people-skills associated with these facets of personality, Extraversion and, to a lesser extent, Agreeableness are associated with positive affect, which could balance the instrumental orientation of highly C people. Bardi and Ryff (2007) examined adjustment to community relocation among elderly women, a transition often calling for cooperation with others and involving stressful disruption in routine. Their findings—based on pre- and post-move comparisons of anxiety and depression—suggest that for women who were low on C, high Extraversion was especially protective. Once again, this pattern is not consistent with a protective effect of Extraversion at high levels of C, but it does suggest that positive emotions associated with Extraversion may be compensatory given low C. In any event, few studies have examined interactions involving C and other aspects of personality, although the affective dimensions of Neuroticism, Agreeableness, and Extraversion are likely candidates because of their associations with qualities of interpersonal relationships, including social supports.

The LCP Model and Directions for Future Research

The discovery and documentation of Conscientiousness as a robust predictor of healthy aging and longer life raise important conceptual and methodological challenges for future research, challenges that concern the social circumstances in which C behaviors influence (or fail to influence) health across the life course. Such causal links need to be understood before effective health promotion interventions can be implemented.

Several explanatory mechanisms—involving socioeconomic attainments and their many links to health and disease, the stress process, health behaviors, and the management of diseases—have thus far been identified and studied extensively. Our review underscores that much more attention could be trained on the mechanisms that would explain the effect of C, and facets of C, on this range of mediating mechanisms. Health behaviors and the management of diseases are clearly important mediators but research suggests that they explain only part of the association between C and morbidity and mortality. C is related to several other classes of variables also linked to health, such as SES and stress. C predicts the major facets of socioeconomic status, such as educational attainment, income and wealth, and occupational prestige. Yet, there has been little cross-fertilization between the substantial literature involving SES and health, and research on C and health. Thus, the role of C in the many mechanisms by which SES translates into less morbidity and a longer life—knowledge about health, access to higher quality care, early adoption of new technologies, and so on—has not been studied. Intuitively, C should be related to all aspects of the stress process, but the evidence suggests greater nuance, with greater attention paid to the facets of C and to the specific qualities of stressors and situations.

In addition to considering greater specificity with reference to these mediating mechanisms, meta-analyses reveal that their associations might be moderated by factors that have yet to be fully identified. The LCP Model suggests a series of possible moderating processes. The person's C and the C of significant others are likely related to health processes from birth until later adulthood, although the specific mechanisms by which C translates into health and the avoidance of disease varies across the phases of life. The C of parents is undoubtedly important in manifold ways, but much less is known about spouses and even less about the significance of the C of intimates, friends and co-workers, children, and caregivers. The person's C begins to influence outcomes by late childhood through the avoidance of psychosocial and health risks and the promotion of health behaviors. Across adulthood, however, the mechanisms by which C influences health could be better understood and it may be that effect of C changes at different stages of adulthood. Moreover, while researchers have uncovered surprisingly few interactions thus far between C and social context, we have posited a series of hypotheses that have scarcely been examined, by which context and personality can alter returns on C and, consequently, the likelihood of C behaviors in the future. These hypotheses need to be investigated in relation to age and life stage as well.

Indeed, the LCP Model's hypotheses, summarized in Tables 1 and 2, suggest very high levels of contingency in how C influences health. For example, parental C and self-control are likely important to health-related processes through childhood, which could then initiate positive feedback and encourage future C processes, promoting cumulating advantages. Yet, parents deprived of adequate resources may experience difficulties in "translating" their C into parenting skills, consistent with disablement. As suggested by this example, the phase-specific and continuous processes proposed in Table 1 may be subject to the moderational, feedback, and selection mechanisms stated in Table 2.

Research pursuing these themes requires large, diverse samples for at least two reasons. First, such mediational and moderational hypotheses typically require large numbers of cases for adequate statistical power. Tests of these complex ideas with small samples may be misleading and unnecessarily complicate the evidentiary base. Second, such hypotheses—particularly if studied in terms of both total C and its individual facets—require large numbers of people with diverse experiences, diversity that creates sufficient variability in the processes being studied.

This latter point is a marked weakness of extant research, which has often relied on homogenous (typically middle-class) convenience samples. (Some notable exceptions thus far include the

National Health and Retirement Survey, the German Socio-Economic Panel Study, and the National Longitudinal Study of Adolescent Health.) There is growing appreciation in psychology for the potential value of large-scale survey research (Trzesniewski, Donnellan, & Lucas, 2010). On the other hand, large-scale research sometimes collects short-form personality inventories—a practice that makes the study of specific facets of C and affective dimensions of, for example, Agreeableness difficult (Baldasaro, Shanahan, & Bauer, in press). Ideally, large, diverse samples across the life span that include longer forms of personality inventories will inform future research.

Further attention to two other aspects of sampling may be profitable. First, although some research questions depend on large, diverse samples, other questions call for more well-specified, strategic samples that may, of necessity, be small. Ethnographies or studies that draw on extensive measures of personality and social context may be quite revealing as shown, for example, by the Lutfey–Freese ethnography and detailed studies of C, social-cognitive processes, and health behaviors (e.g., Bogg et al., 2008). The detailed study of stress processes, for example, may also require in-depth data collection from a relatively small number of subjects. Ideally, large and small sample designs will inform one and other.

Second, sampling considerations also entail questions of "how often" and "when." Many of the processes that we have discussed call for repeated assessments of the individual and social context to address phase-specific mechanisms and how "health returns" on C can, in turn, influence levels of C. These considerations suggest the possible value of an accelerated cohort design (albeit with sufficient numbers of cohorts and measurement occasions), continued attempts to combine multiple data resources (e.g., see Friedman, Kern, Hampson, & Duckworth, 2014; Kern, Hampson, Goldberg, & Friedman, 2014), and diary studies (e.g., O'Connor et al., 2009). Even with such data, however, the modeling of feedback cycles (as suggested, for example, by demanding situation and positive amplification hypotheses) represents a distinct statistical challenge.

Over the past two decades, an impressive body of research has well documented the importance of individual differences in C to risk of morbidity and mortality. The next generation of research will ideally address the precise nature and meaning of these associations: more fine-grained measures of the person and her experiences; social cognitive processes connecting C with choices about health; the relevance of timing and developmental stage; and the conditions—both social and personal—in which C is particularly effective in promoting health and avoiding disease as people develop and age.

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