

Department of Health and Human Services
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Conscientiousness and Healthy Aging

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Workshop Report*

I. Introduction

Research has shown that personality traits predict a range of outcomes in aging, including health, longevity, economic security, and general well-being. The personality trait of conscientiousness is especially noteworthy, as it seems to predict many life outcomes, in different populations, often over extended periods of time. Indeed, existing research indicates that conscientiousness predicts various aspects of physical health and longevity, academic and occupational achievement, marital stability, and mental health.¹ Examining the links between conscientiousness and life outcomes may yield important clues about ways to promote the possibility of living a long, healthy, successful, and happy life. Existing data do not provide a clear picture of the underlying mechanisms that account for observed differences among individuals, for the persistence and changes of these differences over time, or, for the impact of conscientiousness on patterns of behavioral, psychological, and physiological function. On

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¹ Kern, M.L., & Friedman, H.S. (2008). Do conscientious individuals live longer? A quantitative review. *Health Psychology, 26*, 505-512.

Friedman, H. S. & Martin, L.R. (2007). A life-span approach to personality and longevity: The case of conscientiousness. In C. Aldwin, C. Park & A. Spiro (eds.). *Handbook of Health Psychology and Aging*. NY: Guilford, pp. 167-185.

Roberts, B.W., Kuncel, N.R., Shiner, R., Caspi, A., & Goldberg, L.R. (2007). The power of personality: The comparative validity of personality traits, socioeconomic status, and cognitive ability for predicting important life outcomes. *Perspectives on Psychological Science, 2*, 313-345.

Hampson, S.E., Goldberg, L.R., Vogt, T.M., & Dubanoski, J.P. (2007). Mechanisms by which childhood personality traits influence adult health status: Educational attainment and healthy behaviors. *Healthy Psychology, 26*, 121-125.

Bogg, T., & Roberts, B.W. (2004). Conscientiousness and health behaviors: A meta-analysis of the leading behavioral contributions to mortality. *Psychological Bulletin, 130*, 887-919.

Noftle, E.E., & Robins, R.W. (2007). Personality predictors of academic outcomes: Big five correlates of GPA and SAT scores. *Journal of Personality and Social Psychology, 93*, 116-130.

Dudley, N.M., Orvis, K.A., Lebiecki, J.E., & Cortina, J.M. (2006). A meta-analytic investigation of conscientiousness in the prediction of job performance: Examining the intercorrelations and the incremental validity of narrow traits. *Journal of Applied Psychology, 91*, 40-57.

Kendler, K.S., & Myers, J. (2010). The genetic and environmental relationship between major depression and the five-factor model of personality. *Psychological Medicine, 40*, 801-806.

January 6-7, 2011, the National Institute on Aging (NIA) sponsored a workshop on conscientiousness and health aging, co-chaired by David Reiss and Lis Nielsen, in order to facilitate a new phase of research investigating the processes that link conscientiousness and later life outcomes. Attendees included invited experts in the fields of psychology, psychiatry, sociology, and genetics and staff from the NIA. (See appendices 1 and 2 for the meeting agenda and list of participants.)

In their opening remarks, Nielsen and Reiss emphasized that the NIA actively supports personality research and is interested in integrating personality models with more longitudinal approaches in order to elucidate the mechanisms and pathways underlying personality's effects. Establishing these pathways will enable researchers to link the early phases of development to what is already known about aging in ways that can explain the actuarial success of personality measures. This research has the potential to provide important clues about how to enhance conscientiousness or some of its immediate behavioral, cognitive, or emotional correlates, particularly when evidence suggests that such enhancement would lead to favorable outcomes over the life course. Both Reiss and Richard Suzman remarked that the intent of the workshop was to foster the exchange of innovative ideas to reinvigorate and move forward the field of personality research.

II. Defining Conscientiousness

Personality researchers usually define conscientiousness as a hierarchically organized family of traits that describe individual differences in the propensity to be self-controlled, responsible to others, hard-working, orderly, and rule-following.² Using methods typical of personality research (e.g., factor analysis), researchers have identified and replicated five lower-order facets of conscientiousness across studies: impulse control, responsibility, orderliness, industriousness, and conventionality.³ The construct of conscientiousness adheres well to the definition of a personality trait as a relatively enduring pattern of responses to environmental stimuli. Brent Roberts noted, however, that this definition does not account for the automaticity of the thoughts, feelings, and behaviors that are associated with a personality trait like conscientiousness. The classic hierarchical model holds that trait-level conscientiousness represents a relatively enduring pattern of behavior, but that changes can come about through repeated environmental or intrapsychic presses that challenge those patterns. An alternative contextual model provides a more comprehensive picture of the dynamics of personality. This model, which draws from the social-cognitive literature, holds that relationships, experiences, and environment shape the development of a trait like conscientiousness. Environmental affordances allow for dispositions to emerge—people develop a context-based repertoire of behaviors influenced by the relationships they have with others. For example, conscientiousness seems to be most manifest in achievement settings, such as work and school. Patterns of responding coalesce over time into a

² Roberts, B.W., Jackson, J., Fayard, J.V., Edmonds, G., & Meints, J. (2009). Conscientiousness (Chapter 25, pp. 369-381). In M. Leary & R. Hoyle (Eds.), *Handbook of individual differences in social behavior*. New York, NY: Guilford.

³ Roberts, B.W., Bogg, T., Walton, K.E., Cherynshenko, O.S., & Stark, S.E. (2004). A lexical investigation of the lower-order structure of conscientiousness. *Journal of Research in Personality*, 38, 164-178.

Roberts, B.W., Chernyshenko, O.S., Stark, S., & Goldberg, L.R. (2005). The structure of conscientiousness: An empirical investigation based on seven major personality questionnaires. *Personnel Psychology*, 58, 103-139.

relatively stable trait, but they can be changed through persistent, ongoing environmental or intrapsychic processes that contradict established patterns of thought, feeling, and behavior.

Researchers are currently using genetic approaches in order to better understand the observed relationship between conscientiousness and various outcomes. Like many other personality variables, conscientiousness appears to be heritable, but these genetic studies have not revealed much detail about underlying mechanisms. A recent meta-analysis of genome-wide association studies (GWAS) of personality found one single nucleotide protein (SNP) that was associated with conscientiousness across multiple samples.⁴ Antonio Terracciano observed that, because of the many intervening factors between a SNP and a complex phenotype like trait conscientiousness, replication is difficult to achieve, and these results are typical of GWAS approaches. Existing twin data yield some insight into the interplay between genetic and environmental contributions in linking personality and health outcomes, and research in fields like epigenetics will allow researchers to further explore these gene-environment interactions. Although genetic studies will not provide full explanations of conscientiousness, they may point toward the biological pathways that link conscientiousness to life outcomes.

A unified model of conscientiousness and its links to aging outcomes requires a synthesis of these existing constructs. It is possible that common variance among the facets of conscientiousness explains its relationship to life outcomes, suggesting that a latent trait of conscientiousness does in fact exist. On the other hand, it is also possible that specific residual variance drives the relationship, suggesting the relative importance of the specific facets of conscientiousness. Although there does seem to be some self-regulatory process that is common to the facets of conscientiousness, Nancy Eisenberg observed that the specific facets do generate unique predictions. Indeed, different facets seem to have different impacts depending on the outcome under examination.⁵ The facets of conscientiousness all correlate with various biomarkers (e.g., cholesterol, blood pressure, inflammatory proteins) that may link to long-term outcomes like cardiovascular disease, depression, and longevity—however, the facets of order and discipline demonstrate the most consistent relationship. It is clear that there is still much to learn about how the hierarchical structure of conscientiousness relates to long-term outcomes. Using multivariate approaches that bridge trait and social-cognitive models will allow researchers to better understand this relationship. Statistical techniques like structural equation modeling allow for the incorporation of developmental trajectories into models that account for the measured and latent aspects of a trait. Nielsen noted that developmental trajectories of systems for reward processing and self control are currently being modeled in the field of developmental neuroscience.

III. Developmental Origins of Conscientiousness

⁴ Terracciano, A., Sanna, S., Uda, M., Deiana, B., Usala, G., Busonero, F., Maschio, A., Scally, M., Patriciu, N., Chen, W., Diste, I. M. A., Slagboom, P. E., Boomsma, D. I., Villafuerte, S., Sliwerska, E., Burmeister, M., Amin, N., Janssens, A. C. J. W., van Duijn, C. M., Schlessinger, D., Abecasis, G. R., & Costa, P. T. Jr. (2010). Genome-wide association scan for five major dimensions of personality. *Molecular Psychiatry*, *15*, 647-656.

⁵ See, for example: O'Connor, D. B., Conner, M. T., Jones, F. A., McMillan, B. R. W., & Ferguson, E. (2009). Exploring the benefits of conscientiousness: An investigation of the role of daily stressors and health behaviors. *Annals of Behavioral Medicine*, *37*, 184-196.

Most researchers would consider conscientiousness to be a trait that develops over the lifespan; however, there is no overarching theoretical perspective that bridges the existing research on aspects of conscientiousness in children and adults. Research on these different age groups occurs in silos, relying on different terminology and typically published in different journals. Personality researchers typically focus on adults, while temperament researchers typically focus on childhood. Angela Duckworth noted that, although there is an overarching, consensual taxonomy for personality traits, there is no taxonomy for temperament that is as consensually endorsed by developmental psychologists. On the contrary, much of the developmental literature examines individual aspects (as opposed to omnibus measures) of temperament. As psychological constructs, however, Duckworth argued that personality and temperament are more similar than they are different. Both personality and temperament are thought to be influenced by genes and experience, to emerge early in life, to be relatively stable over the life course, to be hierarchically organized, and to be linked to neurobiological substrates. Temperament interacts with other aspects of the individual (such as cognitive styles, beliefs, and goals) and leads to motivations that can influence behavior, ultimately feeding into a complex model of personality.

One of the biggest obstacles to integrating temperament and personality into a unified model is in ensuring that such a model accounts for developmental stages across the lifespan. The specific behaviors that represent the expression of a trait change with age. For a child, conscientious behavior might be cleaning up toys after playing; for an adolescent it might be doing homework carefully; for a young adult it might be paying bills on time; and for an older adult it might be taking medication as advised. Despite these age-specific considerations, Duckworth noted that there is considerable overlap between the construct of effortful control in Rothbart's model of temperament and measures of conscientiousness in the NEO-PI-R measure of personality. In fact, Caspi and Shiner treat the terms self-control and conscientiousness as relatively synonymous.⁶ The capacity for effortful control seems to be an important aspect of conscientiousness—and executive function more broadly—that predicts later outcomes. Self-control has been conceptualized as a dual system model, in which a subcortical “hot” system generates impulses to do things that are automatic and bring immediate gratification (e.g., eat a dozen fresh cookies), and a complex prefrontal “cold” system that exerts top-down control over the hot system (e.g., avoiding the cookie). With this in mind, it seems that tendencies toward conscientiousness may reflect a well-functioning cold system.

Given this dual-system model, Duckworth argued, conscientiousness should be most beneficial in the presence of strong, maladaptive impulses—those children who do not have the impulses in the first place will not need to regulate them. Examining individual differences in the hot system—including behaviors related to specific temptations (e.g., food, alcohol, sex, gambling) and sensation-seeking or reactive-impulsive tendencies—may help to elucidate the relationship

⁶ Caspi and Moffitt discuss the overlap between self-control and conscientiousness in several articles. See, for example:

Caspi, A., & Shiner, R.L. (2006). Personality development. In Damon, W. & Lerner, R. (Series Eds.) & Eisenberg, N. (Vol. Ed.), *Handbook of child psychology: Vol. 3. Social, emotional, and personality development* (6th ed., pp. 300-365). New York, NY: Wiley.

Moffitt, T.E., Areseneault, L., Belsky, D., Dickson, N., Hancox, R.J., Harrington, H., Houts, R., Poulton, R., Roberts, B.W., Ross, S., Sears, M.R., Thomson, W.M., & Caspi, A. (2011). A gradient of childhood self-control predicts health, wealth, and public safety. *Proceedings of the National Academy of Sciences*, *108*, 2693-2698.

between effortful control and various outcomes. In addition, understanding individual differences in the cool system will help to explain who is better able to control maladaptive impulses when they arise. Furthermore, developmental research demonstrates that aspects of this dual-system model change over time. For example, sensation-seeking (hot) increases in adolescence and then decreases in early adulthood, whereas skills like executive attention and planning (cold functions) increase in a monotonic fashion over this period. These developmental stages are critical to explaining the various outcomes as they are observed over the lifespan. Finally, the developmental literature provides clear evidence for the fact that emotion and regulation are closely linked. It is possible that some of the physiological processes implicated in self-regulation and effortful control may have more to do with the experience and regulation of emotion. Distinguishing effortful control measures from measures of emotional experience and regulation warrants further attention.

The ability to inhibit automatic responses and to focus attention is thought to be a central component of overarching executive function. Numerous tasks, including those tapping executive attention and the ability to inhibit behavior can be used to assess executive skills. Delay of gratification measures have been frequently used. Children's performance on delay of gratification tasks correlates with informant (teacher and parent) ratings of their capacity for effortful control. Furthermore, children's performance on a delay of gratification task correlates with measures of both effortful control and conscientiousness.⁷ The overlap between these aspects of executive function, effortful control, and conscientiousness indicates a relationship between the three constructs, but the exact nature of the relationship is not entirely clear. Eisenberg and Duckworth expressed the sentiment that trying to integrate these various constructs is often a frustrating endeavor; without some form of extrinsic motivation, it may be difficult to bring researchers from different disciplines together and eliminate the silo effect.

IV. Conscientiousness in Context

In order to avoid mistakes of earlier personality research (e.g., research on Type A behavior), research on conscientiousness must be conceptually grounded, taking into account the fact that personality is embedded in a rich, complex context. Howard Friedman noted that the relationship between trait conscientiousness and various outcomes depends upon individual life pathways across time—conscientiousness will emerge and have different impacts depending on the situations that a person non-randomly encounters and selects. By combining the typical trait model of conscientiousness with a context-oriented model, such as Jacquelynne Eccles's general expectancy value model of achievement choices, researchers will have the tools to understand the processes that underlie the relationship between personality and life outcomes.

According to the general expectancy value model of achievement choices, there are many factors, both proximal and distal, that influence whether a person engages and persists in a specific behavior. These factors include stable characteristics of the person (e.g., personality traits like conscientiousness), social influences, personal identity (e.g., goals, self-schemata), memory systems (e.g., affective associations), previous experiences, expectations for success, and the subjective value of the task at hand. Identity is a key aspect of this model. The extent to

⁷ Duckworth, A.L., & Kern, M.L. (in press). A meta-analysis of the convergent validity of self-control measures. *Journal of Research in Personality*.

which a person believes she is conscientious will influence the situations she engages in—she will select herself into situations that support her personal and social identities. The surrounding environment is also a key aspect of this model, because it constrains and shapes the expression of personality traits. Thus, early exposure to conscientious parents, success in school, and other prosocial contexts may lead to low risk taking and, ultimately, reduced exposure to health-compromising experiences. People who are conscientious are more likely to seek out and create supportive contexts. This model represents a process that occurs over the life course and that builds on itself over time.

Early relationships represent one contextual factor that interacts with aspects of the child to influence development and life outcomes. Indeed, research suggests that early relationships play an influential role in a child's ability to self-regulate.⁸ It is important to note that the relationships between a child and the people in her environment are bidirectional—the child and those around her elicit certain responses from each other. This is especially true in the parent-child relationship. Thus, a child's ability to self-regulate moderates the effects that parenting has on outcomes related to the child's personality and functioning. One important pathway by which parenting can influence child development is through the attachment relationship. Pasco Fearon described the attachment relationship as one that is defined by behavior that serves to maintain the child's proximity to a caregiver in times of stress. The caregiver acts as a source of comfort, allowing the child to explore her environment. The child develops a cognitive model of the relevant aspects of the physical and social environment that is based on her history of social interactions. Through these internal working models, a healthy attachment relationship can promote autonomy and learning through the development of ego resilience, empathy and moral reasoning, positive attributions about the self and other, emotion regulation, and prosociality.

Evidence from meta-analyses shows a consistent association between early attachment and later outcomes. For example, disorganized attachment correlates with antisocial behavior⁹ and the quality of peer relationships. The effects of a disorganized attachment interact with social adversity and gender and may emerge more strongly over time. Attachment is presumed to operate across the lifespan, shaping the quality of adult pair bonds and modulating the stress-buffering functions of adult intimate relationships.¹⁰ Although attachment seems to be linked to some measures of personality, there appears to be little direct relationship with conscientiousness. Despite this, attachment theory provides a clearly articulated model that accounts for the importance of context in the development and expression of personality traits

⁸ See, for example:

Campbel, S.B., Spieker, S., Vandergrift, N., Belsky, J., Burchinal, M., & NICHD Early Child Care Research Network. (2010). Predictors and sequelae of trajectories of physical aggression in school-age boys and girls. *Development and Psychopathology*, *22*, 133-150.

Eisenberg, N., Zhou, Q., Spinrad, T.L., Valiente, C., Fabes, R.A., & Liew, J. (2005). Relations among positive parenting, children's effortful control, and externalizing problems: A three-wave longitudinal study. *Child Development*, *76*(5), 1055-1071.

Eisenberg, N., Chang, L., Ma, Y., & Huang, X. (2009). Relations of parenting style to Chinese children's effortful control, ego resilience, and maladjustment. *Development and Psychopathology*, *21*, 455-477.

⁹ Fearon, R.P., Bakermans-Kranenburg, M.J., Van IJzendoorn, M.H., Lapsley, A-M., & Roisman, G.I. (2010). The significance of insecure attachment and disorganization in the development of children's externalizing behavior: A meta-analytic study. *Child Development*, *81*(2), 435-456.

¹⁰ See, for example: Coan, J.A., Schaefer, H.S., & Davidson, R.J. (2006). Lending a hand: Social regulation of the neural response to threat. *Psychological Science*, *17*, 1032-1039.

over time. This developmental, contextual framework can inform more classic models of personality.

V. Measuring Conscientiousness

There are many methods that are used to assess aspects of conscientiousness. The personality literature typically relies on explicit self- and observer-report measures of conscientiousness. Implicit measures (e.g., Implicit Association Test) and physiological measures (e.g., heart rate variability) may capture aspects of conscientiousness that are not tapped by these explicit measures because they do not contain the same potential for reporting bias that is inherent to explicit measures. Experimental measures of conscientiousness, on the other hand, can be used repeatedly over time and across different age groups. These measures tend to focus on behaviors related to impulsive decision-making (e.g., delay Discounting Measure, Balloon Analogue Risk Task), inattention (e.g., Continuous Performance Test, Delayed Memory Test), and disinhibition (e.g., Go, No-go tasks). Roberts and Daryl O'Connor pointed out that it is difficult to know exactly whether these measures are assessing the same or even similar constructs without a clear definition of the constructs that belong in the domain of conscientiousness. Several attendees noted that individual differences in things like punctuality or the amount of detail in response to an open-ended survey item seem to be strong predictors of various outcomes, but these proxies for conscientiousness do not illuminate the process by which conscientiousness leads to these outcomes. One of the main goals for research in conscientiousness, then, must be to develop multiple measures that demonstrate convergence—ideally, this would lead to the creation of a common scale that is portable and replicable across studies.

Despite numerous studies tracking conscientiousness over time in adulthood, there have not been many studies tracking conscientiousness from childhood through adulthood. Taking a longitudinal perspective will provide insight into the extent to which various measures are tapping an enduring personality trait or a particular state. In taking such a longitudinal perspective, however, researchers must pay careful attention to the equivalence (or lack thereof) between measures across different stages in the lifespan. Duckworth observed that some measures from the temperament literature could be matched up to facets of conscientiousness, including effortful control items from the Child Behavior Questionnaire and items from the Eysenck Junior Impulsiveness Questionnaire. Looking at trajectories over time will elucidate the dynamics of personality change and the mechanisms through which personality change occurs, and will suggest points for intervention.

Research must also explore the ways in which contextual factors modify the relationship between conscientiousness and life outcomes. This research will depend on contextualized measurement techniques, like experience sampling, ecological momentary analysis, and daily diaries.¹¹ Current measures do not tap important aspects of conscientiousness, such as the

¹¹ See, for example:

Kahneman, D., Krueger, A.B., Sckade, D.A., Schwartz, N., & Stone, A.A. (2004). A survey method for characterizing daily life experience: The day reconstruction method. *Science*, 306(5702), 1776-1780.

Jackson, J.J., Wood, D., Bogg, T., Walton, K.E., Harms, P.D., & Roberts, B.W. (2010). What do conscientious people do? Development and validation of the Behavioral Indicators of Conscientiousness (BIC). *Journal of Research in Personality*, 44(4), 501-511.

salience of conscientious behavior to a person in a given situation. Salience may lead to considerable variability in performance across tasks and may even be more predictive of performance than overall conscientiousness. Comparing a person's average versus maximal performance on a task may clarify this aspect of the relationship between conscientiousness and outcome, but, as Sarah Hampson noted, personality research does not often take this approach. Roberts commented that researchers in industrial-organizational psychology often use standardized tasks to investigate how people respond across various situations, and these kinds of tasks could be adapted for use in personality research. Carl Lejuez stressed that context is especially important because conscientiousness is not universally beneficial—in fact, high conscientiousness may contribute to disorders such as obsessive compulsive disorder.

It is also important that researchers use measures that have ecological validity, mapping onto things that people do in their everyday lives. Many tasks assess the tendency to succumb to temptations that maximize immediate rewards, at the expense of rewards in the distant future. However, Lejuez noted that people often engage in behaviors that avoid minimal punishment in the present (e.g., succumbing to smoke), ignoring the fact that this may result in much bigger punishment down the line (e.g., lung cancer). Lejuez observed that relatively few tasks have been developed that tap this avoidant behavior. One can reframe reward and risk-taking tasks in terms of negative reinforcement, although these measures may be more difficult to justify to institutional review boards and grant agencies because they are not as immediately intuitive as more typical positive reinforcement measures.

Researchers must also continue to explore the physiological bases of conscientiousness. Existing research suggests that certain physiological responses (e.g., ERP P300, cortisol, brain activity in left middle frontal gyrus and ventral prefrontal cortex) are correlated with aspects of personality; although these physiological responses are not exclusive to conscientiousness, examining functional pathways can provide important information about the etiology and biological substrates of trait conscientiousness. The fact that the dopamine and serotonin neurotransmitter systems are implicated in impulse control and in conscientiousness, for examples, provides clues about which genetic pathways are involved in the expression of conscientiousness. Roberts acknowledged that this field is very new and so the approach should be as open-minded as possible.

VI. Intervention Approaches

There are three major approaches to studying intervention related to a personality trait like conscientiousness. The first approach includes studies that seek to remediate low conscientiousness, which does not necessarily require an understanding of process. The second approach involves studies that test mechanisms of change, which allows for theory development and identification of future implications. The third approach examines how conscientiousness moderates existing interventions for typical behavioral targets such as poor health behaviors. Ideally, these approaches are used in combination. There are, however, limits to the level of mechanistic specificity that these approaches can test, because there are many components to an intervention, and personality change is a collection of processes operating in conjunction. Ben

Kern, M. L., Friedman, H. S., Martin, L. R., Reynolds, C. A., & Luong, G. (2009). Conscientiousness, career success, and longevity: A lifespan analysis. *Annals of Behavioral Medicine*, 37, 154-163.

Chapman argued that the focus of study should therefore be on the cluster of change processes that treatment represents. An example of this approach would be the Homing in on Health study (HIOH), which takes its cue from social-cognitive theory and specifically theory about health self-efficacy.¹² The HIOH intervention encompasses education, modeling, goal-setting, practice, social support, emotional regulation, and self-monitoring training. In this kind of intervention study, the point is to look at mechanisms that seem to tap some common factor and also the interactions between mechanisms. Examining each element of a treatment in isolation is a laborious and inefficient process—instead, researchers can use post-hoc analyses to tease apart whether different treatment elements moderate the effect of the intervention or are tied to different outcomes.

Intervention studies may be observational or experimental in nature. Quasi-experimental and observational studies tend to have more representative samples and allow the study of changes in personality as they occur naturally. These methods do not, however, guarantee isolation of causal effect. Experimental studies, on the other hand, allow for randomization and control by design, but intentional sample restriction can compromise researchers' ability to draw generalizable conclusions from the study. Both observational and experimental designs are beset with problems related to measurement, adherence to treatment, participant attrition, time frame, and general selection biases. These two approaches complement each other and, when used in combination, can produce generalized causal inferences about mechanism.

Perhaps the most important aspect of designing an intervention, especially one that will be implemented at the level of public health, is identifying the target outcome. Chapman noted that a public health approach can be informed by identifying and comparing the population attributable risk (PAR) for different intervention targets.¹³ O'Connor observed that if the outcome is longevity, health behaviors that modify the stress response (physiological and psychological) could be a useful point of intervention, because these behaviors seem to be significant contributors to longevity. Research suggests that social-cognitive strategies that focus on self-monitoring, implementation intentions, and planning are particularly effective in leading to behavioral changes.¹⁴ Most notably, these strategies focus on enhancing the behaviors that people who are low in conscientiousness are not good at. These strategies do not provide a magic bullet, but the effects of these interventions over the population would be significant. Furthermore, these strategies do seem to link up with aspects of intervention work being done with children in relation to self-regulation and executive function.¹⁵ Because aspects of conscientiousness develop early in life, many intervention approaches have looked to childhood

¹² Jerant, A., Moore-Hill, M., & Franks, P. (2009). Home-based, peer-led chronic illness self-management training: Findings from a 1-year randomized control trial. *Annals of Family Medicine*, 7, 319-327.

¹³ Other public health metrics that may help prioritize targets for interventions include the quality-adjusted life years, disability-adjusted life years, or years of life lost associated with a particular intervention target.

¹⁴ See, for example:

Armitage, C.J. (2006). Evidence that implementation intentions promote transitions between the stages of change. *Journal of Consulting and Clinical Psychology*, 74(1), 141-151.

Armitage, C.J. (2004). Evidence that implementation intentions reduce dietary fat intake: A randomized trial. *Health Psychology*, 23(3), 319-323.

Gollwitzer, P.M., & Sheeran, P. (2006). Implementation intentions and goal achievement: A meta-analysis of effects and processes. *Advances in Experimental Social Psychology*, 38, 69-119.

¹⁵ For example, Tools of the Mind is a research-based early childhood program that promotes intentional and self-regulated learning.

as a possible point for intervention to promote self-regulation. From a life course perspective, it may be important to base interventions a model of nutrition, in terms of providing a “steady diet” of intervention, rather than inoculation or “one shot” approach — early investments will compound over time but may need to be reinforced at various points. With this in mind, Reiss noted that it will be important to link the intervention literatures on children and adults in order to be able to build an intervention that spans the life course.

Due to the significant influence of contextual factors on treatment outcomes, interventions must be able to account for the specific needs, abilities, and circumstances of the individual participant. Specifically, researchers must determine which intervention strategies will work for whom, based on what theory says about the specific behavior in question. This represents a third manner in which personality traits such as Conscientiousness can be used to inform interventions for healthy aging. Thus, the personality configuration of the individual will play a significant role in determining the intervention approach. That is, personality characteristics of the individual, such as the desire to change, play a huge role in determining whether an intervention is successful.¹⁶ Lejuez noted that one such individualized approach to intervention is behavioral activation treatment, which is based on social action theory. In this treatment approach, the participant identifies the life areas that are most important to him, the values he holds that are relevant to those life areas, and the activities in which he engages that are consistent with his values. The participant then uses these areas and values to identify, plan, and perform actions. This kind of intervention addresses the utility value and interest value that the intervention holds for the participant. Although Lejuez acknowledged that behavioral activation may not be the best treatment for any outcome in particular, it provides individualized treatment and does not require huge amounts of time or resources.

VII. Integrating Datasets

Personality researchers often infer causal pathways from cross-sectional or short-term studies. The reality, however, is that only longitudinal studies provide insight into processes over time. Margaret Kern asked whether researchers could draw on existing longitudinal datasets to further develop theory and better understand the causal processes that link conscientiousness to outcomes. Single studies all have limitations related to aspects of study design, sample characteristics, measures used, location, and historic period. In order to counteract these limitations, researchers rely on independent replication to verify the results of a study. Researchers use meta-analysis to test the same model and integrate findings across different studies. Another approach to overcoming these limitations, however, is to integrate *data* from different studies. Data integration has the advantages of increasing sample size, allowing for a broader psychometric assessment of constructs, and allowing for coverage over an extended period of development. In order to get a full lifespan perspective, researchers can integrate data

¹⁶ O'Connor noted that the work of Magen and Gross at Stanford seems to get at the issue of expectancy value by making it rewarding to engage in the more disciplined behavior, and Lejuez noted that this seems to be similar to the concept of learned industriousness. See, for example:

Magen, E., & Gross, J.J. (2007). Harnessing the need for immediate gratification: Cognitive reconstrual modulates the reward values of temptations. *Emotion*, 7(2), 415-428.

Eisenberger, R. (1992). Learned industriousness. *Psychological Review*, 99(2), 248-267.

from studies that examine similar constructs over different sections of the life course. Ultimately, data integration may allow researchers to fill the gaps in one study with data from another.

The main issue with integration of datasets is achieving measurement equivalence. Ideally the same measures and coding are used across studies—this is the critical starting point before assumptions about causal pathways can be made across multiple samples. Kern noted, for example, that both the Terman Lifecycle study¹⁷ and the Hawaii Personality and Health Cohort study include measures of childhood personality from similar age points and have many common variables that are assessed later in life. In order to be able to integrate these datasets, researchers must find equivalent items and examine whether they show the same relationship to childhood personality and midlife health in each study.

One must first develop a register of longitudinal studies of personality and health in order to facilitate the process of data integration. This register would include both studies that are completed and studies that are ongoing. An example of this kind of collaborative research program is the Integrative Analysis of Longitudinal Studies on Aging (IALSA) research network led by Scott Hofer at the University of Victoria. The IALSA network is comprised of more than 25 longitudinal studies on aging, with a focus on health and cognitive outcomes. Information about joining the IALSA network is available on the IALSA Website.¹⁸ One goal for advancing the current research agenda would be to create a similar network that focuses specifically on personality and life outcomes, including health, subjective well-being, and socioeconomic and career achievement. Suzman commented that it is important to identify which studies are already in the national archive (i.e., ready to be integrated), which studies collect biospecimens, and which studies include data on cultural and contextual factors. Both Eccles and Eisenberg noted that in order to get at context, such a network would have to include smaller datasets that have more diverse measures (e.g., coding of parent-child interactions). Eccles mentioned that the Center for Analysis of Pathways from Childhood to Adulthood (CAPCA) based out of the University of Michigan has pulled together longitudinal datasets from America and Europe, many of which have richer measures than those typically found in larger studies. She further noted that journals have been resistant to or skeptical of data harmonization, so researchers may have to educate others about why data harmonization is a valid and worthwhile approach.

The hope is that the integration of various datasets will provide insight into the causal mechanisms that link conscientiousness to various outcomes. Although there is always the possibility that unmeasured differences across samples may confound data analysis, existing research suggests that conscientiousness is an important predictor across heterogeneous samples. Friedman argued that the fact that conscientiousness predicts such “big” outcomes as longevity, despite the flaws and differences across studies, is noteworthy. It is difficult to pay attention to all relevant aspects of conscientiousness simultaneously in any single study. Integrating data from multiple studies with different samples and measures will potentially allow researchers to understand the influence of sample differences as potential moderators and will prevent the field from narrowing its focus prematurely.

¹⁷ Martin, L.R., Friedman, H.S., & Schwartz, J. E. (2007). Personality and mortality risk across the lifespan: The importance of conscientiousness as a biopsychosocial attribute. *Health Psychology, 26*, 428-436.

¹⁸ <http://www.ialsa.org/>

VIII. Conclusions

The perspectives introduced in this workshop provide clear evidence that there is much important work yet to be done in employing modern personality research in understanding healthy aging. Integrating classic hierarchical models of personality with more contextual models from the social-cognitive literature will allow researchers to make significant strides in moving the field forward. Synthesizing these models and applying them across the lifespan will provide new and important insights into the mechanisms that link conscientiousness to many life outcomes. Integrating existing longitudinal datasets will provide researchers with a more comprehensive picture of the factors that influence conscientiousness. Exploring the possible synthesis of various models related to conscientiousness will allow researchers to develop a unified approach to measuring the relevant aspects of conscientiousness. This work has the potential to yield measures that can be imported into ongoing studies across the world. Being able to identify the protective factors that lead to such important life outcomes as good physical health, increased longevity, higher academic and occupational achievement, and increased well-being will allow researchers to make a persuasive case for including these measures in models of risk for a range of adverse health and economic outcomes. Most importantly, this work will help to identify ways in which conscientiousness can be fostered or enhanced across the lifespan and across populations. From a public health perspective, it is reasonable to assume that the more we know about mechanisms of personality function, the more we will understand how to intervene in order to promote those favorable outcomes with which specific traits are associated. Identifying these mechanisms, and where in the life course they are operative, will set the stage for new interventions designed to offset the substantial risks of non-conscientious patterns of behavior.

Appendix 1 Workshop Agenda

Day 1 – January 6, 2011

8:30–9:00 a.m. Workshop Goals/Formal Introductions

9:00–10:30 Session 1A: Defining and Measuring Conscientiousness

This session will examine the definition, measurement, and etiology of conscientiousness using integrated perspectives from developmental, clinical, and cognitive psychology as well as neurobiology and genetics. We will examine various approaches to thinking about conscientiousness and its measurement to address four questions. 1) Are there sufficiently large observed associations among behavioral and self-report measures of conscientiousness so that multi-method assessment strategies can be developed and results can be compared across studies that use one or the other? 2) What biological and psychological mechanisms account for differences among individuals in conscientiousness? 3) Does a better understanding of these mechanisms lead to more accurate delineation of components of conscientiousness? 4) Do these mechanisms shed light on the predictive utility of the conscientiousness construct?

Presentations will focus on how various approaches to conceptualization and measurement will aid in answering core questions about how and why conscientiousness is associated with important life course outcomes in domains of health, work, and economic behavior. What personality measures perform well in studies of factors that mediate or moderate change?

Central Questions/Themes:

- *Do genetic and neurobehavioral analyses of conscientiousness illumine its components and mechanisms that account for its actuarial success?*
- *Does any reasonable modification of the concept allow an understanding of personal motivation, drive, values, or objectives?*
- *Are there formulations of conscientiousness that favor our understanding of its short- and long- term impact?*
- *What are the components of conscientiousness? How can we understand their “hierarchical organization?” Is hierarchical organization a statistical concept, or does it reflect a specifiable psychobiological mechanism that “coordinates” the components of conscientiousness?*

Brief Paper Summary: Brent Roberts and Robert Krueger

Discussion initiators: Daryl O'Connor (functional analyses of personality traits) and Antonio Terracciano (Big Five and molecular genetic approaches)

10:30–11:00 BREAK

11:00–12:00 p.m. Session 1B: Developmental Origins of Components of Conscientiousness

The workgroup paper could not, because of its many goals, focus on developmental processes. Nonetheless, an understanding of the origin of conscientiousness is probably crucial to understanding the concept itself and may provide clues to its actuarial success. We consider here the larger issue of the development of prosocial characteristics of children and, in more detail, the concepts of delay of gratification, self-control, and “grit”, all of which have been studied in children and/or adolescents.

Central Questions:

- *What data and concepts help us link prosocial development in children with conscientiousness in adolescence and adulthood?*
- *Can multivariate genetic analyses provide insight into heterotypic and homotypic continuity in the development of conscientiousness and its components?*
- *What neurobehavioral mechanisms influence the early development of these components?*

Presentation: *Angela Duckworth (grit and self-control in childhood and adolescence)*

Discussion initiators: *Nancy Eisenberg (prosocial development) and Robert Krueger (genetic strategies in longitudinal studies)*

12:00–1:30 LUNCH

1:30–3:00 Session 2: Context and Conscientiousness

This session will examine the interplay between conscientiousness and both the environment within individuals and the social context they develop: 1) How does conscientious influence the selection of individuals into favorable environments? 2) How does conscientiousness influence an individual’s coping with and adapting to stressful life circumstances? 3) How does conscientious interact with other features of personality to attenuate or enhance the impact of these features? Included in the inquiry here are other personality traits, personal values, and motivations. In order to enhance our understanding of how individuals integrate self-appraisal and the role demands of their social world, we have planned a brief presentation on values, motivation, and the integration of personal and collectivity identity.

Central Questions/Themes:

“Contexts” within individuals

- *What is the interplay among conscientiousness, motivation, and personal identity?*
- *Do other traits such as neuroticism influence the effects of conscientiousness?*

Social contexts

- *Does conscientiousness select individuals into environments?*
- *What genetic and environmental mechanisms underlie these selection processes?*
- *What contextual (e.g., work settings) cultural and economic processes constrain or amplify the effects of conscientiousness net selection?*
- *What are the prospects for advancing two (or more) person personality research? For example, how does the personality of one person in a defined relationship (e.g., spouse,*

parent, employer, physician) influence the personal functioning of a second person in that relationship (e.g., marital partner, child, employee, physician)? To what extent is conscientiousness transmitted from parent to child and by what mechanism does this transmission occur?

Presentation: *Jacque Eccles (Personal identity and collective identity)*

Discussion initiators: *Howard Friedman (conscientiousness in the context of other personality traits) and Carl Lejuez (social action theory)*

3:00–3:30 BREAK

3:30–5:30 Session 3: Conscientiousness and Interventions/Experiments

Interventions and conscientiousness will be examined from three perspectives. First, how can planned interventions be used to help illumine mechanistic accounting for the development, persistence, and/or effects of conscientiousness? In this domain we will consider both clinical formats for intervention as well as laboratory and field experiments that may have no therapeutic intent. The second perspective is how can we deploy what is known about both conscientiousness and intervention to modify conscientiousness or the factors that mediate its effects on health or economic outcomes. Third, does individual variation in conscientiousness help explain differential outcome of interventions?

Three levels of intervention will be considered. First is the individual level, where a range of behavioral, economic, and psychotherapeutic research might be deployed. The second level is social, where the target of the intervention is a group or family. At the third level, the population level, what public policy intervention options exist? Can clear research priorities be set for further elucidating the mechanistic pathways linking personality and aging outcomes? Are there any clear cases where solid evidence of mediators and moderators of aging-relevant outcomes exists, such that we are prepared to launch an intervention? Is there clear mechanistic evidence pointing to when in the life course particular interventions are most likely to be effective?

Central Questions

- *What research should now be planned for interventions relevant to conscientiousness?*
- *Are there justifications for focusing on or prioritizing levels of intervention (individual, group, or large social system)?*
- *What experimental paradigms, including laboratory models are important to utilize or develop?*
- *What interventions are appropriate at each life stage, and what is likely to be the duration of such interventions?*
- *What developmental models are most suitable for weighting developmental timing of interventions, the level of the intervention, and expected duration of effect?*
- *Are there datasets current and accessible that can be used to explore conscientiousness as a moderator of intervention effects? How might variations in conscientiousness or other personality variables be incorporated into new intervention studies?*

Brief Paper Summary: *Benjamin Chapman, Sarah Hampson*

Discussion initiators: Carl Lejuez (experimental manipulations), Angela Duckworth (early childhood interventions), Daryl O'Connor (interventions for health)

Day 2 – January 7, 2011

8:30–10:30 a.m. Session 4: Piecing Together Causal Sequences Involving Conscientiousness and Its Effects Across the Lifespan

This session will inventory the current state of knowledge about lifespan and explore critically methods for linking shorter-term longitudinal studies to test processes extended across the child and adult lifespan. To be fully useful, lifespan models need to account for child origins of personality traits, the persistence of these traits across time, and for the intervening steps between trait and outcome. Likely to be included in such models are “sleeper” effects and mechanisms that account for the selection of individuals into favorable or adverse environments. Genetic and neurobiological tools may be critical.

Before even considering the resources necessary for an extended longitudinal study we need to know what we can learn from existing datasets. Absent a complete longitudinal study on conscientiousness, what can we conclude now by putting together existing datasets? Given what is known about effects or manifestations of personality that may appear in the short-term, disappear, and then reappear later on, what are appropriate cautions about conclusions about life course trajectories and intervention effects? How should selection into environments be accounted for in our life course models? How far are we from a full lifespan causal model of personality and health/economic outcomes?

Central questions

- *What are the emerging life course models accounting for the long-term actuarial success of conscientiousness as a predictor of trajectories of health and well-being in aging?*
- *What existing studies of children and of adults are most suitable for testing these life course models?*
- *In linking several studies together, under what circumstances is harmonization of data feasible and how far can we go with less exact tools of “conceptual integration”?*

Brief paper summary: Howard Friedman, Sarah Hampson

Discussion initiators: Nancy Eisenberg (child to adult transitions), Antonio Terracciano (prospects for linking datasets, e.g., BLSA), Margaret Kern (prospects for linking datasets)

10:30–11:00 BREAK

11:00–1:00 p.m. Session 5: Re-examining the Fundamental Tasks of Personality Theory

This session is meant to take a step back to re-consider the fundamental scientific utility of contemporary personality theory in lifespan and aging research. We will consider alternative intellectual strategies to addressing the questions that have been grappled with in terms of core personality traits, like the Big 5, namely:

- Theories differ in their approach to characterizing individual differences; can we understand more fully the links between these strategies and the basic scientific questions they are addressing?
- All personality theories focus on the stability of these individual differences, but how well do we understand the mechanism of stability and change in these dimensions of difference?
- Most important, what can we learn from a comparative analysis about mechanisms linking personality characteristics to favorable outcomes in adult development and aging? What clues do these analyses provide for interventions?

Attachment theory provides an opportunity for comparative analysis. As a system it provides well-developed measures (most not suitable for survey research), evidence of stable forms of attachment, and evidence that these patterns matter for well-being. This theory was mechanistic from the beginning. Unlike trait theories, this approach is constructed around a proposed set of interpersonal and intrapersonal mechanisms with a focus on childhood, adolescence, and earlier adult development. It has lent itself to effective interventions in infancy, childhood, and adulthood. There is only a small literature on attachment processes in aging, although the more limited and descriptive term “attachment” is often used in selected domains of research. Its focus is different, and it may embrace phenomena that are complementary to the Big Five.

Central Questions/Themes:

- *Does a review of attachment theory and some of its empirical bases shed light on mechanisms of development that might be related to conscientiousness?*
- *Does the attachment perspective contribute to “life-course modeling” of the unfolding of and impact of personality?*
- *Does it provide leads for intervention strategies relevant to conscientiousness?*
- *Are there elements of attachment research that would profitably be included in future research using the Big Five perspective?*
- *A limit of the attachment approach often cited is its labor-intensive measurement strategies. If the attachment construct is used in large-scale survey research, can these measurement problems be surmounted?*

Presentation: Pasco Fearon (attachment theory)

Discussion initiators: Brent Roberts, Nancy Eisenberg, Jacque Eccles (All: integrating perspectives on personality development and function)

1:00 –2:30 LUNCH

2:30–3:30 Discussion and Integration

Appendix 2

List of Participants

* Workgroup Participants

- ***Benjamin Chapman, PhD**, University of Rochester, Rochester, NY
- ***John Clarkin, PhD**, Weill Cornell Medical College and New York Presbyterian Hospital
(unable to attend)
- ***Angela Lee Duckworth, PhD**, University of Pennsylvania, Philadelphia, PA
- ***Jacquelynne Eccles, PhD**, University of Michigan, Ann Arbor, MI
- Nancy Eisenberg, PhD**, Arizona State University, Tempe, AZ, and Editor, *Child Development Perspectives*
- Pasco Fearon, PhD**, University of Reading (United Kingdom)
- ***Howard S. Friedman, PhD**, University of California, Riverside, CA (by phone)
- ***Sarah Hampson, PhD**, Oregon Research Institute, Eugene, OR
- ***Margaret L. Kern, PhD**, University of Pennsylvania, Philadelphia, PA
- ***Robert Krueger, PhD**, University of Minnesota, Minneapolis, MN (by phone)
- ***Carl Lejuez, PhD**, University of Maryland, College Park, MD
- Daryl O'Connor, PhD**, University of Leeds (United Kingdom) and Incoming Joint Editor-in-Chief, *Psychology & Health*
- ***Brent W. Roberts, PhD**, University of Illinois, Urbana-Champaign, Champaign, IL
- ***Michael Shanahan, PhD**, University of North Carolina at Chapel Hill, NC (by phone)
- Antonio Terracciano, PhD**, Laboratory of Behavioral Neuroscience, NIA, Baltimore, MD

NIA Division of Behavioral and Social Research

- Jonathan King, PhD**, Program Director, Cognitive Aging
- Jennifer Harris, PhD**, Genetics Consultant
- Anna Mikulak**, Science Writer (Contractor)
- Lis Nielsen, PhD (co-chair)**, Program Director, Psychological Development and Integrative Science
- David Reiss, MD (co-chair)**, Consultant (Also Clinical Professor in the Child Study Center, Yale School of Medicine)
- Erica Spotts, PhD**, Program Director, Behavioral Genetics of Aging
- Sidney Stahl, PhD**, Chief, Individual Behavioral Processes Branch
- Richard Suzman, PhD**, Director

NIA Intramural Program Participants

- Luigi Ferrucci, MD, PhD**, Chief, Longitudinal Studies Section, Intramural Research Program
- Angelina Sutin, PhD**, Postdoctoral IRTA, Laboratory of Personality and Cognition, Intramural Research Program