

BRIEF REPORT

The Role of Adherence in the Relationship Between Conscientiousness and Perceived Health

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Objective: Conscientious individuals experience better physical health, in part because of their greater propensity to behave in ways that maintain wellness. In the current study we examined whether and how adherence mediates the relation between conscientiousness and physical health. Moreover, we examined whether these effects differed for adhering to doctor's orders (doctor adherence) versus adhering to medication regimens (medication adherence), as the latter is likely more relevant for older adults' health. **Method:** A nationwide sample of adults ($N = 2,136$, $M_{\text{age}} = 51$ years) completed personality and adherence measures, in addition to a self-report measure of perceived general health, in an online survey. Correlational analyses were performed to examine the basic relations between the constructs of interest. A bootstrapping approach was employed for examining whether the indirect effect through adherence was conditional on age. **Results:** Doctor adherence partially mediated the relation between conscientiousness and perceived health across adulthood. However, the indirect effect of medication adherence was conditional on age, insofar that medication adherence mediated the link between conscientiousness and perceived health only for older adults in the sample (i.e., those around age 51 and over). **Conclusion:** These results suggest that although conscientious individuals report higher levels of both doctor and medication adherence, the role of adherence in explaining the link between conscientiousness and health may differ across adulthood.

Keywords: conscientiousness, adherence, health behaviors, conditional indirect effects models

It is a well-established finding that personality traits can be used to identify individuals predisposed toward better physical health (Friedman, 2008; Smith, 2006). One mechanism by which personality appears to influence health is through promoting or discouraging health behaviors. For example, conscientious individuals are more likely to take part in a wide variety of healthier behaviors (Bogg & Roberts, 2004), and in turn, this appears to mediate the link between conscientiousness and better health (Lodi-Smith et al., 2010). In the current study we focus on adherence, which has been suggested to be an important mediator for understanding the link between personality and health (Cloninger, 2005). Although conscientiousness has been shown to predict greater adherence (e.g., Christensen & Smith, 1995; O'Leirigh, Ironson, Weiss, & Costa, 2007), two questions remain when considering the role adherence plays in explaining the link between conscientiousness and health. First, does the relation depend on the form of adherence under investigation? Second, does adherence serve as a better

explanation of the conscientiousness-to-health relation at different points in adulthood? We thus sought to examine whether adherence mediated the relationship between conscientiousness and perceived health, as well as to test if this indirect effect was conditional on either age or the form of adherence assessed.

Conscientiousness and Adherence

Given that conscientious individuals exhibit a greater propensity for healthy behavior (Bogg & Roberts, 2004), it is perhaps unsurprising that a number of studies have demonstrated a positive relation between this trait and adherence. Support for this claim comes from work investigating adherence both with respect to self-report inventories and regimens for specific health problems. First, research has suggested that conscientious individuals reported higher levels of *wellness maintenance* (Booth-Kewley & Vickers, 1994; Edmonds, Bogg, & Roberts, 2009), defined as a propensity to follow doctor's orders, maintain a healthy weight, and exercise. Second, conscientious individuals demonstrated greater adherence to self-care for several specific health ailments, including renal disease (Christensen & Smith, 1995), high cholesterol (Stilley, Sereika, Muldoon, Ryan, & Dunbar-Jacob, 2004), and diabetes (Skinner, Hampson, & Fife-Schaw, 2002). Therefore, one conclusion from this literature is that conscientious individuals tend to exhibit greater adherence behavior.

Another conclusion from this work is that adherence can be conceptualized in multiple ways (Meichenbaum & Turk, 1987),

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and it appears difficult to view adherence as a singular construct. Indeed, research has shown that patients who adhere in one way may not in another (DiMatteo et al., 1993). For example, individuals could demonstrate adherence by obeying their doctor's orders (doctor adherence), or by following their prescribed medication regimens (medication adherence). Doctor and medication adherence represent two of the more prominent forms of adherence assessed in the studies discussed above and also have been examined through multiple-research perspectives (see, e.g., Park & Meade, 2007, for cognitive research on these topics).

It is worth noting that these two forms can be assessed as general health behaviors, rather than as specific to a certain health condition. This method allows for the possibility of investigating age differences with respect to the effect of adherence. When focusing on self-care for an ailment, one often cannot assess adherence prior to diagnosis, and adherence presumably should evince similar benefits throughout treatment. However, if one conceives of adherence as a general health behavior, age differences become of greater interest because some types of adherence behavior may be more relevant at different periods across the life span. For example, although doctor adherence may always be beneficial, one is more likely to take medication later in life. Therefore, medication adherence may only serve as a mediator of the conscientiousness to health relation for older rather than younger adults.

Age has played a prominent role in the adherence literature, and even at times, a somewhat paradoxical one. For example, older adults tend to have greater difficulty learning information that pertains to their medical needs (for a review, see Brown, 2007). It is interesting then that some research has shown that older adults in fact demonstrated higher levels of adherence (Park et al., 1999). In other cases though, older adults made more adherence-related errors (e.g., Morrell, Park, Kidder, & Martin, 1997). Although these studies provided only a sampling of work in the field, they are presented here simply to note the importance of studying age when considering adherence behaviors.

The literature on conscientiousness and health behavior also points to the possibility of age as a possible moderator. In their meta-analysis, Bogg and Roberts (2004) examined whether the relationships between conscientiousness and specific health behaviors differed for younger and older adults. For most behaviors examined, conscientiousness was linked to health behavior more strongly for younger adults. The authors suggested that a number of health behaviors might not be relevant to older adults, thus limiting the variance for reporting these behaviors. In addition, physical health declines with age and, as such, older adults may be restricted from performing certain health behaviors. These results present the possibility that how conscientiousness predicts health may differ across the life span. Therefore, age appears an important variable for understanding the pathways between personality and health.

Current Study

In the current study we sought to add to the personality and health literature in three important ways. First, we examined whether conscientiousness correlated with greater doctor and medication adherence. Conscientious adults should report higher levels of both forms of adherence. Second, we tested whether these

specific health behaviors served to mediate the link between conscientiousness and participants' perceptions of their general health. Following previous work on health behavior (e.g., Lodi-Smith et al., 2010), one would predict that both forms of adherence would serve as mediators. Third, we investigated whether the indirect effects of adherence were conditional on age. Given that medication adherence might be more relevant for older adults; it was of interest to examine whether this variable served to explain the health benefits of conscientiousness better for older than younger adults.

Method

Participants and Procedure

In the current study, 2,136 adults (51% women) were sampled from across the United States. Participants were on average 51 years old (range: 20–101). With respect to the racial breakdown, 79% reported White, non-Hispanic, 9% reported Black, non-Hispanic, 7% reported Hispanic, and 5% reported either other or being multiracial. Over half of the sample was employed, either full-time (40.1%) or part-time (13.4%), and 28.2% were retired. The modal level of education for the sample was having a high school diploma (29.2%), with 37.7% of the sample reporting less than high school graduation, 16.8% having achieved a bachelor's degree, and 17.6% of the sample reporting some postgraduate work. Participants were asked to report any medications they were currently taking, and 59% reported currently taking some form of medication (e.g., prescribed drugs, over-the-counter medications, and vitamins).

All individuals provided informed consent prior to participation, were debriefed following participation, and the university's institutional review board approved all scales and sampling procedures. In the consent form, participants were told that the purpose of the study was to investigate age differences in personality traits, and how the relationship between personality and health-related behaviors changes with age. Participants were recruited through the Knowledge Networks, Inc. survey administration service, which compiles a nationwide panel of possible participants using probability-based sampling to gain a representative sample. After joining the panel, the service provides participants with the equipment necessary to complete the online-based surveys (e.g., a laptop or other Internet-ready device). Participants are contacted when surveys are available that match their demographics. The only exclusion criterion for the current study was that participants had to be adults or emerging adults. Participants' personal information was stripped prior to data transmission and replaced with a randomly assigned case number. The entire survey included several measures of personality, health behavior, and social environmental factors. For parsimony, only those measures used in the current analyses were described.

Measures

Conscientiousness. Conscientiousness was assessed using a shortened version of the Chernyshenko Conscientiousness Scales (CCS; Chernyshenko, 2002; Roberts, Chernyshenko, Stark, & Goldberg, 2005), which is provided in the Appendix. Participants rated their agreement to 57 items on a 4-point scale ranging from

1 (*disagree strongly*) to 4 (*agree strongly*). This scale assesses six different facets of conscientiousness (order, virtue, traditionalism, self-control, responsibility, and industriousness), and the overall total score was employed (current sample, $\alpha = .93$). This reliability is in line with the initial development paper, which evidenced reliabilities for the six facets of at least $\alpha = .87$. A higher score on this measure thus indicates that a participant is more conscientious, but there are no specific cutoff scores for distinguishing “conscientious” from “nonconscientious” individuals. Although the full version is provided in the Appendix, three items were deleted from the current survey by accident.

The CCS was chosen because it was developed with the intent of providing an instrument to assess the most frequently replicated facets of conscientiousness and thus most readily captures the multitude of ways in which one can be conscientious. These scales were created using an ideal-point approach, uncommon in personality measurement, which intends to capture the entire range of the trait continuum (Chernyshenko, Stark, Drasgow, & Roberts, 2007). Therefore, this measure provides an advance to those currently in the literature by virtue of not only capturing those facets most typical of conscientiousness, but also by assessing them in a manner to reflect the whole continuum of possible scores on the trait. That said, it should be noted that in the initial scale development (Chernyshenko, 2002), scores on the CCS correlated with more frequently employed measures of conscientiousness, such as the International Personality Item Pool (IPIP) markers (Goldberg, 1999). In addition, this scale has demonstrated construct validation insofar that it predicts outcomes such as student study behaviors, work behaviors, and health behaviors (Chernyshenko, 2002; see also Chernyshenko et al., 2007, for validation of the order facet).

Doctor adherence. Doctor adherence was assessed using a shortened four-item version of the general adherence scale from DiMatteo, Hays, and Sherbourne (1992). Participants rated how often each of the statements provided was true on a 6-point scale ranging from 1 (*none of the time*) to 6 (*all of the time*). The four scale items were “I follow my doctor’s suggestions exactly,” “I have a hard time doing what my doctor suggests I do” (reverse scored), “I am unable to do what is necessary to follow my doctor’s treatment plans (reverse scored), and “I find it easy to do the things my doctor suggests I do.” This scale evidenced moderate reliability in the current sample ($\alpha = .67$).

Medication adherence. Medication adherence was assessed using a four-item scale adapted from the Medication Adherence Self-Efficacy Scale (Ogedegbe, Mancuso, Allegrante, & Charlson, 2003). Participants rated how sure they were that they could carry out each of the provided tasks all of the time on a 4-point scale ranging from 1 (*not at all sure*) to 4 (*very sure*). The four scale items were “Get refills on your prescribed medications before running out,” “Make taking your medications part of your routine,” “Fill your prescriptions whatever they cost,” and “Always remember to take prescribed medications.” This scale evidenced good reliability in the current sample ($\alpha = .89$).

It is worth noting that this measure has been previously described as *adherence self-efficacy*, and thus one can rightly interpret it as such. However, for the current purposes, the term *adherence* was chosen for two primary reasons. First, doing so presents a clearer connection with the doctor adherence measure, which is less associated with self-efficacy. Second, Park and Meade (2007) defined *medical adherence* as “the probability that

a patient will follow a doctor’s health instructions” (p. 3), and this definition appears to coincide closely with the instructions for the medication adherence measure. Therefore, the term medication adherence is used throughout, although it should be noted that this measure has its origins in self-efficacy research.

Perceived general health. Participants’ perceptions of their health were assessed using six items from the Short Form–36 health survey (Ware & Sherbourne, 1992). Participants rated their agreement to the items using a 7-point scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Sample items include “My health is excellent,” “I am as healthy as anybody I know,” “I seem to get sick a little easier than other people” (reverse scored), and “My health is now significantly better than it was one year ago.” This scale evidenced good reliability in the current sample ($\alpha = .82$). Most participants rated their health as above average ($M = 4.61$, $SD = 1.28$), and general health evidenced only a weak relation with age, $r(2128) = -.06$, $p < .05$. Thus, participants on average reported moderate to good health, and this was largely not conditional on participants’ age.

Plan of Analysis

The first set of analyses addressed whether conscientiousness was related to doctor and medication adherence. To this end, correlations were performed between the adherence measures and conscientiousness. In addition, it was examined whether conscientiousness and both forms of adherence correlated with better perceived health, which would replicate previous work.

The next set of analyses tested whether conscientiousness had an indirect effect on perceived health through adherence, using the bootstrapping method promoted by Preacher, Rucker, and Hayes (2007) with 5,000 bootstrapped samples. Models were analyzed separately for doctor and medication adherence. This analytic approach employs two regression models in testing for conditional indirect effects. The first regression model predicts the mediator (adherence) from the independent variable (conscientiousness), the moderator (age), and the interaction between the independent variable and the moderator. This model allows one to assess (a) whether the predictor is still related to the mediator when controlling for age, and (b) whether the predictor to mediator relationship is moderated by age. This second point tests the prediction that adherence may be more related to conscientiousness for younger than older adults.

The second regression model predicts the outcome (perceived health) from five predictors: the independent variable, the mediator, the moderator, the interaction between the independent variable and the moderator, and the interaction between the mediator and the moderator. This model allows tests of five important questions. First, does the predictor retain a direct effect on the outcome, when the mediator and moderator are in the model? Second, is the relation between the predictor and the outcome moderated by age? This result would be evidenced by a significant interaction between the independent variable and age. Third, does the mediator significantly predict the outcome, controlling for the other variables? Fourth, is the relation between the mediator and the outcome moderated by age? This result would be evidenced by a significant interaction between the mediator and age. Fifth, is the indirect effect significant across different ages?

To help elucidate the answer to this final question, the macro provides estimated values for the indirect effect at the mean of the moderator as well as one standard deviation above and below the mean. In the current study, indirect effects will be provided at ages 34, 51, and 68. Although these values are largely arbitrary in nature because they are selected based solely on the current sample's age distribution, these three ages do fall respectively within the ranges described by Heckhausen, Dixon, and Baltes (1989) for young, middle, and older adulthood.

Results

Correlational Results

First, as expected, conscientious participants reported better perceived health, $r(2128) = .29, p < .05$. In addition, both doctor adherence, $r(2117) = .24, p < .05$, and medication adherence, $r(2096) = .10, p < .05$, correlated with better perceived health. Moreover, supporting the first research prediction, conscientious individuals reported greater doctor, $r(2121) = .31, p < .05$, and medication, $r(2095) = .33, p < .05$, adherence. It is worth noting that the two adherence measures correlated only modestly, $r(2099) = .34, p < .05$, suggesting that these forms of adherence are related yet not synonymous. Current medication status (taking medications or not) did not moderate the relations between medication adherence and either conscientiousness or perceived health (both z tests of group differences in correlations, $ps > .05$).

To test whether the two measures of adherence are statistically distinguishable, it was examined whether they still correlated with the constructs of interest, when controlling for the other form of adherence and age. Doctor adherence remained significantly correlated with both conscientiousness, $r(2095) = .24, p < .05$, and perceived health, $r(2092) = .22, p < .05$, when controlling for medication adherence. Medication adherence also remained significantly correlated with conscientiousness, $r(2095) = .19, p < .05$, and perceived health, $r(2092) = .05, p < .05$, when controlling for doctor adherence. These two forms of adherence thus demonstrated unique relations with the constructs of interest, providing further support for considering them as empirically distinct measures. Given evidence for all expected initial relations, the next set of analyses tested the proposed conditional indirect effects models.

Tests of Conditional Indirect Effects

Second, the results of the bootstrapping analyses are displayed in Table 1 with respect to doctor adherence as a mediator and in Table 2 for medication adherence as a mediator. In both cases, unstandardized betas and standard errors are presented, as are provided by the macro. Results are discussed separately below for doctor adherence and medication adherence.

As shown in Table 1, conscientious individuals reported higher levels of doctor adherence ($B = 0.82$), controlling for age and the interaction term. Moreover, conscientious individuals reported better perceived health ($B = 0.56$), as did those with higher levels of doctor adherence ($B = 0.39$). However, no interaction terms were significant in either regression model. Significant indirect effect estimates were evidenced for all three ages. Thus, doctor adher-

Table 1
Tests of the Conditional Indirect Effect of Conscientiousness on Health Through Doctor Adherence

Predictor	<i>B</i> (<i>SE</i>)	<i>t</i>	
Regression model results			
Predicting doctor adherence			
Conscientiousness	.818 (.178)	4.59*	
Age	-.003 (.010)	-0.27	
Conscientiousness by age	.001 (.003)	0.32	
Predicting general health			
Conscientiousness	.560 (.245)	2.29*	
Age	-.024 (.014)	-1.77	
Conscientiousness by age	.009 (.005)	1.89	
Doctor adherence	.389 (.090)	4.31*	
Doctor adherence by age	-.003 (.002)	-1.90	
	Age	Indirect effect <i>B</i> (<i>SE</i>)	<i>z</i>
Estimated indirect effects at specific ages			
	34	.241 (.043)	5.64*
	51	.198 (.030)	6.63*
	68	.154 (.041)	3.74*

Note. Z statistics refer to the test of significance for the indirect effect at that specific age.

* $p < .05$.

ence partially mediated the effect of conscientiousness on perceived health, and this indirect effect was not conditional on age.

Table 2 presents the results for medication adherence. Conscientious ($B = 1.06$) and older ($B = 0.04$) participants reported higher levels of medication adherence. Moreover, these variables significantly interacted ($B = -0.01$), suggesting that conscientiousness was more strongly linked to medication adherence for younger than older adults. To follow up this interaction, separate correlations were performed between conscientiousness and medication adherence for younger (up to 40 years), middle (41–60), and older adults (61 years and over). Although all three correlations were significant, conscientiousness correlated more strongly with medication adherence for younger, $r(643) = .33$, than for middle, $r(738) = .22$, or older, $r(714) = .26$, adults.

When predicting perceived health, conscientiousness again had a significant direct effect ($B = 1.018$). Age ($B = -0.036$) and its interaction with medication adherence ($B = 0.005$) also were significant predictors. This interaction suggests that medication adherence was more strongly related to perceived health for older than younger adults. Again this effect was followed up by examining the correlations separately for younger, middle, and older adults. The correlations by age group respectively were $r(644) = .13$, $r(738) = .12$, and $r(714) = .16$, all $ps < .05$.

Given this interaction, and the significant interaction evidenced when predicting the mediator, it appears that the indirect effect through medication adherence differs with respect to age. Indeed, for young adults, medication adherence failed to serve as a mediator ($B = 0.03$), but it did partially mediate the link between conscientiousness and perceived health at ages 51 ($B = 0.07$) and 68 ($B = 0.08$). These results suggest that medication adherence partially explains the relationship between conscientiousness and perceived health for middle and older adults, but not for younger adults.

Table 2
Tests of the Conditional Indirect Effect of Conscientiousness on Health Through Medication Adherence

Predictor	<i>B</i> (<i>SE</i>)	<i>t</i>
Regression model results		
Predicting medication adherence		
Conscientiousness	1.056 (.133)	7.94*
Age	.041 (.008)	5.32*
Conscientiousness by age	-.010 (.003)	-3.86*
Predicting general health		
Conscientiousness	1.018 (.252)	4.04*
Age	-.036 (.014)	-2.54*
Conscientiousness by age	.003 (.005)	0.55
Medication adherence	-.131 (.112)	-1.18
Medication adherence by age	.005 (.002)	2.12*
Age	Indirect effect <i>B</i> (<i>SE</i>)	<i>z</i>
Estimated indirect effects at specific ages		
34	.025 (.032)	0.81
51	.067 (.026)	2.61*
68	.080 (.032)	2.50*

Note. *Z* statistics refer to the test of significance for the indirect effect at that specific age.

* $p < .05$.

Discussion

It is no longer a question that personality traits are informative when predicting health. Research now must turn to examining the mechanisms underlying the links between personality and health. The current study added to this literature by providing further insight into why conscientious individuals experience better health, assessed here as perceived general health. The current findings suggest that, in part, this relationship results because conscientious individuals exhibit higher levels of adherence. This indirect effect was always significant with respect to doctor adherence. However, for medication adherence, it was only significant for participants at the mean sample age and older.

This evidence for moderated mediation suggests that the mechanisms through which conscientiousness predicts health may differ across the life span. To be specific, for any developmental period, the health benefits awarded by conscientiousness may be best explained by those behaviors most relevant for maintaining one's health during that period. For example, adhering to medication regimens is a more relevant health behavior for older than younger adults. Accordingly, this would explain why medication adherence failed to mediate the relation between conscientiousness and health for younger adults.

A couple of supplementary findings are worth noting. First, these results provide support for conceptualizing adherence as a multifaceted construct. The two forms of adherence under investigation correlated only modestly with one another, and evidenced unique relations with respect to both conscientiousness and perceived health. Moreover, the mediation results clearly differed with respect to which adherence measure was employed as the mediator. Second, in line with previous work (Bogg & Roberts, 2004), these findings suggest that age may moderate the link between conscientiousness and health behavior, but this moderation depends on the specific behavior of interest. Indeed, although

no age moderation was evident for doctor adherence, the relation between conscientiousness and medication adherence was stronger for younger than older adults.

The magnitudes of the correlations evidenced in the current study warrant some discussion. Some correlations were of a modest magnitude, particularly those with respect to medication adherence. Most of the current correlations evidenced were within the range of the upper two thirds of those found in the social sciences (Hemphill, 2003; Meyer et al., 2001); however, the correlations for medication adherence generally were within the bottom third. It is possible that medication adherence would relate more strongly to health if a more objective and precise measure of health was employed, a topic for future research. In addition, it would be valuable to examine whether the relation would be strengthened when using an objective measure of adherence as well. It should be noted that most correlations in this study were of a magnitude similar to if not greater than those shown in the previous literature. For example, meta-analytic work has found average correlations between conscientiousness and other specific health behaviors in the range of .05 to .28 (Bogg & Roberts, 2004), using total sample sizes much larger than the current work. Therefore, the current study found correlations between conscientiousness and adherence larger than those typically evidenced between the trait and specific health behaviors.

A few limitations are worth noting, as avenues for future research. First, all measures were self-reported, and thus susceptible to biased reporting. Future research should consider replicating the current findings using more objective markers of general health, such as doctor-rated health or physiological indicators of better health such as lower blood pressure, higher heart rate variability, and lower obesity. In addition, it would be worth examining whether the self-report measures in the current study predict objective markers of doctor and medication adherence. Second, although the tested models were theoretically couched, longitudinal research is needed to fully examine the mediation models of interest. Third, although it was assumed that medication adherence is more salient for older adults, future research should measure which behaviors are most important to the health for any individual participant. Fourth, the current measure of doctor adherence evidenced less than ideal reliability, which is unsurprising given the brevity of the measure. In addition, some of the relations with respect to medication adherence were relatively small in magnitude, and perhaps may have been attenuated due to the use of a brief measure. Future work should examine whether similar effects result with longer measures of adherence behavior.

From these findings, one can make a number of broad suggestions for health psychologists and practitioners. For researchers, the current findings point to the fact that the pathways between dispositions and health can be complex in nature, and should be studied as such. For practitioners, these findings support the need to consider patients' personality dispositions when charting a treatment plan. Indeed, it may be beneficial to ask patients to complete personality inventories during appointments, to determine which patients may need additional assistance or reminders to follow prescriptions (e.g., those low in conscientiousness). Such a policy appears most important for older patients, as the current results suggest that the link between medication adherence and health is somewhat greater for older adults.

In broad terms, the current study provides valuable, albeit preliminary progress toward the understanding of how personality traits predict health through adherence. These findings not only demonstrate evidence for claims that adherence may prove an important mediator of this relation (Cloninger, 2005), but also suggest that traits may promote health in different ways across the life span. This work continues to move the field past the initial questions of whether traits predict health, and onto examining how and why these health benefits occur.

References

- Bogg, T., & Roberts, B. W. (2004). Conscientiousness and health behavior: A meta-analysis of the leading behavioral contributors to mortality. *Psychological Bulletin, 130*, 887–919.
- Booth-Kewley, S., & Vickers, R. R., Jr. (1994). Associations between major domains of personality and health behavior. *Journal of Personality, 62*, 281–298.
- Brown, S. C. (2007). How older patients learn medical information. In D. C. Park & L. L. Liu (Eds.), *Medical adherence and aging: Social and cognitive perspectives* (pp. 93–121). Washington, DC: American Psychological Association.
- Chernyshenko, O. S. (2002). *Applications of ideal point approaches to scale construction and scoring in personality measurement: The development of a six-faceted measure of conscientiousness*. Unpublished doctoral dissertation, University of Illinois at Urbana–Champaign.
- Chernyshenko, O. S., Stark, S., Drasgow, F., & Roberts, B. W. (2007). Constructing personality scales under the assumption of an ideal point response process: Toward increasing the flexibility of personality measures. *Psychological Assessment, 19*, 88–106.
- Christensen, A. J., & Smith, T. W. (1995). Personality and patient adherence: Correlates of the five-factor model in renal dialysis. *Journal of Behavioral Medicine, 18*, 305–313.
- Cloninger, C. R. (2005). How does personality influence mortality in the elderly? *Psychosomatic Medicine, 67*, 839–840.
- DiMatteo, M. R., Hays, R. D., & Sherbourne, C. D. (1992). Adherence to cancer regimens: Implications for treating the older patient. *Oncology, 6*, 50–57.
- DiMatteo, M. R., Sherbourne, C. D., Hays, R. D., Ordway, L., Kravitz, R. L., McGlynn, E. A., . . . Rogers, W. H. (1993). Physicians' characteristics influence patients' adherence to medical treatment: Results from the Medical Outcomes Study. *Health Psychology, 12*, 93–102.
- Edmonds, G. E., Bogg, T., & Roberts, B. W. (2009). Are personality and behavioral measures of impulse control convergent or distinct predictors of health behaviors? *Journal of Research in Personality, 43*, 806–814.
- Friedman, H. S. (2008). The multiple linkages of personality and disease. *Brain, Behavior, and Immunity, 22*, 668–675.
- Goldberg, L. R. (1999). A broad-bandwidth, public-domain, personality inventory measuring the lower-level five-factor models. In I. Mervielde, I. Deary, F. De Fruyt, & F. Ostendorf (Eds.), *Personality psychology in Europe* (Vol. 7, pp. 7–28). Tilburg, The Netherlands: Tilburg University Press.
- Heckhausen, J., Dixon, R. A., & Baltes, P. B. (1989). Gains and losses in development throughout adulthood as perceived by different age groups. *Developmental Psychology, 25*, 109–121.
- Hemphill, J. F. (2003). Interpreting the magnitudes of correlation coefficients. *American Psychologist, 58*, 78–79.
- Lodi-Smith, J., Jackson, J., Bogg, T., Walton, K., Wood, D., Harms, P., & Roberts, B. W. (2010). Mechanisms of health: Education and health-related behaviours partially mediate the relationship between conscientiousness and self-reported physical health. *Psychology & Health, 25*, 305–319.
- Meichenbaum, D. H., & Turk, D. C. (1987). *Facilitating treatment adherence: A practitioner's guidebook*. New York, NY: Plenum Press.
- Meyer, G. J., Finn, S. E., Eyde, L. D., Kay, G. G., Moreland, K. L., Dies, R. R., . . . Read, G. M. (2001). Psychological testing and psychological assessment: A review of evidence and issues. *American Psychologist, 56*, 128–165.
- Morrell, R. W., Park, D. C., Kidder, D. P., & Martin, M. (1997). Adherence to anti-hypertensive medications across the life span. *The Gerontologist, 29*, 345–353.
- O'Leirigh, C., Ironson, G., Weiss, A., & Costa, P. T., Jr. (2007). Conscientiousness predicts disease progression (CD4 number and viral load) in people living with HIV. *Health Psychology, 26*, 473–480.
- Ogedegbe, G., Mancuso, C. A., Allegrante, J. P., & Charlson, M. E. (2003). Development and evaluation of a medication adherence self-efficacy scale in hypertensive African-American patients. *Journal of Clinical Epidemiology, 56*, 520–529.
- Park, D. C., Hertzog, C., Leventhal, H., Morrell, R. W., Leventhal, E., Birchmore, D., . . . Bennett, J. (1999). Medication adherence in rheumatoid arthritis patients: Older is wiser. *Journal of American Geriatrics Society, 47*, 172–183.
- Park, D. C., & Meade, M. L. (2007). A broad view of medical adherence: Integrating cognitive, social, and contextual factors. In D. C. Park & L. L. Liu (Eds.), *Medical adherence and aging: Social and cognitive perspectives* (pp. 3–21). Washington, DC: American Psychological Association.
- Preacher, K. J., Rucker, D. D., & Hayes, A. F. (2007). Addressing moderation mediation hypotheses: Theory, methods, and prescriptions. *Multivariate Behavioral Research, 42*, 185–227.
- Roberts, B. W., Chernyshenko, O., Stark, S., & Goldberg, L. (2005). The structure of conscientiousness: An empirical investigation based on seven major personality questionnaires. *Personnel Psychology, 58*, 103–139.
- Skinner, T. C., Hampson, S. E., & Fife-Schaw, C. (2002). Personality, personal model beliefs, and self-care in adolescents and young adults with Type 1 diabetes. *Health Psychology, 21*, 61–70.
- Smith, T. W. (2006). Personality as risk and resilience in physical health. *Current Directions in Psychological Science, 15*, 227–231.
- Stilley, C. S., Sereika, S., Muldoon, M. F., Ryan, C. M., & Dunbar-Jacob, J. (2004). Psychological and cognitive function: Predictors of adherence with cholesterol lowering treatment. *Annals of Behavioral Medicine, 28*, 117–124.
- Ware, J. E., & Sherbourne, C. D. (1992). The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. *Medical Care, 30*, 473–483.
- Wiebe, J. S., & Christensen, A. J. (1996). Patient adherence in chronic illness: Personality and coping in context. *Journal of Personality, 64*, 815–835.

(Appendix follows)

Appendix

Full 60-Item Chernyshenko Conscientiousness Scale (CCS)

Instructions: Please rate how much you agree with each of the following sentences. Rate yourself as you see yourself at the present time, not as you wish to be in the future. Describe yourself as you are generally or typically. Rate yourself on the following scale: 1 (*disagree strongly*), 2 (*disagree somewhat*), 3 (*agree somewhat*), 4 (*agree strongly*).

(Items are arranged below according to the facet, or lower order trait, of conscientiousness they are designed to assess.)

Order

1. (R) Being neat is not exactly my strength.
2. Organization is a key component of most things I do.
3. I need a neat environment in order to work well.
4. I become annoyed when things around me are disorganized.
5. (R) For me, being organized is unimportant.
6. (R) Half of the time I do not put things in their proper place.
7. *(R) Most of the time my room is in complete disarray.
8. *Every item in my room and on my desk has its own designated place.
9. *(R) I frequently forget to put things back in their proper place.
10. I hate when people are sloppy.
11. (R) If I could get away with it, I would not pay taxes.
12. (R) I would lie without hesitation if it serves my purpose.
13. (R) I could be insincere and dishonest if the situation required me to do so.
14. (R) If I find money laying around, I'll keep it to myself.
15. If a cashier forgot to charge me for an item I would tell him/her.
16. I would rather get a bad grade than copy someone else's homework and turn it in as my own.
17. It bothers me when people cheat on their taxes.
18. If I accidentally scratched a parked car, I would try to find the owner to pay for the repairs.
19. I firmly believe that under no circumstances it is okay to lie.
20. The people who know me best would say that I am honest.

Traditionalism

21. I have the highest respect for authorities and assist them whenever I can.
22. (R) People respect authority more than they should.
23. Even if I knew how to get around the rules without breaking them, I would not do it.
24. (R) I believe that people should be allowed to take drugs, as long as it doesn't affect others.
25. I support long-established rules and traditions.
26. People who resist authority should be severely punished.
27. (R) When I was in school, I used to break rules quite regularly.
28. In my opinion, all laws should be strictly enforced.
29. (R) In my opinion, censorship slows down progress.
30. When working with others I am the one who makes sure that rules are observed.

(Appendix continues)

Self-Control

- 31. (R) I often rush into action without thinking about potential consequences.
- 32. I rarely jump into something without first thinking about it.
- 33. (R) I am known to make quick, hot-headed decisions.
- 34. I do not take unnecessary risks.
- 35. (R) I am easily talked into doing silly things.
- 36. (R) My friends say I am unpredictable.
- 37. (R) I get into trouble because I act on impulses rather than on thoughts.
- 38. I am careful with what I say to others.
- 39. I dislike being around impulsive people.
- 40. Even under time pressure, I would rather take my time to think about my answer than to say the first thing that comes to mind.

Responsibility

- 41. I carry out my obligations to the best of my ability.
- 42. I often feel responsible for making sure that all group project assignments are completed.
- 43. I go out of my way to keep my promises.
- 44. (R) Sometimes it is too much of a bother to do exactly what is promised.
- 45. I would gladly spend some of my leisure time trying to improve my community.
- 46. (R) If I am running late to an appointment, I may decide not to go at all.

- 47. (R) I am usually not the most responsible group member, but I will not shirk on my duties either.
- 48. If I am running late, I try to call ahead to notify those who are waiting for me.
- 49. (R) When I make mistakes I often blame others.
- 50. (R) I have a reputation for being late for almost every meeting or event.

Industriousness

- 51. I have high standards and work toward them.
- 52. I go above and beyond of what is required.
- 53. (R) I do not work as hard as the majority of people around me.
- 54. (R) I invest little effort into my work.
- 55. I demand the highest quality in everything I do.
- 56. I try to be the best at anything I do.
- 57. I make every effort to do more than what is expected of me.
- 58. (R) I do what is required, but rarely anything more.
- 59. (R) Setting goals and achieving them is not very important to me.
- 60. (R) Getting average grades is enough for me.

Note: * Indicates an item left out of the current study.

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