



Examining the relationship between changes in personality and changes in depression



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ABSTRACT

The present study explored the potential importance of using personality trait change as a unique predictor of change in depressive symptoms in a large, longitudinal sample. Cross-sectional, prospective, and correlated-change analyses, as well as several potential mediators (i.e., life satisfaction, chronic stressors, physical health) that may account for the link between personality traits and depression were tested. As predicted, the relationship between static levels of personality traits and depression found in previous research was replicated, and strong evidence was found for personality trait change in predicting change in depression. Variables associated with satisfaction and health were found to partially mediate the link between personality traits and depression.

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1. Introduction

Past research has shown that personality traits (e.g., neuroticism, conscientiousness) are some of the strongest predictors of depression (e.g., Kendler & Myers, 2010; Koorevaar et al., 2013; Shea, Widiger, & Klein, 1992; Steunenberg, Braam, Beekman, Deeg, & Kerkhof, 2009; Widiger & Trull, 1992). To date, the vast majority of research in this area has adhered to a vulnerability model in which traits are conceptualized as a cause of depression. This research adopts a “static” view of personality traits, such that they are conceptualized as not only stable, but so stable that changes in traits are seldom, if ever considered as being important enough to study. In contrast, we know relatively little regarding the relationship between personality trait change and change in depression. This is noteworthy given a wealth of recent research demonstrating that personality traits do indeed change across the lifespan (e.g., Lucas & Donnellan, 2011; Roberts & Mroczek, 2008). Thus, the fact that personality traits change invites the question of whether the relation between personality traits and depression goes beyond the static perspective most often invoked and to a more dynamic model, in which changes in personality traits are associated with change in depression (e.g., Barlow, Sauer-Zavala, Carle, Bullis, & Ellard, 2014).

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In light of the issues mentioned above, the goals of the current research were threefold. First, we sought to confirm past research that static levels of specific personality traits, in particular neuroticism and conscientiousness, are strong predictors of depression. Second, by extending the analyses we tested whether changes in neuroticism and conscientiousness predict change in depression in a large, representative sample of older adults. Third, we examined mechanisms that explain why personality traits and personality trait change might contribute to depression and change in depression. Specifically, we tested behavioral and affective mechanisms, such as physical health and life satisfaction, which are known to relate to personality traits and depression but have not been tested as potential mediators between these constructs.

1.1. Personality and depression

Personality traits are defined as relatively enduring and automatic patterns of thoughts, feelings, and behaviors that are elicited in trait-affording situations, and that can and do change over time (Roberts, 2009). In contrast to personality traits, depression is defined by affective, cognitive, and behavioral variability, most notably episodes of negative states (*Diagnostic and Statistical Manual of Mental Disorders, 4th ed.*). Further, whereas personality traits are relatively enduring, depressive episodes usually last on a scale of weeks to months. Much research has been devoted to examining the relationship between personality traits and depression. Among the Big Five personality traits (McCrae & Costa, 1999), research found that neuroticism and conscientiousness are particularly important in understanding depression (Kendler & Myers,

2010). Meta-analytic findings show that neuroticism and conscientiousness are the two most robust predictors of major depressive disorder (Kotov, Gamez, Schmidt, & Watson, 2010). Moreover, after neuroticism, conscientiousness accounts for the most significant proportion of genetic risk for depression among the traits of the Big Five (Kendler, Gatz, Gardner, & Pedersen, 2006; Kendler & Myers, 2010). Based on this foundational research, we chose to focus on these two personality traits.

1.1.1. Neuroticism

Neuroticism has received the most attention from depression researchers, not surprisingly, given that it is characterized by emotional instability, self-consciousness, and negative emotionality (Matthews & Deary, 1998). Research has consistently demonstrated that, across the lifespan, higher levels of neuroticism are associated with higher levels of depression (e.g., Goodwin & Gotlib, 2004; Kotov et al., 2010; Weiss et al., 2009). Neuroticism also predicts severity, course, and maintenance of depression (e.g., Bienvenu et al., 2004; Brown, 2007). Researchers examining the role of genetics through twin studies have found that neuroticism, which is strongly heritable, is a major risk factor for developing depression later in life and accounts for a significant proportion of genetic risk for depression (Kendler & Myers, 2010; Kendler et al., 2006). Despite the vast amount of research on the direct relationship between neuroticism and depression, very little research has been dedicated to identifying the longitudinal relationship between these two variables or the mediating mechanisms linking neuroticism to depression.

1.1.2. Conscientiousness

In recent years, researchers have been paying more attention to the role of conscientiousness in depression. Conscientiousness is characterized by self-discipline, persistence, and organization (Roberts, Jackson, Fayard, Edmonds, & Meints, 2009). In contrast to neuroticism, higher levels of conscientiousness have been found to be associated with lower levels of depression (e.g., Anderson & Mclean, 1997; Weber et al., 2012; Weiss et al., 2009). Research has found that conscientiousness is related to a variety of factors that are linked to positive affect and well-being, such as healthy behaviors, achievement, and good social functioning (e.g., Bogg & Roberts, 2004; Jensen-Campbell & Malcolm, 2007; Richardson & Abraham, 2009; Wagerman & Funder, 2007; Zellars, Perrewé, Hochwarter, & Anderson, 2006).

1.2. Personality and depression: The importance of examining change

That personality changes across the lifespan is now widely accepted. Research has discovered mean-level changes in personality traits at different stages of life. Moreover, these changes can be approximated as a function of age (e.g., Lucas & Donnellan, 2009; Soto, John, Gosling, & Potter, 2011; Specht, Egloff, & Schmukle, 2011; Srivastava, John, Gosling, & Potter, 2003). For example, studies have found that individuals tend to become more conscientious, agreeable, and more emotionally stable with age, and that these trends continue into older adulthood. Studies have also found that although personality change appears to be greatest earlier in life and into young adulthood, meaningful change still occurs throughout middle-age and older adulthood (Roberts, Walton, & Viechtbauer, 2006). One plausible explanation for personality trait change is attributed to accumulating life experiences and age-appropriate expectations, such that individuals learn and adapt based on their experiences and their current life situations (Roberts, Wood, & Smith, 2005). Whereas the majority of research in personality has examined younger cohorts, examining change in older adults is nonetheless important. An ample amount of research has found that even modest changes in personality are

useful predictors of health and well-being outcomes (e.g., Takahashi, Edmonds, Jackson, & Roberts, 2013). Importantly, finding that personality trait change is significantly associated with depression change, in a sample believed to be most resistant to change (i.e., older adults), would serve to highlight the importance of invoking dynamic models at all levels of research.

Increasingly, researchers are focusing more on how personality trait change is related to psychopathology and life outcomes (e.g., Hudson, Roberts, & Lodi-Smith, 2012; Turiano et al., 2012; Wright, Pincus, & Lenzenweger, 2012). For example, recent work using latent growth modeling has found that changes in neuroticism and impulsivity are important factors in problematic alcohol use (Littlefield, Sher, & Wood, 2009). Further, Mroczek and Spiro (2007) found that men who evidenced both a high overall level of neuroticism, as well as an increasing level of neuroticism over time, were at greater risk of mortality than men who did not. Conversely, people who show increases in conscientiousness tend to show improvements in both their ratings of physical health and their endorsement of positive health behaviors (Letzring, Edmonds, & Hampson, 2014; Takahashi et al., 2013).

1.3. Mediation factors in the link between conscientiousness and depression

Very little work has focused on potential mechanisms mediating the link between traits, such as neuroticism, and depression. Analogous research on outcomes such as health (e.g., Bogg & Roberts, 2013; Chapman, Roberts, & Duberstein, 2011; Deary, Weiss, & Batty, 2010) would lead one to posit mechanisms, such as life experiences, behaviors, and even health itself as potential mediators of the relations between personality traits and depression. Thus, it may be the case that depression is indirectly influenced by particular life events and behaviors associated with one's personality, such as chronic stressors and behaviors aimed at maintaining good physical health. For example, recent research (Hill, Nickel, & Roberts, 2013) shows that conscientiousness is presumed to affect outcomes, such as depression, through two behavioral pathways. Highly conscientious people proactively foster better life circumstances through their implementation efforts. This in turn should lead to higher levels of life satisfaction, thereby preventing the onset of depression. Conversely, highly conscientious people avoid many pitfalls of life, such as stress inducing experiences and poor health, which in turn inoculate them from experiencing depression. Likewise, we believe the same type of pathways would result from high and low levels of neuroticism. Below, we consider several potential mediating mechanisms that reflect implementing and immunizing pathways. Specifically, we consider physical health, life satisfaction, and chronic stress as potential mediators of both the static and dynamic relation between personality traits and depression.

Research has found that neuroticism and conscientiousness are major predictors of health and health-related behaviors, such as maintaining good hygiene, healthy eating, and exercising (e.g., Bogg & Roberts, 2013). In particular, neuroticism has been found to be linked to poor health, greater risk of mortality, and is also likely to influence health through high negative affect (e.g., Mroczek, Spiro, & Turiano, 2009; Smith & Gallo, 2001). In contrast, conscientiousness may impact physical health through better health behaviors or through physiological systems such as inflammatory pathways (Sutin et al., 2010). The importance of physical and mental health has been well documented and numerous studies have found that poor health can lead to depression through strained relationships, loneliness and social isolation, and psychological distress (e.g., Alpass & Neville, 2003; Aneshensel, Frerichs, & Huba, 1984; Ayotte, Yang, & Jones, 2010).

Life satisfaction is a broad construct that encompasses affective and cognitive components and is linked to subjective well-being (e.g., Diener, Lucas, & Oishi, 2002; Diener, Scollon, Oishi, Dzokoto, & Suh, 2009). Studies indicate that neuroticism may be especially important in determining life satisfaction, such that in contrast to emotionally stable individuals, emotionally unstable individuals tend to experience more undesirable life events and to be involved in more stressful events, such as interpersonal conflict (e.g., Magnus, Diener, Fujita, & Pavot, 1993). Research has shown that conscientiousness is generally a positive, adaptive trait that is associated with higher life satisfaction and closely related constructs (e.g., DeNeve & Cooper, 1998; Judge & Ilies, 2002; McCrae & Costa, 1991; Steel, Schmidt, & Shultz, 2008; Weiss, Bates, & Luciano, 2008). In contrast to low conscientious individuals, high conscientiousness individuals experience more positive life events and tend to avoid snares in life (e.g., being involved in criminal activity, using drugs; Moffitt et al., 2011). Unsurprisingly, lower levels of life satisfaction have been found to be associated with greater levels of depression (e.g., Frisch, Cornell, Villanueva, & Retzlaff, 1992).

Chronic stressors may be composed of many different factors, such as ongoing problems in physical health as well as ongoing problems in interpersonal relationships. Expectedly, a large body of research demonstrates that high levels of neuroticism are associated with greater levels of chronic stress (Brown & Rosellini, 2011; Lahey, 2009). Further, research has found that neuroticism, which is closely related to high emotional and interpersonal sensitivity, plays a major role in stress generation and negative life events (e.g., Fergusson & Horwood, 1987; Hammen, 2006; Kendler, Gardner, & Prescott, 2003; Magnus et al., 1993; Poulton & Andrews, 1992). Research has found that conscientiousness is related to problem focused coping, which serves to decrease stress in response to stressors (Bartley & Roesch, 2011). Higher levels of conscientiousness have also been found to be linked to less occupational and interpersonal stress, as well as less reactivity to stress (e.g., higher resistance to glucocorticoids; Murphy, Miller, & Wrosch, 2012). A large body of research has found that life stress contributes to depression. Research on stress generation has also found that whereas stress leads to depression, depressed individuals create more stress than non-depressed individuals (e.g., Hammen, 1991, 2005). Thus, personality traits may influence depression through stress generation and reactions to life events.

1.4. Study hypotheses

We conducted cross-sectional, prospective, and correlated-change analyses with the aim of testing the relationship between personality traits and depression over time. We used latent scores of personality traits, mediating variables (physical health, life satisfaction, chronic stressors), and depression in longitudinal data gathered in 2006 and 2010 from members of the Health and Retirement Study (HRS). Our hypotheses for the current study were threefold. First, we expected to replicate existing research by demonstrating that static levels of neuroticism and conscientiousness are associated with depression. In addition, we predicted that static levels of neuroticism and conscientiousness would be associated with depression, even after taking into account static levels of all other traits. Second, in terms of prospective analyses, we expected static levels of neuroticism and conscientiousness in 2006 to predict levels of depression in 2010. We also expected that levels of each personality trait in 2006 would provide incremental validity in predicting depression in 2010, above and beyond levels of all other traits in 2006. Third, we expected changes in neuroticism and conscientiousness to be independently associated with changes in depression.

For each of the hypotheses, we examined mediating mechanisms between personality and depression. We expected that for both time points, physical health, life satisfaction, and chronic stressors, would partially mediate the link between static levels of personality traits and depression. Further, we hypothesized that physical health, life satisfaction, and chronic stressors in 2010 would mediate the link between personality in 2006 and depression in 2010. Finally, we tested whether changes in each of the mediators also explained part of the association between changes in personality traits and change in depression.

2. Method

We used the RAND HRS data files from the Health and Retirement Study, which is a nationally representative longitudinal study of Americans ages 50 and older and their spouses (Burkhauser & Gertler, 1995). Participants are assessed every two years. Because at the time this manuscript was written personality measures were included in just two different time points, we used data collected in the eighth (2006) and tenth (2010) waves of assessment (for more information regarding the HRS, go to: <http://hrsonline.isr.umich.edu/>).

2.1. Sample

We used data compiled from a total of 5217 participants. In 2006, a total of 5002 participants ($M_{\text{age}} = 67$, $SD = 9.8$, 59% female) had composite scores for each of the measures listed below. In 2010, a total of 5007 participants ($M_{\text{age}} = 71$, $SD = 9.7$, 60% female) had composite scores for each of the measures listed below. Across both time points, the ethnic background of our sample was 85% European American, 11% African American, and 4% other, and participants reported an average of 13 years of education. *T*-tests for independent samples revealed that individuals who were missing at least one composite score in 2006 had, in 2010, significantly higher levels of neuroticism (Cohen's $d = .07$), chronic stress ($d = .07$), and depression ($d = .08$), and lower levels of conscientiousness ($d = .10$), life satisfaction ($d = .09$), and physical health ($d = .13$), than did individuals who completed the entire survey in 2006 (all p 's < .05). Whereas individuals who were missing at least one composite score in 2010 had, in 2006, significantly lower levels of physical health ($d = .16$) and conscientiousness ($d = .14$; p 's < .05), they did not differ significantly in terms of depression, neuroticism, life satisfaction, and chronic stress in 2006, than did individuals who completed the entire survey in 2010.

2.2. Measures

2.2.1. Personality

Personality was measured using the MIDUS Big Five Adjectival scale (Lachman & Bertrand, 2001), which has been found to have good reliability and construct validity (Mroczek & Kolarz, 1998; Zimprich, Allemand, & Lachman, 2012). Participants rated the degree to which each adjective described them on a four-point scale (1 = not at all; 4 = a lot). The items in the Conscientiousness scale were *organized*, *responsible*, *hardworking*, and *careless* (reverse-scored). The items in the Neuroticism scale were *moody*, *nervous*, *calm* (reverse-scored), and *worrying*. The items in the Agreeableness scale were *helpful*, *warm*, *caring*, *softhearted*, and *sympathetic*. The items in the Extraversion scale were *outgoing*, *friendly*, *lively*, *active*, and *talkative*. The items in the Openness scale were *creative*, *imaginative*, *intelligent*, *curious*, *broad-minded*, *sophisticated*, and *adventurous*. Internal consistencies for the neuroticism, conscientiousness, agreeableness, extraversion, and openness

scales were, in 2006, $\alpha = .71, .66, .78, .76,$ and $.79,$ respectively, and in 2010, $\alpha = .71, .68, .79, .76,$ and $.80,$ respectively.

2.2.2. Depression

A version of the Center for Epidemiologic Studies–Depression scale (CES-D; Radloff, 1977) was used to measure depression in 2006 and 2010. The CES-D, which was designed to assess depressive symptomology, has good psychometric properties across a range of demographic characteristics and is predictive of concurrent depression (Hertzog, Van Alstine, Usala, Hultsch, & Dixon, 1990; Radloff, 1977). Participants were asked to rate their agreement to eight items on a two-point scale (0 = no; 1 = yes). Scores were based on the sum of six negative items and two positive items. The negative items assessed whether the participant experienced the following all or most of the time: *feel depressed, feel like everything is an effort, sleep is restless, feel alone, feel sad, could not get “going.”* The positive items assessed whether the participant experienced all or most of the time: *feel happy, enjoyed life.* Internal consistencies were good across both time points (α 's = 0.80).

2.2.3. Life satisfaction

Life satisfaction was measured using a five-item scale (Diener, Emmons, Larsen, & Griffin, 1985). Respondents were asked to rate, on a seven-point scale (1 = strongly disagree; 7 = strongly agree), the degree to which they agreed with 5 different statements (i.e., *in most ways my life is close to ideal; the conditions of my life are excellent; I am satisfied with my life; so far, I have gotten the important things I want in life; if I could live my life again, I would change almost nothing*). Scores across each of the items were averaged to provide an overall score of life satisfaction. Internal consistencies were good across both time points (α 's = 0.89).

2.2.4. Physical health

Participants reported their current level of overall physical health. Participants responded (1 = excellent; 5 = poor) to a single item (i.e., “would you say your health is excellent, very good, good, fair, or poor?”). Higher values denoted poorer levels of health.

2.2.5. Chronic stressors

Chronic stressors were measured using an eight-item scale. Respondents were asked to rate, on a five-point scale (1 = no, didn't happen; 5 = yes, very upsetting), the degree to which they were upset by eight different types of ongoing life stressors (i.e., health problems; physical or emotional problems in spouse or child; alcohol or drug use in family member; difficulties at work; financial strain; housing problems; problems in a close relationship; providing regular assistance to a sick, limited, or ailing friend or family member). Respondents were asked to only respond to ongoing problems that lasted twelve months or longer. Scores across each of the eight items were averaged to provide an overall score of chronic stress. Reliability of this scale was adequate across both time points ($\alpha = .65$ in 2006, $\alpha = .66$ in 2010).

2.3. Analyses

For all analyses of static levels (in 2006 and 2010) of personality traits, mediators, and depression, we used factor scores derived from latent change models (see below) both concurrently and prospectively. These measures were analyzed using partial correlations and multiple regression models.

The basic format of the latent change models is found in Fig. 1. A latent change model uses two waves of data to estimate the intercept and slope of a variable over time, controlling for measurement error. This allowed us to calculate latent estimates of the correlations among the slopes, which represents changes in both sets of variables over time (McArdle, 2009). In the models, we specified

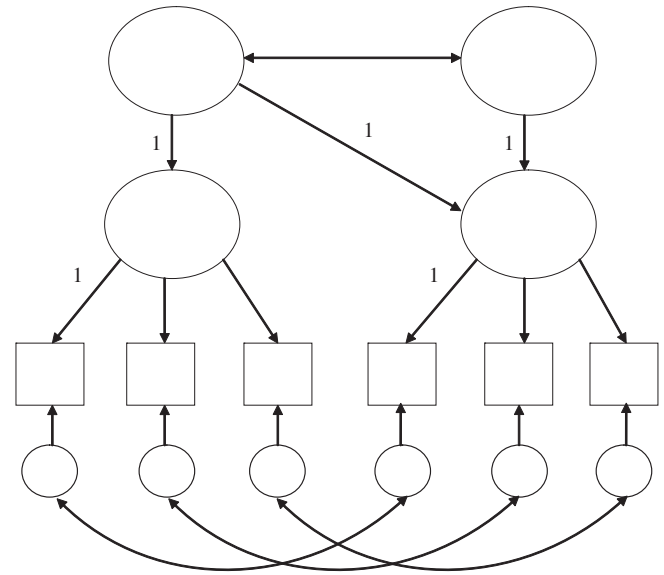


Fig. 1. Basic format of the latent change models used to examine changes, from 2006 to 2010, in neuroticism, conscientiousness, depression, and mediator variables. Note. In the actual models used, the number of indicator variables varied depending on the latent variable in question.

the intercept to be centered at time 1. Additionally, latent change models use Full Information Maximum Likelihood (FIML) estimation to fit the models directly to the raw data. This allows estimation of the model parameters using all available data (Hox, 2000). This is preferable to procedures that use only complete case data or data imputation, which can lead to biased estimates (Wothke, 2000). Latent variables were approximated from individual scale items (5–8 scale items per latent variable). Second-order latent intercept and slope variables were then estimated from the time 1 and time 2 latent scores. Extraction of latent scores (in 2006, 2010, and changes from 2006 to 2010) was done by creating composite variables through regression imputation, which allows for complex latent variables with several indicator variables to be represented as single composite scores. In order to extract factor scores, in cases of missing data we imputed data for all participants.

We examined mediation in the following ways. First, for the concurrent and prospective analyses, we computed a set of three hierarchical regression analyses using the factor scores for personality traits, depression, and the respective mediators. For each set of regression analyses, we entered one mediating variable (e.g., physical health) in the first step, followed by personality (conscientiousness or neuroticism) in the second step, with depression serving as the outcome variable. This allowed us to examine the reduction in association between personality traits and depression, after taking into account each of the potential mediators. For the analyses using changes in mediators over time, we extracted the slope parameters from the latent change models (Fig. 1) and computed changes in the respective mediators.

We conducted four separate mediation analyses (for 2006, 2010, prospectively from 2006 to 2010, and then using dynamic variables) by using the *MEDIATE* macro (which allows for inclusion of multiple independent variables; Hayes & Preacher, 2013) with 10,000 resamples and which provides 95% Monte Carlo confidence intervals. For the static analyses, we entered factor scores for conscientiousness and neuroticism as independent variables, chronic stress, life satisfaction, and self-report of health as mediator variables, and depression as the dependent variable. We conducted parallel analyses for the dynamic variables in which we used changes in the respective variables estimated using the latent change models.

Table 1
Zero-order and partial correlations between personality traits and depression.

	Zero-order correlations		Partial correlations	
	Depression 2006	Depression 2010	Depression 2006	Depression 2010
Neuroticism 2006	.40*	.36*	.37*	.32*
Conscientiousness 2006	-.17*	-.18*	-.10*	-.11*
Neuroticism 2010	.36*	.40*	.32*	.36*
Conscientiousness 2010	-.17*	-.19*	-.09*	-.11*

* $p < .05$.

3. Results

3.1. Cross-sectional analyses

We began by examining the associations between static levels of personality traits and depression. As seen in Table 1 (left side), as predicted, across both time points, neuroticism ($r = .40$ in 2006 and in 2010) and conscientiousness ($r = -.17$ in 2006, $r = -.19$ in 2010) were significantly associated with depression and in the anticipated directions.¹ We then computed partial correlations between personality traits and depression while controlling for all other personality traits. As seen in Table 1 (right side), across both time points, as predicted, the associations between neuroticism and depression remained strong even after taking conscientiousness, agreeableness, extraversion, and openness into account ($r = .37$ in 2006, $r = .36$ in 2010). In contrast, across both time points, the associations between conscientiousness and depression experienced greater reductions after taking into account all other personality traits, yet were still statistically significant ($r = -.10$ in 2006, $r = -.11$ in 2010).

3.2. Prospective analyses

We computed two sets of linear regression analyses to determine whether static levels of personality traits in 2006 would predict static levels of depression in 2010. As expected, neuroticism and conscientiousness in 2006 predicted depression in 2010 ($\beta = .36$, $p < .05$, and $\beta = -.18$, $p < .05$, respectively). To examine incremental validity, we computed two sets of hierarchical linear regression analyses. In each analysis, we entered one personality trait in 2006 on the first step and all other traits in 2006 on the second step. As expected, static levels of neuroticism in 2006 predicted static levels of depression in 2010, above and beyond static levels of all other traits in 2006 ($\beta = .32$, $p < .05$). In addition, static levels of conscientiousness in 2006 predicted static levels of depression in 2010, above and beyond static levels of all other traits in 2006 ($\beta = -.12$, $p < .05$).

3.3. Change analyses

Having examined the relationship between personality traits and depression using cross-sectional and prospective analyses, we then tested whether personality trait change would predict change in depression. Fit statistics for each model indicated a good to adequate fit to the data (for models representing changes in neuroticism, conscientiousness, openness, extraversion, agreeableness, and depression, Root Mean Square Error of Approximation = .04, .04, .07, .07, .05, and .07, respectively). Having found

¹ The associations between the remaining personality domains and depression were as follows: for agreeableness, openness, and extraversion in 2006, $r = -.06$, $-.13$, and $-.21$, respectively; for agreeableness, openness, and extraversion in 2010, $r = -.07$, $-.15$, and $-.20$, respectively.

support for the structure of each model, we then extracted latent growth factor scores for each variable. Having obtained latent growth factor scores for each variable, we then proceeded to examine the associations among them by computing zero-order correlations and partial correlations. As predicted, changes in neuroticism were significantly associated with change in depression ($r = .15$, $p < .05$, 95% CI: .13–.18), such that an increase in neuroticism was associated with an increase in depression. This was the case even after taking into account changes in all other personality traits ($r = .15$, $p < .05$, 95% CI: .13–.18). In contrast, change in conscientiousness was not significantly associated with change in depression ($r = -.03$, $p = .07$, 95% CI: .002 to $-.06$). This was the case even after taking into account changes in all other personality traits ($r = .00$, $p = .94$, 95% CI: $-.03$ to .03).

3.4. Mediation analyses

Having examined the associations between static and dynamic levels of personality traits and depression, we tested whether variables associated with satisfaction, health, and stress would mediate these links. Table 2 contains, for each time point: (a) the original standardized regression coefficients for personality traits predicting depression; (b) the regression coefficients after taking into account each of the mediating variables; and (c) the standardized indirect effects of personality traits on depression through each of the mediating variables. Table 3 contains this information for the prospective analyses. As seen in Table 2, the link between neuroticism and depression in 2006 and 2010 was partially mediated by health, stress, and satisfaction variables. For example, in 2006 the effect of neuroticism predicting depression was .40, whereas that effect size ranged from .31 to .35 when taking into account the mediator variables, indicating a slightly weakened (but still quite strong) link between neuroticism and depression after introducing those variables. Further, even when conscientiousness was simultaneously introduced in the same mediation model, the indirect effects of neuroticism on depression through each of the mediation variables was still significant (albeit weak).

The same trend in findings also applied for 2010 as well as prospectively from 2006 to 2010. Similar to neuroticism, the link between conscientiousness and depression in 2006 and 2010 was affected when introducing the health, stress, and satisfaction variables. For example, in 2006 the effect of conscientiousness predicting depression was $-.17$, whereas that effect size ranged from $-.09$ to $-.12$ when taking into account the mediator variables, indicating a weakened yet significant link between conscientiousness and depression after introducing those variables. When neuroticism was simultaneously introduced in the same mediation model, the indirect effect of conscientiousness on depression was still statistically significant (albeit weak). This was generally the case for 2010, as well as prospectively from 2006 to 2010.

We next examined whether changes in these mediators accounted for the relation between change in neuroticism and change in depression. We only examined change in neuroticism because the relation between change in conscientiousness and change in depression was not significant. Table 4 contains (a) original standardized regression coefficients for neuroticism change predicting change in depression; (b) the regression coefficients after taking into account each mediating variable; and (c) the standardized indirect effects of change in neuroticism on change in depression through each mediating variable. The mediation analyses showed that in terms of predicting dynamic levels of depression, dynamic levels of neuroticism were largely unaffected by the inclusion of the mediation variables (in all cases, $\beta = .14$ or $.15$, $p < .05$).²

² Age did not moderate the effects.

Table 2

Standardized regression weights and indirect effects (and 95% confidence intervals) of personality traits on depression through each of the mediating variables in 2006 and 2010.

<i>Cross-sectional mediation 2006</i>			
Neuroticism			
Original regression (beta)	.40 (.38, .43)		
		Mediating variables	
		Chronic stressors	Life satisfaction
Reduced regression (beta)		.31 (.28, .33)	.31 (.28, .33)
Indirect effect		.06 (.05, .06)	.06 (.05, .07)
			Physical health
			.35 (.33, .38)
			.03 (.02, .03)
Conscientiousness			
Original regression (beta)	-.17 (-.20, -.15)		
Reduced regression (beta)		-.12 (-.14, -.09)	-.09 (-.11, -.06)
Indirect effect		-.02 (-.02, -.01)	-.04 (-.04, -.03)
			-.11 (-.14, -.09)
			-.03 (-.03, -.02)
<i>Cross-sectional mediation 2010</i>			
Neuroticism			
Original regression (beta)	.40 (.37, .42)		
		Mediating variables	
		Chronic stressors	Life satisfaction
Reduced regression (beta)		.30 (.28, .33)	.30 (.27, .32)
Indirect effect		.05 (.04, .06)	.06 (.05, .07)
			Physical health
			.34 (.31, .36)
			.03 (.02, .04)
Conscientiousness			
Original regression (beta)	-.19 (-.21, -.16)		
Reduced regression (beta)		-.14 (-.17, -.12)	-.10 (-.12, -.07)
Indirect effect		-.01 (-.02, -.01)	-.04 (-.05, -.03)
			-.12 (-.15, -.10)
			-.03 (-.03, -.02)

Table 3

Standardized regression weights and indirect effects (and 95% confidence intervals) of personality traits (in 2006) on depression (in 2010) through each of the mediating variables (in 2010).

Neuroticism (2006)			
Original regression (beta)	.36 (.33, .38)		
		Mediating variables (2010)	
		Chronic stressors	Life satisfaction
Reduced regression (beta)		.27 (.24, .29)	.27 (.25, .30)
Indirect effect		.05 (.04, .06)	.06 (.05, .07)
			Physical health
			.31 (.29, .34)
			.03 (.02, .04)
Conscientiousness (2006)			
Original regression (beta)	-.18 (-.21, -.15)		
Reduced regression (beta)		-.13 (-.16, -.10)	-.11 (-.13, -.08)
Indirect effect		-.01 (-.02, -.01)	-.04 (-.05, -.03)
			-.12 (-.15, -.10)
			-.02 (-.03, -.02)

3.5. Tests of robustness

To determine the potential impact of confounding variables other than the remaining Big Five, we re-ran the analyses above after controlling for gender, years of education, and age. For correlation analyses, as well as mediation analyses using the [Hayes and Preacher \(2013\)](#) macro, we used residual scores for personality traits, depression, and mediating variables. We also used residual scores for the same analyses examining variables of change. For all mediation analyses using regressions, rather than use residual scores we entered gender, years of education, and

age in the first step (there was no discernible difference in our findings when using this method versus using residual scores).

In terms of the correlation analyses, no meaningful changes were found when using residual scores (at most, slight differences of a few hundredths were detected from the original raw correlation and such differences never impacted the significance of the findings). This was also the case for correlations between changes in personality traits and change in depression, in which the correlations and significance levels were identical to those of the original analyses.

Table 4
Standardized regression weights and indirect effects (and 95% confidence intervals) of dynamic personality traits on depression through each of the mediating variables.

		Mediating variables		
		Chronic stressors	Life satisfaction	Physical health
Neuroticism				
Original regression (beta)	.15 (.13, .18)			
Reduced regression (beta)		.14 (.11, .16)	.14 (.11, .17)	.15 (.12, .18)
Indirect effect		.012 (.008, .016)	.012 (.008, .016)	.004 (.001, .006)
Conscientiousness				
Original regression (beta)	-.03 (-.05, .00)			
Reduced regression (beta)		-.02 (-.04, .01)	-.01 (-.04, .02)	-.02 (-.05, .01)
Indirect effect		-.005 (-.008, -.003)	-.011 (-.015, -.007)	-.004 (-.007, -.002)

In terms of the regression analyses, no meaningful changes were found after controlling for gender, years of education, and age, as effect sizes and confidence intervals were nearly identical to those of the original analyses. This was also the case for regression analyses using variables of change. For the mediation analyses using the [Hayes and Preacher \(2013\)](#) macro, the results were similar to those of the original analyses. That is, no meaningful changes were found after controlling for gender, years of education, and age. Importantly, no meaningful changes were found in the confidence intervals (i.e., those that originally included zero within their range continued to do so, whereas those that did not originally include zero continued that trend).

4. Discussion

We found evidence of the potential importance of personality trait change in predicting changes in depression, as well as replicated existing research demonstrating the link between static levels of personality traits and depression. We also tested mechanisms that may illuminate exactly how personality traits influence depression. We believe that the current findings have important theoretical and clinical implications and contribute to our understanding of the relationship between personality and depression.

Increasingly, researchers are discovering the usefulness of examining personality trait change in the context of various life outcomes, including aspects of psychopathology (e.g., [Hudson et al., 2012](#); [Littlefield et al., 2009](#); [Turiano et al., 2012](#)). We found compelling evidence for the adoption of a dynamic model in which personality trait change predicts change in depression. As predicted, change in neuroticism was a strong predictor of change in depression. However, contrary to our expectations, change in conscientiousness was only a weak (and non-significant) predictor of change in depression. Although one may conclude that change in conscientiousness is unimportant in understanding change in depression, we encourage future research to continue examining this question. For example, certain facets of conscientiousness that are not assessed by the scale used in the current study may be more important to changes in depression. It may also be that change in conscientiousness is an important predictor of depression change in younger adults, which is a time when many individuals experience their first depressive episode.

Alternatively, it is possible that conscientiousness is more relevant to depression as a static variable than as a dynamic one, which generates further questions regarding the link between personality and depression. Indeed, conscientiousness early in life may be particularly important, to the degree that it prevents one from engaging in behaviors and actions that lead to depression later in life

(e.g., [Moffitt et al., 2011](#)). Nonetheless, the current findings indicate that examining dynamic levels of neuroticism are important in understanding depression change. Thus, although existing research examining static levels of personality traits and depression have provided researchers with a good understanding of the link between these constructs, we extend and contribute to existing research by demonstrating the potential utility of treating personality trait change (and neuroticism in particular) as a unique predictor of depression.

Researchers have yet to fully explore the mechanisms that link personality traits to depression. Existing research has either: (a) examined the link between personality traits and daily functioning/well-being; or (b) examined the direct relationship between personality traits and depression. The present research, in a large, representative sample, contributes to our understanding of this fascinating question and suggests that neuroticism and conscientiousness may influence depression through various satisfaction and life outcome variables. Importantly, findings from both cross-sectional and prospective analyses revealed that, whereas neuroticism was found to lead to higher levels of depression over time through lower levels of satisfaction and more stress, conscientiousness was found to lead to lower levels of depression over time through higher levels of satisfaction and less stress. Thus, higher levels of neuroticism appear to influence depression by leading to more snares in life (e.g., more interpersonal conflict) and lower overall well-being, findings that are consistent with a large amount of existing literature exploring negative life outcomes associated with neuroticism (e.g., [Magnus et al., 1993](#); [Mroczek et al., 2009](#)). In contrast, higher levels of conscientiousness appear to influence depression by leading to better health and greater well-being, findings that are consistent with a large amount of existing literature exploring positive life outcomes associated with conscientiousness (e.g., [Bogg & Roberts, 2013](#)). Although the present research invokes a model in which personality traits lead to depression later in life, it is important to note that the directions of causality are likely bidirectional. That is to say that whereas personality traits lead to depression over time, depression may also impact personality development. Further, assuming that the trajectories of personality trait development and depression change are correlated, it is possible that each of these variables influence one another through the same mediators. For example, whereas depression leads to problems (e.g., poor health and interpersonal difficulties), improvement in those life domains may in turn lead to changes in personality traits. We believe research aimed at understanding the link between personality trait change and change in depression would not only help us have a better understanding of the course of depression, but of personality development as well.

In addition to theoretical implications, there are also important clinical implications of adopting a dynamic model of personality trait change and depression. It is possible that assessing depression in the context of personality trait change would allow clinicians to better understand and treat depression in clients. For example, knowing that greater increases in neuroticism directly relate to incremental changes in depression would allow clinicians to anticipate a decrease in functioning in their clients. Further, whereas examining personality traits in the context of psychopathology is becoming increasingly attractive to clinicians (e.g., personality dimensions in the DSM-5), tracking personality trait change may provide incremental validity in predicting the course of depression (in addition to other mental disorders) as well as response to treatment. Additional research may also allow clinicians to better target specific personality traits as a means of treating depression, such as decreasing levels of neuroticism in their clients in order to decrease levels of depression over time. Moreover, targeting and tracking changes in neuroticism in addition to depression may provide useful information about long-term prognosis of therapeutic efficacy (Barlow et al., 2014). Individuals who show decreases in neuroticism in addition to depression may have better outcomes in the long run.

In addition to those already mentioned, we have several recommendations for future research. In the context of depression, one question that has yet to be fully understood is whether treatment (i.e., medication, psychotherapy) leads to personality trait change. Whereas a large body of research demonstrates the effectiveness of medication and psychotherapy in reducing depression and related disorders (e.g., anxiety disorders), it is possible that such treatments actually lead to changes in personality traits (e.g., neuroticism), which in turn lead to changes in depression over time. Further, we believe that future research should examine the role of personality trait change in other forms of psychopathology. For example, given that depression and anxiety are highly comorbid disorders, one might expect to find a similar pattern of results between personality traits and anxiety disorders. Future research may also wish to examine whether the observed changes in personality traits and depression would replicate in a clinical sample.

The current study has some limitations, which should be addressed in future research. First, future research may wish to include full depression scales or administer structured clinical interviews. Second, it may be important to examine these effects using younger samples, longer time frames, and more than two assessments. One might expect to find even stronger effect sizes in a younger sample and our belief of the importance of personality trait change in depression is strengthened given the age of the sample in the current research. Third, the current findings should inform clinical experiments that can better illuminate the potential causal relations between trait changes and fluctuations in depression. Fourth, although research has examined change models using two waves of data, including more time points would allow for a more comprehensive test of mediation. Finally, although the mediation variables we examined in the current research significantly mediated the link between personality and depression, the mediation effects were quite small. In terms of mediating the link between personality trait change and change in depression, the variables examined in the present research made no discernible impact. It is almost a certainty that many variables not considered in the current study serve to account for the role of personality traits in depression, and we encourage future research to continue to examine these mechanisms.

In sum, the present research contributes to our knowledge of the role of personality traits in depression. Given the recent attention that has been given to examining dynamic models of personality and psychopathology, we believe the current research builds upon a very exciting avenue of research.

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Appendix A. Supplementary material

Supplementary data associated with this article can be found, in the online version, at <http://dx.doi.org/10.1016/j.jrp.2014.04.007>.

References

- Alpass, F. M., & Neville, S. (2003). Loneliness, health and depression in older males. *Aging & Mental Health*, 7, 212–216.
- American Psychiatric Association (2000). *Diagnostic and statistical manual of mental disorders: DSM-IV-TR*. Washington, DC: Author.
- Anderson, K. W., & McLean, P. D. (1997). Conscientiousness in depression: Tendencies, predictive utility, and longitudinal stability. *Cognitive Therapy and Research*, 21, 223–238.
- Aneshensel, C. S., Frerichs, R. R., & Huba, G. J. (1984). Depression and physical illness: A multiwave, nonrecursive causal model. *Journal of Health and Social Behavior*, 350–371.
- Ayotte, B. J., Yang, F. M., & Jones, R. N. (2010). Physical health and depression: A dyadic study of chronic health conditions and depressive symptomatology in older adult couples. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 65, 438–448.
- Barlow, D. H., Sauer-Zavala, S., Carle, J. R., Bullis, J. R., & Ellard, K. K. (2014). The nature diagnosis, and treatment of neuroticism: Back to the future. *Clinical Psychological Science*. <http://dx.doi.org/10.1177/2167702613505532>.
- Bartley, C. E., & Roesch, S. C. (2011). Coping with daily stress: The role of conscientiousness. *Personality and Individual Differences*, 50, 79–83.
- Bienvenu, O. J., Samuels, J. F., Costa, P. T., Jr., Reti, I. M., Eaton, W. W., & Nestadt, G. (2004). Anxiety and depressive disorders and the five-factor model of personality: A higher-and lower-order personality trait investigation in a community sample. *Depression and Anxiety*, 20, 92–97.
- Bogg, T., & Roberts, B. W. (2004). Conscientiousness and health-related behaviors: A meta-analysis of the leading behavioral contributors to mortality. *Psychological Bulletin*, 130, 887.
- Bogg, T., & Roberts, B. W. (2013). The case for conscientiousness: Evidence and implications for a personality trait marker of health and longevity. *Annals of Behavioral Medicine*.
- Brown, T. A. (2007). Temporal course and structural relationships among dimensions of temperament and DSM-IV anxiety and mood disorder constructs. *Journal of Abnormal Psychology*, 116, 313–328.
- Brown, T. A., & Rosellini, A. J. (2011). The direct and interactive effects of neuroticism and life stress on the severity and longitudinal course of depressive symptoms. *Journal of Abnormal Psychology*, 120, 844–856.
- Burkhauser, R. V., & Gertler, P. J. (1995). Introduction to special issue on the health and retirement survey/data quality and early results. *The Journal of Human Resources*, 30(Suppl.), S1–S6.
- Chapman, B. P., Roberts, B., & Duberstein, P. (2011). Personality and longevity: Knowns, unknowns, and implications for public health and personalized medicine. *Journal of Aging Research*, 2011, Article ID 759170, 24 pages.
- Deary, I. J., Weiss, A., & Batty, G. D. (2010). Intelligence and personality as predictors of illness and death: How researchers in differential psychology and chronic disease epidemiology are collaborating to understand and address health inequalities. *Psychological Science in the Public Interest*, 11, 53–79.
- DeNeve, K. M., & Cooper, H. (1998). The happy personality: A meta-analysis of 137 personality traits and subjective well-being. *Psychological Bulletin*, 124, 197–229.
- Diener, E. D., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The satisfaction with life scale. *Journal of Personality Assessment*, 49, 71–75.
- Diener, E., Lucas, R. E., & Oishi, S. (2002). Subjective well-being: The science of happiness and life satisfaction. In C. R. Snyder & S. J. Lopez (Eds.), *Handbook of positive psychology* (pp. 463–473). New York: Oxford University Press.
- Diener, E., Scollon, C. N., Oishi, S., Dzokoto, V., & Suh, E. M. (2009). Positivity and the construction of life satisfaction judgments: Global happiness is not the sum of its parts. In E. Diener (Ed.), *Culture and well-being* (pp. 229–243). Springer.
- Fergusson, D. M., & Horwood, L. J. (1987). Vulnerability to life events exposure. *Psychological Medicine*, 17, 739–749.
- Frisch, M. B., Cornell, J., Villanueva, M., & Retzlaff, P. J. (1992). Clinical validation of the quality of life inventory. A measure of life satisfaction for use in treatment planning and outcome assessment. *Psychological Assessment*, 4, 92–101.
- Goodwin, R. D., & Gotlib, I. H. (2004). Gender differences in depression: The role of personality factors. *Psychiatry Research*, 126, 135–142.
- Hammen, C. (1991). Generation of stress in the course of unipolar depression. *Journal of Abnormal Psychology*, 100, 555–561.
- Hammen, C. (2005). Stress and depression. *Annual Review of Clinical Psychology*, 1, 293–319.
- Hammen, C. (2006). Stress generation in depression: Reflections on origins, research, and future directions. *Journal of Clinical Psychology*, 62, 1065–1082.

- Hayes, A. F., & Preacher, K. J. (2013). Statistical mediation analysis with a multicategorical independent variable. *British Journal of Mathematical and Statistical Psychology*. <http://dx.doi.org/10.1111/bmsp.12028>.
- Hertzog, C., Van Alstine, J., Usala, P. D., Hultsch, D. F., & Dixon, R. (1990). Measurement properties of the Center for Epidemiological Studies Depression Scale (CES-D) in older populations. *Psychological Assessment: A Journal of Consulting and Clinical Psychology*, 2, 64–72.
- Hill, P. L., Nickel, L. B., & Roberts, B. W. (2013). Are you in a healthy relationship?: Linking conscientiousness to health via implementing and immunizing behaviours. *Journal of Personality*.
- Hox, J. J. (2000). Multilevel analysis of grouped and longitudinal data. In T. D. Little, K. U. Schnabel, & J. Baumert (Eds.), *Modeling longitudinal and multilevel data: Practical issues, applied approaches, and specific examples* (pp. 15–32). Mahwah, NJ: Erlbaum.
- Hudson, N. W., Roberts, B. W., & Lodi-Smith, J. (2012). Personality trait development and social investment in work. *Journal of Research in Personality*, 46, 334–344.
- Jensen-Campbell, L. A., & Malcolm, K. T. (2007). The importance of conscientiousness in adolescent interpersonal relationships. *Personality and Social Psychology Bulletin*, 33(3), 368–383.
- Judge, T. A., & Ilies, R. (2002). Relationship of personality to performance motivation: A meta-analytic review. *Journal of Applied Psychology*, 87, 797–807.
- Kendler, K. S., Gardner, C. O., & Prescott, C. A. (2003). Personality and the experience of environmental adversity. *Psychological Medicine*, 33, 1193–1202.
- Kendler, K. S., Gatz, M., Gardner, C. O., & Pedersen, N. L. (2006). Personality and major depression: A Swedish longitudinal, population-based twin study. *Archives of General Psychiatry*, 63, 1113–1120.
- 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.
- Koorevaar, A. M. L., Comijs, H. C., Dhondt, A. D. F., van Marwijk, H. W. J., van der Mast, R. C., Naarding, P., et al. (2013). Big Five personality and depression diagnosis, severity and age of onset in older adults. *Journal of Affective Disorders*, 151, 178–185.
- Kotov, R., Gamez, W., Schmidt, F., & Watson, D. (2010). Linking “big” personality traits to anxiety, depressive, and substance use disorders: A meta-analysis. *Psychological Bulletin*, 136, 768–821.
- Lachman, M. E., & Bertrand, R. B. (2001). Personality and the self in midlife. In M. E. Lachman (Ed.), *Handbook of midlife development* (pp. 279–309). New York: John Wiley & Sons.
- Lahey, B. B. (2009). Public health significance of neuroticism. *American Psychologist*, 64, 241–256.
- Letzring, T. D., Edmonds, G. W., & Hampson, S. E. (2014). Personality change at mid-life is associated with changes in self-rated health: Evidence from the Hawaii Personality and Health Cohort. *Personality and Individual Differences*, 58, 60–64.
- Littlefield, A. K., Sher, K. J., & Wood, P. K. (2009). Is “maturing out” of problematic alcohol involvement related to personality change? *Journal of Abnormal Psychology*, 118, 360–374.
- Lucas, R. E., & Donnellan, M. B. (2009). Age differences in personality: Evidence from a nationally representative Australian sample. *Developmental Psychology*, 45, 1353.
- Lucas, R. E., & Donnellan, M. B. (2011). Personality development across the life span: Longitudinal analyses with a national sample from Germany. *Journal of Personality and Social Psychology*, 101, 847–861.
- Magnus, K., Diener, E., Fujita, F., & Pavot, W. (1993). Extraversion and neuroticism as predictors of objective life events: A longitudinal analysis. *Journal of Personality and Social Psychology*, 65, 1046–1053.
- Matthews, G., & Deary, I. J. (1998). *Personality traits*. Cambridge University Press.
- McArdle, J. J. (2009). Latent variable modeling of differences and changes with longitudinal data. *Annual Review of Psychology*, 60, 577–605.
- McCrae, R. R., & Costa, P. T. (1991). Adding Liebe und Arbeit: The full five-factor model and well-being. *Personality and Social Psychology Bulletin*, 17, 227–232.
- McCrae, R. R., & Costa, P. T. Jr. (1999). A five-factor theory of personality. In L. Pervin & O. John (Eds.), *Handbook of personality: Theory and research* (pp. 139–153). New York: Guilford Press.
- Moffitt, T. E., Arseneault, L., Belsky, D., Dickson, N., Hancox, R. J., Harrington, H., et al. (2011). A gradient of childhood self-control predicts health, wealth, and public safety. *Proceedings of the National Academy of Sciences*, 108, 2693–2698.
- Mroczek, D. K., & Kolarz, C. M. (1998). The effect of age on positive and negative affect: A developmental perspective on happiness. *Journal of Personality and Social Psychology*, 75, 1333–1349.
- Mroczek, D. K., & Spiro, A. (2007). Personality change influences mortality in older men. *Psychological Science*, 18, 371–376.
- Mroczek, D. K., Spiro, A., & Turiano, N. A. (2009). Do health behaviors explain the effect of neuroticism on mortality? Longitudinal findings from the VA Normative Aging Study. *Journal of Research in Personality*, 43, 653–659.
- Murphy, M. L., Miller, G. E., & Wrosch, C. (2012). Conscientiousness and stress exposure and reactivity: A prospective study of adolescent females. *Journal of Behavioral Medicine*, 36, 153–164.
- Poulton, R. G., & Andrews, G. (1992). Personality as a cause of adverse life events. *Acta Psychiatrica Scandinavica*, 85, 35–38.
- Radloff, L. S. (1977). The CES-D scale a self-report depression scale for research in the general population. *Applied Psychological Measurement*, 1, 385–401.
- RAND HRS Data, Version L. Produced by the RAND Center for the Study of Aging, with funding from the National Institute on Aging and the Social Security Administration. Santa Monica, CA (November 2011).
- Richardson, M., & Abraham, C. (2009). Conscientiousness and achievement motivation predict performance. *European Journal of Personality*, 23, 589–605.
- Roberts, B. W. (2009). Back to the future: Personality and assessment and personality development. *Journal of Research in Personality*, 43, 137–145.
- Roberts, B. W., Jackson, J. J., Fayard, J. V., Edmonds, G. W., & Meints, J. (2009). Conscientiousness. In M. R. Leary & R. H. Hoyle (Eds.), *Handbook of individual differences in social behavior* (pp. 369–381). New York: Guilford Press.
- Roberts, B. W., & Mroczek, D. (2008). Personality trait change in adulthood. *Current Directions in Psychological Science*, 17, 31–35.
- Roberts, B. W., Walton, K. E., & Viechtbauer, W. (2006). Patterns of mean-level change in personality traits across the life course: A meta-analysis of longitudinal studies. *Psychological Bulletin*, 132, 1–25.
- Roberts, B. W., Wood, D., & Smith, J. L. (2005). Evaluating five factor theory and social investment perspectives on personality trait development. *Journal of Research in Personality*, 39, 166–184.
- Shea, M. T., Widiger, T. A., & Klein, M. H. (1992). Comorbidity of personality disorders and depression: Implications for treatment. *Journal of Consulting and Clinical Psychology*, 60, 857–868.
- Smith, T. W., & Gallo, L. C. (2001). Personality traits as risk factors for physical illness. In A. Baum, T. Revenson, & J. Singer (Eds.), *The handbook of health psychology* (pp. 139–174). Hillsdale, NJ: Erlbaum.
- Soto, C. J., John, O. P., Gosling, S. D., & Potter, J. (2011). Age differences in personality traits from 10 to 65: Big Five domains and facets in a large cross-sectional sample. *Journal of Personality and Social Psychology*, 100, 330–348.
- Specht, J., Egloff, B., & Schmukle, S. C. (2011). Stability and change of personality across the life course: The impact of age and major life events on mean-level and rank-order stability of the Big Five. *Journal of Personality and Social Psychology*, 101, 862–882.
- Srivastava, S., John, O. P., Gosling, S. D., & Potter, J. (2003). Development of personality in early and middle adulthood: Set like plaster or persistent change? *Journal of Personality and Social Psychology*, 84, 1041–1053.
- Steel, P., Schmidt, J., & Shultz, J. (2008). Refining the relationship between personality and subjective well-being. *Psychological Bulletin*, 134, 138–161.
- Steunenberg, B., Braam, A. W., Beekman, A. T., Deeg, D. J., & Kerkhof, A. J. (2009). Evidence for an association of the Big Five personality factors with recurrence of depressive symptoms in later life. *International Journal of Geriatric Psychiatry*, 24, 1470–1477.
- Sutin, A. R., Terracciano, A., Deiana, B., Naitza, S., Ferrucci, L., Uda, M., et al. (2010). High neuroticism and low conscientiousness are associated with interleukin-6. *Psychological Medicine*, 40, 1485–1493.
- Takahashi, Y., Edmonds, G. W., Jackson, J. J., & Roberts, B. W. (2013). Longitudinal correlated changes in conscientiousness, preventative health-related behaviors, and self-perceived physical health. *Journal of Personality*.
- Turiano, N. A., Pitzer, L., Armour, C., Karlamangla, A., Ryff, C. D., & Mroczek, D. K. (2012). Personality trait level and change as predictors of health outcomes: Findings from a national study of Americans (MIDUS). *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 67, 4–12.
- Wagerman, S. A., & Funder, D. C. (2007). Acquaintance reports of personality and academic achievement: A case for conscientiousness. *Journal of Research in Personality*, 41, 221–229.
- Weber, K., Giannakopoulos, P., Bacchetta, J. P., Quast, S., Herrmann, F. R., Delajoye, C., et al. (2012). Personality traits are associated with acute major depression across the age spectrum. *Aging & Mental Health*, 16, 472–480.
- Weiss, A., Bates, T. C., & Luciano, M. (2008). Happiness is a personal (ity) thing: The genetics of personality and well-being in a representative sample. *Psychological Science*, 19, 205–210.
- Weiss, A., Sutin, A. R., Duberstein, P. R., Friedman, B., Bagby, R. M., & Costa, P. T. Jr. (2009). The personality domains and styles of the five-factor model are related to incident depression in Medicare recipients aged 65 to 100. *The American Journal of Geriatric Psychiatry: Official Journal of the American Association for Geriatric Psychiatry*, 17, 591–601.
- Widiger, T. A., & Trull, T. J. (1992). Personality and psychopathology: An application of the five-factor model. *Journal of Personality*, 60, 363–393.
- Wothke, W. (2000). Longitudinal and multi-group modeling with missing data. In T. D. Little, K. U. Schnabel, & J. Baumert (Eds.), *Modeling longitudinal and multilevel data: Practical issues, applied approaches, and specific examples* (pp. 219–240). Mahwah, NJ: Erlbaum.
- Wright, A. G., Pincus, A. L., & Lenzenweger, M. F. (2012). A parallel process growth model of avoidant personality disorder symptoms and personality traits. *Personality Disorders: Theory, Research, and Treatment*, 4, 230–238.
- Zellars, K. L., Perrewé, P. L., Hochwarter, W. A., & Anderson, K. S. (2006). The interactive effects of positive affect and conscientiousness on strain. *Journal of Occupational Health Psychology*, 11, 281–289.
- Zimprich, D., Allemand, M., & Lachman, M. E. (2012). Factorial structure and age-related psychometrics of the MIDUS personality adjective items across the life span. *Psychological Assessment*, 24, 173–186.