Published in final edited form as:
Dev Psychol. 2014 May ; 50(5): 1470–1474. doi:10.1037/a0036028.

Personality Plasticity, Healthy Aging, and Interventions

Daniel K. Mroczek[1,2]

[1]Northwestern University, Dept. of Psychology, Weinberg College of Arts & Sciences, Evanston, IL

[2]Northwestern University, Dept. of Medical Social Sciences, Feinberg School of Medicine, Chicago, IL

Abstract

This commentary on the special series on Conscientiousness and Healthy Aging focuses on several topics brought up in this collection of papers. One is the promise of personality interventions. Despite skepticism on the part of some, such interventions may ultimately prove successful. This is in part because of similarities between personality dimensions and cognitive dimensions, and in part due to evidence showing personality is more dynamic and plastic than once believed. The commentary concludes with a discussion of the role of longitudinal investigations to inform interventions.

Keywords

Personality; Plasticity; Aging; Lifespan Development; Personality Interventions

In 1847 Ignacz Semmelweis proposed a simple intervention. He argued that physicians should wash hands in a chlorine solution before performing medical procedures, thereby reducing patient mortality associated with sepsis. He published data showing that handwashing could reduce mortality below 1% in childbirth wards where death rates were commonly well above 10% in the 19th century, and often higher than 30%. Despite convincing data (one paper was even accepted in *The Lancet*) the medical and scientific establishment ridiculed his proposal and he eventually lost his job at Vienna General Hospital. He sank into a deep depression and was committed against his will to an insane asylum where he was beaten and doused repeatedly with cold water. He died there in obscurity in 1865. Only many years later, vindicated by Joseph Lister, Louis Pasteur and others, did people realize his proposal had merit.

I am not suggesting the authors of certain papers in this special series are at risk for a Semmelweisian demise or even involuntary drenchings. However, two (Chapman, Hampson & Clarkin, this issue; Magidson, Roberts, Collado-Rodriguez & Lejuez, this issue) promote what many members of the scientific community will deem a radical, even outlandish, idea: that interventions can change conscientiousness and other personality traits (see also

Corresponding Author: Dan Mroczek, Northwestern University, Dept. of Psychology, Swift Hall, 2029 Sheridan Rd., Evanston, IL, 60208. daniel.mroczek@northwestern.edu.

Jackson, Hill, Payne, Roberts & Stine-Morrow, 2012; Turiano, Pitzer, Armour, Karlamangla, Ryff & Mroczek, 2012). Two of the others (Drake, Belsky & Fearon, this issue; Eisenberg, Duckworth, Spinrad & Valiente, this issue) hint at the idea of actively changing conscientiousness by improving self-regulation in childhood, although Friedman, Kern, Hampson & Duckworth (this issue), believe population-level efforts to raise conscientiousness may comprise a "mistake" at the present moment. This author is sympathetic to the notion of interventions to increase conscientiousness, or facets of it such as impulse control. Moreover Chapman et al. and Magidson et al. make careful and convincing arguments. However, we should appreciate the fact that new ideas often are initially rejected by large segments of the scientific establishment. This may be especially true of efforts to create personality interventions, because of difficult debates in the 1970s and 80s over the person and the situation and personality trait stability and change. It took enormous effort to persuade the scientific community that personality was not a methodological artifact and many defenders will respond that personality simply is not personality if it is not enduring and stable over time. On the other side of the spectrum, critics surely lurk who are willing to make extreme statements (as some did during the person situation debate) such as "if personality is changeable it therefore doesn't exist." Both of these oversimplify. An analogy with cognitive functioning constructs provides a more realistic picture.

Parallels between Cognitive and Personality Variables

Like personality traits, cognitive functioning dimensions such as memory or verbal fluency have a neurophysiological basis (Jackson, Hill & Roberts, 2012) and are impacted by both genetic and environmental influences, as well as gene-environment interplay and epigenetic processes (South & Krueger, this issue). Both cognitive and personality variables are *dimensional*, are assessed with similar psychometric techniques, and key constructs of each have subtraits or facets (Roberts, Lejuez, Krueger, Richards & Hill, this issue).

Importantly, both personality and cognitive dimensions *develop*, through infancy and childhood and across the lifespan into later life (Roberts & Mroczek, 2008). Cognitive dimensions develop in early childhood as axons mylineates and neural connections reach critical mass, just as personality dimensions (especially precursors of conscientiousness such as self-regulation and impulse control) develop in tune with myelination and connectivity. However, neither cognition nor personality develops solely as a function of brain development. Both also rely on experience. As Chapman et al. (this issue) and South and Krueger (this issue) point out, personality traits -- like many cognitive and physical variables -- are defined by phenotype plasticity, meaning the possession of a polymorphism does not guarantee a given phenotypic expression. A child may have the genetic potential to be a mathematical genius, but if kept innumerate due to environmental circumstances that girl or boy will end up very low on quantitative ability. Similarly, a child genetically predisposed to high self-regulation – potentially giving rise to high conscientiousness in adulthood -- may remain chronically low in self-control over much of the lifespan if raised in a chaotic environment or one that reinforced impulsive behavior. Certain papers in this special series hint at such phenomena (Eisenberg et al., this issue; Drake et al., this issue; South & Krueger, this issue). Interestingly, South and Krueger (this issue) and Roberts et al., (this

issue) argue that genetic influences on both stability and change are “expressed or diminished” over the lifespan by environmental triggers that come into play at different points in a person’s development.

Additionally, cognitive and personality constructs, as well as many physical variables such as body weight, are also defined by the lifespan developmental concept of plasticity (Baltes, 1987; Baltes, Reese & Nesselroade, 1977). This property of plasticity explains why we observe natural change in cognitive, personality and many physical variables, and why scientists have been willing to create interventions that purposely bring about such change, whether they take the form of cognitive boosting programs, weight loss schemes, or in the future, conscientiousness-improving trainings. To be clear, I am using the definition of plasticity put forth by Baltes (1987), who defined it through the idea of flexibility in developmental outcomes. He referred to plasticity as within-person variability in what is possible for a specific developmental outcome. Hence, time-to-time change in personality traits or cognitive variables can potentially reflect plasticity, often in response to external circumstances, but can also reflect internal changes or maturation. Other definitions of plasticity are less broad than Baltes’ (1987) and are tightly linked to the notion of critical or sensitive periods in early development. These definitions refer to the capacity of a developmental variable to change (is plastic) for a restricted amount of time, and often reflect internally programming sequences. First-language acquisition, for example, is a developmental phenomenon that is plastic for only a limited period, roughly up until puberty if not earlier. Baltes (1987), by contrast, argued that personality and cognition are plastic for long swaths of the lifespan.

Of course Baltes argued that although many cognitive, physical and personality variables are plastic, they are not infinitely plastic. Plasticity itself varies across different types of constructs and across individuals as well. Some variables, especially psychopathology constructs such as depression, are highly plastic. They can move up or down over days and weeks, as well as over months and years. Others, like height, are nearly non-plastic. Correlations between measurements of height approach 1.00 over periods of many years during adulthood. By contrast, cognitive variables, personality traits, and physical variables like body weight are *moderately plastic*. They change with time (yet not necessarily for everyone) but usually not quickly. To be sure, some behaviors associated with personality traits may move up or down on an hourly or weekly basis (Fleeson, 2001) but average trait levels do not move so fast. Roberts et al.’s (this issue) trait-state distinction is useful for understanding the difference between “characteristic” aspects of traits and “moment-to-moment fluctuations” in the behaviors, thoughts and emotions associated with traits (e.g., Nesselroade, 1988, and Nesselroade & Boker, 1994). If “characteristic” aspects of personality traits are moderately plastic, like memory or body weight, they may prove a good target for intervention efforts.

Finally, both cognitive and personality dimensions show individual differences in their developmental trajectories over time. Early in the lifespan, cognitive trajectories develop at varying rates across children and adolescent with some characterized by steep increasing trajectories and others by shallower increases. In adulthood, declines come sooner for some than others, with certain people maintaining strong memory or executive function capacities

well into their 80s with others declining precipitously on memory or executive function (or both) from midlife onwards. Personality trajectories show the same kind of variability across people (Mroczek & Spiro, 2003). Most people increase on conscientiousness starting in early adulthood (Roberts, Walton & Vichtbauer, 2006), but not everyone. Among those who increase, some rise at a faster rate than others. As Chapman et al. (this issue) observe, stability coefficients of .7 leaves room for change. As we have said elsewhere, correlation coefficients conceal the individual variation in change (Mroczek, Spiro, Almeida & Pafford, 2006; Mroczek, Spiro & Griffin, 2006).

More importantly, change in cognitive or personality (or physical) constructs do not diminish their predictive power. A fallacy left over from the days of the stability-change debate holds that if a construct changes, it therefore lacks predictive power. As we have pointed out (Mroczek & Spiro, 2007), many physical qualities of individuals change over the lifespan, such as body weight, blood pressure, and cholesterol levels, yet this changeability does not prohibit these variables from predicting meaningful outcomes. What matters is not that these variables change, but that they can increase or decrease into a health-detrimental range. Similarly, memory or executive function can move into a range that diminishes health or quality of life. Personality traits can do the same. Conscientiousness may be fine above, say, the 20^{th} or 30^{th} percentile. If it moves below that, it may spell trouble for maintenance of good health behaviors or doctor adherence. Friedman et al. (this issue) allude to this idea, noting that people are more or less conscientious at different points in their life. I add that health risks associated with conscientiousness move up and down in tandem with changes in this trait. These phenomena, as Friedman et al. (this issue) rightly point out, require a lifespan focus. They also correctly observe that the success of personality interventions is likely to vary depending on where in the lifespan a particular individual is located.

No Hesitation to Intervene

Cognitive and personality constructs are individual differences variables that share many similarities in how they originate, how they are assessed, how they change over the lifespan, and how they influence important life outcomes. However, they differ in that there has been no hesitation to perform interventions on cognitive variables to improve them. Compulsory K-12 education can be thought of as one big cognitive intervention on children. At the other end of the lifespan, there has been no shortage of efforts to boost cognitive functioning among older adults with major projects such as ACTIVE. Personality traits comprise a moderately plastic system, like cognitive functioning, and there may be comparable opportunities with respect to intervention. Specifically, we may learn from cognitive boosting research, especially with respect to interventions that aim at improving executive function (e.g., Basak, Boot, Voss & Kramer, 2008). Executive function is related to many cognitive functioning variables, but also plays a key role in personality traits, particularly with respect to emotion regulation and impulse regulation. The latter is a crucial aspect of conscientiousness. Identifying aspects of cognitive training programs that may be applicable to personality interventions may prevent us from re-inventing the wheel and allow us to capitalize on existing knowledge. However, as noted earlier, Friedman et al. (this issue) and others are skeptical of performing interventions with traits such conscientiousness. Indeed,

intervention efforts to improve cognitive functioning in older adults have not always met with success. However, if we are to do the same with personality traits, or even facets of certain traits, we might learn from our colleagues in cognitive science, studying the efforts they have made and potentially starting off on stronger footing in initial attempts at personality interventions. The bottom up approaches described in the Magidson et al. (this issue) and Chapman et al. (this issue) papers seem especially promising. However, hesitation may come from another angle. Many people see personality traits as central parts of their identity or self. Cognitive variables such as verbal fluency or memory are probably less central to identity, increasing willingness to outsource their improvement to teachers and interventionists. Many people may not be willing to change a trait or facet unless there is a clear benefit.

Personality Plasticity and the Importance of Longitudinal Studies

Despite these hesitations, the moderate plasticity of conscientiousness makes it a tempting goal for personality interventions. However, such efforts would benefit from deeper understanding of the exact extent of personality plasticity and the longitudinal association between personality and health, and this is the focus of 3 special series papers (Friedman et al., this issue; Kern, Hampson, Goldberg & Friedman, this issue; Shanahan, Hill, Roberts, Eccles & Friedman, this issue). Each brings up important issues that, once resolved, should permit more effective personality interventions.

Friedman et al. (this issue) strongly encourage use of existing longitudinal data and we have made similar pleas (Mroczek, Pitzer, Miller, Turiano & Fingerman, 2011). Long-term longitudinal studies are like mature trees. They have accumulated many waves of data over decades. In that passage of time, they have also amassed data on health events and accrued increasing numbers of decedents, allowing mortality analyses. Like a century-old oak, such studies are rare resources and can add to our knowledge base in ways newer longitudinal studies cannot. Friedman et al. (this issue) goes further, indicating that existing studies might integrate data to permit high-N, well-powered analyses on issues regarding personality prediction of health outcomes and long-term personality change. The current author is part of such an effort (Integrative Analysis of Longitudinal Studies of Aging; IALSA; Hofer & Piccinin, 2010) and such large-scale analyses of existing data are bound to yield important findings. However, there are challenges, as Kern et al. (this issue) acknowledge.

The largest of these challenges involves harmonization of variables across different measures, over measurement occasions that can range over a lifetime, and often across different languages when pooling international studies. Kern et al. (this issue) discuss ways this can be achieved, from simple recoding of variables to sophisticated IRT-based (Item Response Theory) test-equating techniques. Although IRT can be very useful when harmonizing, newer models may turn out better suited for harmonization, such as such as the Measurement Model of Derivatives (MMOD; Estabrook, in press) and Openmx (Boker, Neale, Maes, Wilde, Spiegel, Brick, et al., 2011). The latter is specifically built for very large datasets or pooled data, and may help solve the problem of harmonizing variables in large-scale long-term data. Most modeling techniques such as SEM limit the way you can do multiple group or integrated analyses, but Openmx defines models differently, allowing a

"parent model" and many different submodels that can correspond to very different datasets. These newer techniques, utilizing many longitudinal datasets, may illuminate effects that remain unseen or undetectable when utilizing smaller datasets or more limited models. These "big data" findings would be of high value and would provide unparalleled guidance for future personality interventions. Friedman et al. also note important issues that require careful thought before moving ahead with personality interventions. Specifically, they prompt us to consider whether interventions would still be effective after taking into account genetic explanations of the conscientiousness-health association. Additionally, they speculate if interventions to improve conscientiousness would be more or less effective during possible sensitive developmental periods. As mentioned earlier when discussing definitions of plasticity, I noted some developmental variables, like attachment, are plastic and changeable for only limited periods. It may be the case that even if conscientiousness is plastic throughout the full lifespan, it's degree of plasticity may vary. Freidman et al. hints early life circumstances may influence the trait-disease association in midlife and later life, indirectly suggested that interventions may have greater efficacy when done earlier in the lifespan. These are important considerations, and interventionists would be wise to heed the suggestions of Friedman et al.

Investigators pursuing lifespan personality and health projects would also benefit from consideration of the concepts introduced by Shanahan et al. (this issue). In a very thoughtful paper, Shanahan et al. describe myriad processes that may influence the personality-health association over the entire course of the lifespan. Sweeping in its scope, Shanahan et al. point out that the mediational chains that connect personality traits to downstream health outcomes likely change as people pass through different phases of the life course (a point also made by Hill & Roberts, 2011). For example, in adolescence and young adulthood, low conscientiousness probably influences illness and mortality via the mediators such as risky sex, vehicle accidents, drug overdoses, etc., whereas in mid or late adulthood, the prime mediators are more likely to be "self-care" variables such as not smoking, exercise, medication adherence, etc. (Hill & Roberts, 2011). Otherwise said, the character of the explanatory pathway varies with developmental period.

Shanahan et al. also note that the effect of conscientiousness and other traits on health may vary according to social context. The power of traits may be amplified or silenced depending on social or environmental circumstances. Shanahan et al. argue that conscientiousness can be "disabled" by extreme poverty or major life stressors. In their conceptualization, social context is a moderator of the trait-health association. This is interesting, but contrasts with South and Krueger (this issue) who maintain that traits are moderators of the social context-health association. Which is the proper moderator? An illuminative study could set up a horse race between these two competing models, perhaps using "big data" from the IALSA studies, determining which has more merit.

If the Shanahan et al. model is correct, and conscientiousness is disabled by social circumstances, this would have implications for personality interventions. We would need to ask ourselves whether raising conscientiousness makes sense, as opposed to alleviating the social contextual factors (e.g., poverty, access to health care) that lead to poor health. If South and Krueger (this issue) are correct, and the context-health association is amplified by

low conscientiousness, this would provide a powerful argument for personality interventions. Of course we may arrive at a third outcome, a synergistic multiplicative effect on health brought about by both raising conscientiousness and mitigating social-contextual risk factors like poverty. Either way, Shanahan et al. lay out a rich research agenda for lifespan personality and health, an agenda that is also very relevant for personality interventions.

Conclusion

The papers in the special series make clear that healthy or successful aging is at least in part dependent on personality traits, especially conscientiousness. This has led some authors (Chapman et al., Magidson et al.) to advocate interventions that move traits to desirable levels, in turn leading to improved health behaviors and health itself. This is a worthy justification of intervention efforts. However, personality interventions may be justified on grounds of fairness and justice as well. We like a level playing field. A central idea behind compulsory education is that in not leaving wide swaths of the population illiterate and innumerate, we create a fairer playing field. In the 1920s, when researchers discovered that iodine deficiency impacted intellectual development and subsequent IQ (Bernal & Nunez, 1995), not to mention risk for goiter, a simple intervention was undertaken: public health officials asked companies such as Morton to iodize consumer salt. Some estimate that a 10–15 point increase in American IQ can be attributed to this intervention (Bernal & Nunez, 1995). Subsequently many people, especially in states far from the ocean where iodine-rich seafood was rare in the 1920s, grew less disadvantaged and U.S. academic and occupational playing fields became more level. We could make a similar argument justifying interventions on conscientiousness or its facets. If some people are inherently disadvantaged by low self-control, industriousness, or persistence, and raising these can help them finish high school, stop smoking, avoid risky sex, and later in their life course, adhere better to their doctors orders and engage in better self-care, then we would have created a more just and fair society. We would also likely reduce health disparities.

Personality intervention may appear an insurmountable challenge, but note that many major advances in technology or health care were far more complicated. Think of the hundreds of millions of dollars it takes to create an effective drug or class of drugs like SSRIs. Personality interventions, if ultimately successful in promoting healthy aging and enhancing lifespan health, will probably prove cheaper to develop than statin drugs. This is not to say it will be easy. Clinical psychologists regularly warn about how difficult psychological or behavioral change is to bring about even when valid techniques such as CBT are applied in people who are motivated to change. However, in drug discovery, development of medical devices, enhancement of surgical techniques, and many other areas, the challenges are at least as great and certainly much more expensive. Yet this has not stopped biomedical researchers from pursuing novel techniques and technologies that prevent illness, promote healthy aging, and improve overall lifespan health. Will the notion of personality interventions meet concerted resistance as did the ideas of Ignacz Semmelweis? Perhaps, but we should keep in mind that in the end Semmelweis was right.

Acknowledgments

This study was supported by a grant from the National Institute on Aging (R01-AG018436) to Dan Mroczek.

References

Baltes, PB.; Reese, HW.; Nesselroade, JR. Lifespan developmental psychology: Introduction to research methods. Monterey, CA: Brooks Cole; 1977.

Baltes PB. Theoretical propositions of lifespan developmental psychology: On the dynamics between growth and decline. Developmental Psychology. 1987; 23:611–626.

Bernal J, Nunez J. Thyroid hormones and brain development. European Journal of Endocrinology. 1995; 133:390–398. [PubMed: 7581959]

Boker SM, Neale MC, Maes H, Wilde M, Spiegel M, Brick T, et al. Openmx: An open source extended structural equation modeling framework. Psychometrika. 2011; 76:306–317. [PubMed: 23258944]

Chapman B, Hampson SE, Clarkin J. Personality-informed interventions for healthy aging: Conclusion from a NIA Workgroup. Developmental Psychology. (this issue).

Drake K, Belsky J, Fearon RMP. From early attachment to engagement with learning in school: The role of self-regulation and persistence. Developmental Psychology. (this issue).

Eisenberg N, Duckworth AL, Spinrad TL, Valiente C. Conscientiousness: Origins in childhood. Developmental Psychology. (this issue).

Estabrook CR. Evaluating measurement of dynamic constructs: Defining a measurement model of derivatives. Psychological Methods. (in press).

Fleeson W. Toward a structure- and process-integrated view of personality: Traits as density distributions of states. Journal of Personality and Social Psychology. 2001; 80:1011–1027. [PubMed: 11414368]

Friedman HS, Kern ML, Hampson SE, Duckworth AL. A new lifespan approach to conscientiousness and health: Combining pieces of the causal puzzle. Developmental Psychology. (this issue).

Hill PL, Roberts BW. The role of adherence in the relationship between conscientiousness and perceived health. Health Psychology. 2011; 30:797–804. [PubMed: 21604876]

Hofer SM, Piccinin AM. Toward an integrative science of lifespan development and aging. Journals of Gerontology: Psychological Sciences. 2010; 65B:269–278.

Jackson JJ, Hill PL, Payne BR, Roberts BW, Stine-Morrow EAL. Can an old dog learn (and want to experience) new tricks? Cognitive training increases openness to experience in older adults. Psychology and Aging. 2012; 27:286–292. [PubMed: 22251379]

Jackson JJ, Hill PL, Roberts BW. Misconceptions of traits continue to persist: A response to Bandura. Journal of Management. 2012; 38:745–752.

Kern ML, Hampson SE, Goldberg LR, Friedman HS. Integrating prospective longitudinal data: Modeling personality and health in the Terman Life Cycle and Hawaii Longitudinal Studies. Developmental Psychology. (this issue).

Magidson JF, Roberts BW, Collado-Rodriguez A, Lejuez CW. Theory driven intervention for changing personality: Expectancy value theory, behavioral activation, and conscientiousness. Developmental Psychology. (this issue).

Mroczek, DK.; Spiro, A.; Almeida, DM.; Pafford, C. Intraindividual change in personality. In: Mroczek, DK.; Little, TD., editors. Handbook of Personality Development. Mahwah, NJ: Lawrence Erlbaum Associates; 2006. p. 163-180.

Mroczek, DK.; Spiro, A.; Griffin, PW. Personality and aging. In: Birren, JE.; Schaie, KW., editors. Handbook of the Psychology of Aging. 6th ed.. San Diego, CA: Elsevier; 2006. p. 363-377.

Mroczek DK, Spiro A III. Modeling intraindividual change in personality traits: Findings from the Normative Aging Study. Journals of Gerontology: Psychological Sciences. 2003a; 58B:153–165.

Mroczek DK, Spiro A. Personality change influences mortality in older men. Psychological Science. 2007; 18:371–376. [PubMed: 17576273]

Mroczek, DK.; Pitzer, LM.; Miller, LM.; Turiano, NA.; Fingerman, KF. The use of secondary data in adult development and aging research. In: Trzesniewski, KH.; Donnellan, MB.; Lucas, RE., editors. Secondary data analysis: An introduction for psychologists. Washington, DC: American Psychological Association; 2011. p. 121-132.

Nesselroade, JR. Sampling and generalizability: Adult development and aging issues examined within the general methodological framework of selection. In: Schaie, KW.; Campbell, RT.; Meredith, WM.; Rawlings, SC., editors. Methodological issues in aging research. New York: Springer; 1988. p. 13-42.

Nesselroade, JR.; Boker, SM. Assessing constancy and change. In: Heatherton, TF.; Weinberger, JL., editors. Can personality change?. Washington, DC: APA Books; 1994. p. 121-148.

Roberts BW, Mroczek DK. Personality trait stability and change. Current Directions in Psychological Science. 2008; 17:31–35. [PubMed: 19756219]

Roberts BW, Walton K, Viechtbauer W. Patterns of mean-level change in personality traits across the life course: A meta-analysis of longitudinal studies. Psychological Bulletin. 2006; 132:1–25. [PubMed: 16435954]

Roberts BW, Lejuez CW, Krueger RF, Richards JM, Hill PL. What is conscientiousness and how can it be assessed? Developmental Psychology. (this issue).

Shanahan MJ, Hill PL, Roberts BW, Eccles J, Fiedman HS. Conscientiousness, health and aging: The life course of personality model. Developmental Psychology. (this issue).

South SC, Krueger RF. Genetic strategies for probing conscientiousness and its relationship to aging. Developmental Psychology. (this issue).

Turiano NA, Pitzer LM, Armour C, Karlamangla A, Ryff CD, Mroczek DK. Personality trait and trait change as predictors of health outcomes: Findings from the Midlife in the U.S. Study (MIDUS). Journal of Gerontology: Psychological Sciences. 2012; 67:4–12.