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Interrelations Between Daily Stress Processes and Big Five Personality Trait Changes Over 20 Years

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Personality is characterized by continuity and the capacity to change across the lifespan. Integrative personality frameworks imply that variability in daily life experiences has the potential to evoke longer term changes in personality over time. However, strong tests of this assumption across the adult lifespan are relatively rare. We examined the interrelations between changes in daily stress reactivity and changes in Big Five personality traits over a nearly 20-year period. Three measurement bursts from the National Study of Daily Experiences ($N = 2,022$; 55% female) each included daily measures of stressor exposure and negative affect across eight consecutive days (yielding 33,942 days of data across 18 years of adulthood). At each wave, participants reported on their personality traits (i.e., openness, conscientiousness, extraversion, agreeableness, neuroticism). Multilevel structural equation modeling simultaneously modeled stress reactivity at Level 1; longitudinal changes in stress reactivity at Level 2; and the interrelations between changes in stress reactivity and changes in personality traits at Level 3. Higher reactivity at baseline was associated with lower levels of extraversion and conscientiousness and higher levels of neuroticism at baseline. Further, increases in reactivity across the 18-year period were associated with declines in extraversion, agreeableness, and openness. Changes in reactivity were not related to changes in neuroticism or conscientiousness. These findings clarify how changes in daily experiences are related to broader personality changes and inform integrative frameworks of personality development across the adult lifespan.

Public Significance Statement

Frameworks explaining why personality changes across the lifespan often rely on theorizing about how things that happen daily trickle up to change people psychologically over the long term. Although people became less reactive to stress over a 20-year period, increases in this reactivity were associated with declines in extraversion, agreeableness, and openness to experience. Findings here constitute some of the first long-term tests of integrative personality frameworks and provide several directions for future research on how and why personality changes across the lifespan.

Keywords: multilevel structural equation modeling, stress reactivity, personality traits, intraindividual variability, measurement burst

Personality can be characterized as having both continuity and the capacity to change across the lifespan (Hooker & McAdams, 2003). The sources of personality changes are debated, with much attention paid to life events and environmental circumstances as catalysts of change (Bleidorn et al., 2018; Roberts & Mroczek, 2008). Implied within these frameworks is that variability in daily life experiences has the potential to evoke longer term changes in personality over time (Wrzus & Roberts, 2017; Wrzus et al., 2016). In other words, daily experiences over long periods of time might "trickle up" to engender long-term personality changes. Although these frameworks make intuitive sense and can be appealing, strong tests of this assumption (that daily experiences are linked to longer term psychological change) are relatively rare, particularly over more extended periods (Cerino, Charles, Mogle, et al., 2024; Cerino, Charles, Piazza, et al., 2024). In the present study, we examined interrelations between changes in daily stress reactivity and changes in Big Five personality traits in a three-wave burst design over a nearly 20-year period.

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Data and study materials are publicly available at the following website at https://www.icpsr.umich.edu/web/ICPSR/series/203. Study analysis code can be found at https://osf.io/rn46p; study materials are publicly available via the Midlife in the United States (MIDUS) and Inter-university Consortium for Political and Social Research websites. This study design and analytic plans were not preregistered. The ideas and data appearing in the article have not been disseminated before (e.g., at a conference or meeting, posted on a listserv, shared on a website). The authors have no conflicts of interest to report.

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continued

Personality Development and Sources of Change

The Big Five personality traits are composed of openness to experience (e.g., intellectually curious, imaginative, and artistic), conscientiousness (e.g., organized, goal-oriented, and self-disciplined), extraversion (e.g., more sociable, active, and adventurous), agreeableness (e.g., trusting, altruistic, and accommodating), and neuroticism (e.g., tendency to worry, feel anxious, and be prone to experiencing depressive symptoms; John & Srivastava, 1999). Each of these traits holds relevance for understanding individual differences in personal and interpersonal outcomes (e.g., health, mortality, social engagement) across the lifespan (Atherton et al., 2014; Ozer & Benet-Martínez, 2006). Dynamic theories of personality development situate personality traits within integrative frameworks of structures (e.g., traits) and processes (e.g., states; Hooker & McAdams, 2003; Noftle & Fleeson, 2014). Together, these characteristics inform intraindividual variability in personality that manifests in everyday life as well as macrolevel intraindividual change in personality that operates across the lifespan. The present study examined the capacity for co-occurring intraindividual changes in personality processes (i.e., daily stress reactivity) and structures (i.e., "Big Five" traits) across adult development and aging.

More broadly, when theorizing about how and why personality changes in the aforementioned framework, many suggestions have been offered (Bleidorn et al., 2022; Roberts & Mroczek, 2008). Of course, individual differences in personality are often driven by enduring biological factors that promote continuity and change over time (Briley & Tucker-Drob, 2014; McCrae et al., 2000). Some have also provided explanations centering around the observation that people often shift toward more "mature" personality characteristics (i.e., the maturity principle; Roberts & Nickel, 2021; Specht et al., 2014) or seek out and interpret environments that reinforce and promote stability in personality (i.e., the correspondence principle; Roberts & DelVecchio, 2000). Whether these processes are initiated or maintained through volitional efforts, social investments, exogenous shocks or life events, or biological/physiological changes is the subject of much work (Bleidorn et al., 2013, 2018; Edmonds et al., 2008; Haehner et al., 2023; Hudson et al., 2019; Jayawickreme et al., 2021; Roberts & Jackson, 2008; Stieger et al., 2021; Terracciano et al., 2005). In the past decade or so, personality psychologists have developed more contextualized models of personality development that have helped the field gain a broader appreciation for how people's daily experiences can predict variation in personality traits.

Specifically, the triggering situations, expectancy, states/state expressions, and reactions (TESSERA) framework makes several predictions about how more short term or momentary situations, expectancies, states, and reactions have the potential to spur longer term personality development (Quintus et al., 2021; Wrzus, 2021; Wrzus & Roberts, 2017). Briefly, triggering situations in momentary and daily life provide people the opportunity to have expectancies and experience different types of states that may or may not be consistent with their personalities. Repeated expressions of particular thoughts, feelings, behaviors, and reactions to these situations are thought to trickle up and affect longer term personality change, often through positive reinforcement or external feedback. These short-term variations are also thought to transfer into long-term personality development through associative processes (e.g., implicit learning and associations that are reinforced) and reflective processes (e.g., consciously thinking about these experiences, thoughts, feeling, and behavior, which might implicate assimilating/accommodating these experiences within a life story). To date, the TESSERA framework has helped explicate how short- and long-term variability in personality are linked and the contexts in which shifts in environmental conditions might engender psychological change.

Although the TESSERA framework offers a useful explanation for the sources of personality change, formal tests of the TESSERA framework over more extended periods are relatively rare. Of course, there is evidence to support various portions of the framework (van Zalk et al., 2020; Wrzus et al., 2016, 2021). For example, extraverted people find themselves in social situations more and interpret ambiguous situations in a more social light (Harari et al., 2020; Rauthmann et al., 2015). Likewise, personality predicts behavior in daily life and how people respond to different types of situations (Fleeson & Gallagher, 2009; Leger et al., 2016, 2021; Sherman et al., 2015). These findings are often interpreted with respect to personality exerting an essential influence in people's daily lives—guiding the situations they find themselves in and how they respond to those situations. In a recent study that leveraged daily diaries and personality changes over a 2-year period, Quintus et al. (2021) found that daily engagement in trait-relevant behavior was associated with longer term changes in conscientiousness, agreeableness, and extraversion (i.e., if a person frequently did more extraverted things daily, they became more extraverted over time). Although these tests provide important illustrations for how daily behavior might affect broader personality change, studies to date have often only followed people over a few months or a few years at most (Hudson et al., 2019, 2020; Quintus et al., 2021). Such a limitation is understandable and often acknowledged: it is difficult and costly to assess daily experiences in multiple bursts over long periods of a person's life. In the present study, we leveraged a data set that did just that. Specifically, we examined how variation in daily stress processes changed over 20 years of the adult lifespan and whether these changes in daily stress processes were associated with changes in Big Five personality traits.

Daily Stress Reactivity and Links With Personality

Daily stress reactivity is often operationalized as daily within-person associations between stress exposure and negative affect. Negative affect is higher on days when an individual is exposed to a

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stressor than stressor-free days (Stawski et al., 2019). Greater stress reactivity is a risk factor for worse health outcomes across the lifespan, with past research demonstrating links between greater stress reactivity and increased risk of morbidity (Piazza et al., 2013), mortality (Mroczek et al., 2015), higher levels of inflammation (Sin et al., 2015), poorer sleep efficiency (Ong et al., 2013), and more affective disorders (Charles et al., 2013; Stawski et al., 2023). This past work uses the same data set as the present study, the National Study of Daily Experiences (NSDE), to evaluate how daily processes may inform concurrent and long-term health outcomes. However, most of this research leverages one wave of stress reactivity data, limiting capacity to evaluate changes in stress reactivity across waves of assessment. Recent work has evaluated developmental trajectories of stress reactivity across 18 years using all three waves of daily diary data (Almeida et al., 2023). In this work, younger adults exhibited declines in stress reactivity, while people in midlife and older adulthood reported relatively stable levels of stress reactivity across time.

Emerging evidence suggests that changes in stress reactivity co-occur with changes in health and well-being (Rush et al., 2019, 2024). But no work has examined whether *changes* in stress reactivity co-occur with *changes* in personality traits over a comparable period of time. That is not to say that personality and daily stress experiences are unrelated though. Most research linking personality traits to daily stress processes focuses on neuroticism and conscientiousness and how these individual difference characteristics modulate responses to stress (Hooker et al., 2013; Leger et al., 2021; Mroczek & Almeida, 2004). People higher in neuroticism tend to exhibit higher levels of stress reactivity (Mroczek & Almeida, 2004), and mechanistic accounts point toward stress reactivity as a possible mediator explaining the links between neuroticism, conscientiousness, and health (Leger et al., 2021). Using three waves of the NSDE, Leger et al. (2021) found that higher levels of neuroticism at Wave 1 (~1995) were related to more stress reactivity at Wave 2 (~2005), which in turn was related to more chronic conditions and functional limitations at Wave 3 (~2015). Higher levels of conscientiousness at Wave 1 were also associated with less stress reactivity at Wave 2, which in turn related to better physical health at Wave 3. In a 100-day microlongitudinal study, Hooker et al. (2013) found that links between personality traits and health and social goal progress depend on daily stress. Specifically, higher neuroticism was associated with more perceived stress and less goal progress on stressful days, and higher conscientiousness was generally associated with less perceived stress and more goal progress on stressful days. However, health-goal progress was hindered for people with high conscientiousness on days when they perceived more stress. This clarifies the value of examining the role of personality traits when studying daily stress processes and the synergies between traits and states when informing health and well-being across the lifespan. The present study extends this prior work to test whether changes in dynamic personality processes (i.e., stress reactivity) co-occur with changes in personality structures (i.e., traits).

The fact that personality traits are associated with the occurrence and experience of daily stressors is consistent with the broader TESSERA framework (Wrzus, 2021; Wrzus & Roberts, 2017). Specifically, people high in neuroticism and low in conscientiousness tend to experience greater situational reactivity in response to stress. But how do stress reactivity and personality traits change in concert with each other (if at all)? There are many frameworks in the adult development and gerontology literature that suggest people change how they manage their emotions and stress as they get older (e.g., Baltes & Baltes, 1990; Carstensen et al., 1999; Charles & Luong, 2013). In the context of the TESSERA framework, this might also have implications for how people's personalities change. We review two examples for how this might work for neuroticism and extraversion.

As people experience emotional regulatory gains across life, it is possible that this could translate to lower levels of neuroticism—a trait characterized by experiences of distress and emotional instability (Lahey, 2009). Notably, both stress-related reactivity and neuroticism changes tend to go in "the same direction," at least normatively—daily stress reactivity and neuroticism tend to decline across the lifespan (Almeida et al., 2023; Soto et al., 2011). In walking through the components of the TESSERA model, daily stressors might trigger a cascade of negative emotional and behavioral responses in people high in neuroticism (e.g., if they received critical feedback at work). One potential reason that daily stressors tend to elicit negative affect is that people high in neuroticism often *expect* stressors to be threatening or overwhelming—an expectancy component that amplifies state expressions of distress. This affective reactivity may also be moderated by how the stressor is appraised (e.g., as highly negative or uncontrollable; Wrzus, 2021; Wrzus & Roberts, 2017), shaping both the intensity and duration of emotional responses. It is likely that stressor leads highly neurotic people to perseverate and feel more negative affect (Mroczek & Almeida, 2004). However, as people age and their emotion regulation improves (Charles & Carstensen, 2010; Charles et al., 2023), people may start to anticipate how a stressor unfolds and develop useful coping strategies for dealing with it. These more adaptive expectancies (e.g., that the feedback does not define them as a person or that they can adjust their behavior to bring about better outcomes) may lead to changes in state expressions for neurotic people—they might not react as negatively to the stressor and their behavior might be altered (e.g., they may be less likely to catastrophize or react in maladaptive ways). This reaction is then reinforced through internal (e.g., they feel better) or external feedback (e.g., they have more positive relationships with coworkers). Finally, through repetition and reflecting on the experience and developing learned associations (e.g., if I do not catastrophize when my boss criticizes me, things work out), neuroticism might decline over time. However, these changes are only possible if situations and states/expectancies are trait-inconsistent. In other words, if neurotic people keep catastrophizing when stressful situations arise or do not develop associations with this new behavior that challenge their dispositions, their neuroticism might be reinforced and become more stable.

Extraversion is often characterized, at least partially, as the tendency to experience positive affect (Smillie et al., 2012; Srivastava et al., 2008). In the context of the TESSERA model, a daily stressor—particularly if there is a social element (e.g., giving a presentation in front of other people)—might be particularly stressful and draining for introverts. However, given gains in emotion regulation over time, introverts' expectancies might change based on experiences in which they received positive feedback or experiences that were not as evaluative as they thought. In turn, their state expressions and behaviors might also change, such that they speak up a little more or use more assertive speech or body language. Their negative reactivity might be further reduced as they seek out and have similar positive experiences (Schmidt & Fox, 1994), particularly if they reflect more on those experiences (e.g., that it

went well or they may begin to associate their more extraverted actions with positive outcomes). Repetition, reflections, and associative learning in the context of these interactions might eventually generalize into trait-level increases in extraversion over time. Conversely, if these situations consistently lead to trait-consistent reactions—such as negative self-evaluations or receiving critical feedback in response to a presentation—introverted tendencies may be reinforced or stabilized. This is consistent with the flipside as well, such that extraverts' positive affect and well-being are often driven by their more frequent socializing, particularly if those interactions are reward-based (a type of positive reinforcement; Smillie et al., 2012; Srivastava et al., 2008).

The Present Study

In the present study, we examined the interrelations between changes in daily stress reactivity and changes in Big Five personality traits in a three-wave burst design over a nearly 20-year period. Drawing on the TESSERA framework (Wrzus, 2021), we thought that daily processes and longer term personality changes would be associated with each other, likely through situation selection, expectancies, state expressions, and reactions. We used data from the MIDUS NSDE, which constituted three bursts (and broader surveys) three times from 1995/1996 to 2017/2019. We examined interrelations in starting levels and changes in daily stress processes and Big Five personality traits with a bivariate growth curve model in the context of a multilevel structural equation model, as a partial reproduction and extension of previous work on personality and daily stressful experiences in the NSDE (Leger et al., 2016, 2021).

Method

Transparency and Openness

Data are publicly available via the Inter-university Consortium for Political and Social Research website (Ryff et al., 2019). All analyses were completed using Mplus Version 8.10 (Muthén & Muthén, 2022). We used all available data (thus there was no a priori sample size planned or stopping rule), and no exclusions were made. Study analysis code can be found at the OSF page for the study; study materials are publicly available via the MIDUS and Inter-university Consortium for Political and Social Research websites. This study design and analytic plans were not preregistered. This study was approved by the Institutional Review Board of the University of Wisconsin; all respondents consented to their participation.

Using Monte Carlo simulations, we examined the power to detect long-term change in stress reactivity and for changes in stress reactivity to predict intercepts and changes in personality. Based on these simulations, with 33,600 days of daily diary data across three bursts, we can detect a small main effect of change (.002 units/year) in daily stress processes (e.g., stressor reactivity). There was also sufficient power (>.80) to use change in stressor reactivity as a significant predictor of personality traits.

Participants and Procedure

We used data from the Midlife in the United States (MIDUS) project (Ryff et al., 2019), a publicly available data set consisting of multiple subprojects using a large representative sample of American adults ($N_{\text{Individuals}}$ = 2,880; $N_{\text{DailyReports}}$ = 33,942; M_{age} = 47.02, SD = 12.60; range = 24–74 at baseline; 55% female). The MIDUS project incorporates a large-scale longitudinal panel design, where participants completed three waves of a comprehensive survey on their health and well-being at approximately 9-year intervals, starting in 1995/1996 and ending in 2017/2019. A random subset of these participants was invited to participate in the National Study of Daily Experiences (NSDE). Individuals who agreed to participate responded to end-of-day telephone interviews for eight consecutive days that assessed daily levels of stress and affect (see Almeida, 2005; Almeida et al., 2009, for a detailed description of the data collection). Participants provided their informed consent for each portion of the MIDUS project. Additional details, including ethical review procedures implemented by the original study team and a full list of publications using the data, can be found at the MIDUS website at https://midus.wisc.edu/. The data featured here constitute a novel contribution not subsumed by previous publications using the MIDUS data.

NSDE Daily Diary Measures

Negative Affect

Daily negative affect was assessed at each wave of the NSDE data collections. Across eight consecutive days, participants were presented with a list of six negative emotions (*fidgety*, *nervous*, *worthless*, *so sad that nothing could cheer you up*, *everything was an effort*, and *hopeless*; Mroczek & Kolarz, 1998) and asked to indicate how frequently they felt each emotion in the past 24 hr. Responses ranged from 0 (*none of the time*) to 4 (*all of the time*). Daily negative affect scores were computed by averaging across the items for each day. Multilevel omegas estimated within- and between-person reliability (see Geldhof et al., 2014). Within-person reliability estimates were .60, .58, and .54 and between-person reliability were .81, .82, and .82 for Bursts 1, 2, and 3, respectively. Prior work has affirmed the one-factor structure of negative affect at both the within- and between-person levels (Rush & Hofer, 2014).

Daily Stressors

Daily stressors were assessed using a semistructured interview using the Daily Inventory of Stressful Events (Almeida et al., 2002). The Daily Inventory of Stressful Events was designed to capture a broad array of stressors and event types, and a major strength of the measure is that it does so without specifically capturing mood-related or resource risk outcomes as stressor events (i.e., the stress response, which would ideally be measured separately from the stressor measure). The inventory consisted of six questions inquiring whether certain types of stressors had been experienced in the past 24 hr (e.g., "In the past 24 hr, did you have an argument or disagreement with anyone?"). A dichotomous variable was used to characterize days as either stress days (at least one stressor was reported) or nonstress days (no stressor reported). A daily stressor was reported on approximately 40% of days during the three bursts.

MIDUS Survey Measures

Personality Traits

At Waves 1, 2, and 3 of the MIDUS survey, participants reported on their personality traits by responding to adjectives describing each of the "Big Five" personality traits (Prenda & Lachman, 2001) developed from existing personality-trait inventories (Lachman & Weaver, 1997). Participants were asked to report how much each of the following adjectives described them on a scale from 1 (*not at all*) to 4 (*a lot*): "organized," "responsible," "hardworking," and "careless" (conscientiousness); "moody," "worrying," "nervous," and "calm" (neuroticism); "outgoing," "friendly," "lively," "active," and "talkative" (extraversion); "creative," "imaginative," "intelligent," "curious," "broad-minded," "sophisticated," and "adventurous" (openness); and "helpful," "warm," "caring," "softhearted," and "sympathetic" (agreeableness). Mean scores were calculated for the averages of each trait after reverse-scoring appropriate items.

Covariates

Participant age at Wave 1, sex, and education were included as covariates to adjust for sample heterogeneity. Age at Wave 1 was centered at the sample minimum age in all statistical models. Sex was coded with males as the reference category (0 = *male*, 1 = *female*). Education was coded as a binary variable (0 = *high school degree or less*, 1 = *some college* or more).

Analytic Strategy

A multilevel structural equation modeling (MSEM) framework that combines features of multilevel modeling and structural equation modeling was used. This approach handled the hierarchically structured data from the measurement burst design and permitted a multivariate examination of time-varying relationships between stress reactivity and personality across time-scales and levels of analysis (Asparouhov & Muthén, 2009; Preacher et al., 2010; Rush et al., 2024). An important feature of the MSEM approach is that random effects at each level can be modeled as either exogenous or endogenous variables at subsequent levels of analysis. That is, the latent random slopes (i.e., the deviation of individual stress reactivity scores from the overall group mean of stress reactivity) can be specified to represent individual differences in the within-person associations, and these individual differences can be included as predictors of outcomes (i.e., personality traits). Furthermore, the current measurement burst design that assesses individuals across multiple time-scales can be modeled in a manner that permits random effects from lower levels of analysis to also be specified as random effects at subsequent levels, linking change processes across time-scales.

The current research capitalizes on this flexibility by specifying daily within-burst associations between stress and negative affect as a random slope that may also change within individuals over longer intervals of time (i.e., across bursts). The long-term change in the random short-term association can further be specified as a random slope, permitting individual differences in the magnitude of change in reactivity to daily stressors across 18 years of adulthood. Within the MSEM, a latent growth curve model was simultaneously estimated to capture individual levels and changes in personality, and the extent that long-term changes in daily stress reactivity were associated with these changes in personality across 18-years of adulthood. Daily measurement occasions were nested within measurement bursts, and measurement bursts were nested within people, resulting in three levels of analysis. Model specification for each level of analysis is described next, and the full model is depicted in Figure 1.

Within-Burst (Level 1)

At the within-burst level, daily stressor exposure$_{ijk}$ was included as a predictor of daily levels of negative affect (NA)$_{ijk}$. The subscript *ijk* in Figure 1 indicates that both stressor exposure and NA could vary across days (*k*), measurement bursts (*j*), and individuals (*i*). Stress reactivity was modeled as the daily within-person association between stressor exposure and NA. Because stressor exposure was a dichotomous variable, stress reactivity can be defined as the difference in NA on stressor days compared with nonstressor days. This daily within-person association between stressor exposure and NA (i.e., stress reactivity) was modeled as a random slope and thus was permitted to vary across bursts and individuals. That is, the strength of the daily stressor–NA association could differ across bursts within an individual, as well as across individuals.

Between-Burst (Level 2)

At the between-burst level of analysis, the random stress reactivity$_{ij}$ slope was modeled as a latent endogenous variable that varies across bursts and individuals. Burst-level NA$_{ij}$ was also modeled as a latent endogenous variable representing the mean NA for person *i* during burst *j*. A burst$_{ij}$ variable (Burst 1 = 0; Burst 2 = 1; Burst 3 = 2) was included as a predictor of both burst-level NA$_{ij}$ and stress reactivity$_{ij}$ to examine whether there was a within-person change across bursts in the level of NA or the strength of the daily stressor-NA association, respectively. Because there were three bursts (and three waves), we were only able to model linear changes in stress reactivity (and personality change; see below). The long-term change in stress reactivity across bursts was modeled as a random slope, permitting individual differences in the magnitude of change in daily stress reactivity across bursts. That is, modeling whether some individuals differed in how much their stress reactivity changed across the 18 years from Burst 1 to Burst 3. "Burst mean stress," which is the proportion of burst-specific stressor days for individual *i* during burst *j*, was also included as a covariate of burst-level NA$_{ij}$ to adjust for differences in burst-level stressor exposure (cf. Rush et al., 2019 for a more detailed description of the model specification).

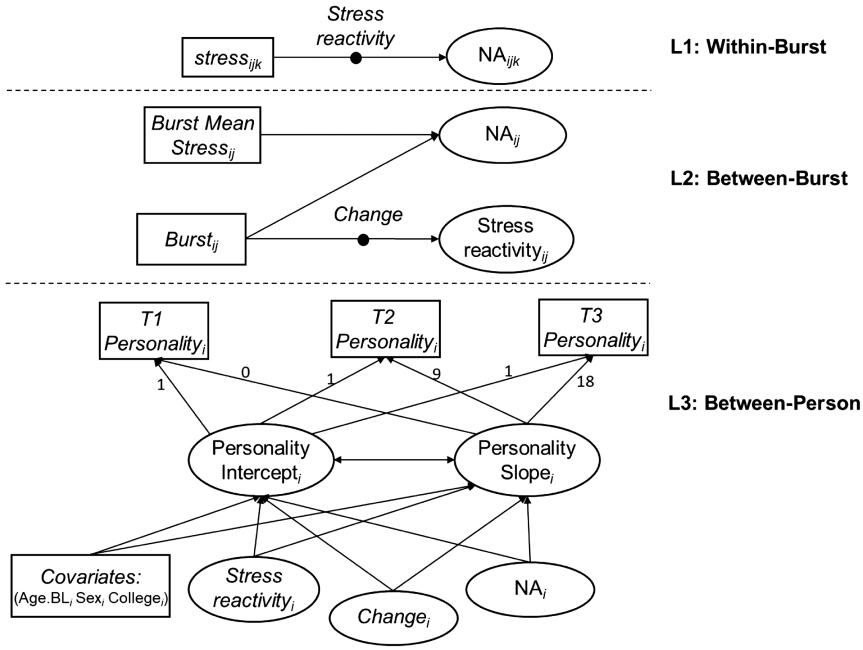
Between-Person (Level 3)

Individual differences in stress reactivity$_i$ and the magnitude of long-term changes in stress reactivity (i.e., change$_i$) were modeled as latent slopes. Thus, they are estimated from the model and reflect the strength of the daily stress reactivity association at baseline (i.e., when burst = 0) and the amount of *change* in stress reactivity, respectively, for individual *i*. NA$_i$ was modeled as a latent mean that reflects average levels of NA for individual *i* across days and bursts.

To model long-term personality changes, we specified a latent growth curve model at Level 3 (see Figure 1). The latent growth

Figure 1

Three-Level Structural Equation Model Predicting Longitudinal Changes in Personality



Note. Daily assessments are nested within-bursts and bursts of measurements are nested within people. Ovals indicate variables that were estimated within the model. Black dots indicate that pathway was modeled as a random slope. NA = negative affect; stress = stress exposure day; Age.BL = age at baseline; L = level; T = time.

curve specified a latent intercept (i.e., Personality Intercept$_i$) and slope (i.e., Personality Slope$_i$) for levels of personality and changes in personality across the three waves of data (18 years) by loading onto the observed personality variables at each wave. The time metric was centered such that the 0 value represented baseline levels of personality (at Wave 1).

Individual differences in (a) stress reactivity at Burst 1, (b) the magnitude of changes in stress reactivity across 18 years, and (c) mean levels of NA were used to predict individual differences in changes in each of the Big Five personality traits across 18 years; as well as estimated levels of personality at Wave 1. A set of observed covariates was included to adjust for the effects of Wave 1 age, sex, and education on baseline levels and changes in personality. All models were estimated in Mplus Version 8.10 (Muthén & Muthén, 2022) using the Bayes estimator with uninformed priors, two chains, and 50,000 iterations. These models permit effects to be estimated simultaneously and make use of all available data. Common global fit indices are not available when estimating three-level random effects models using the Bayes estimator in Mplus.

Results

Table 1 provides descriptive statistics for primary study variables. Intraclass correlation coefficients from unconditional models showed significant between-person and within-person variation in daily NA and stress reactivity. Each Big Five personality trait was examined in separate models, and the estimates from the full MSEMs are presented in Table 2.

Daily Stress Reactivity Over Time

Consistent with previous studies (Almeida et al., 2023; Rush et al., 2024), there was a significant within-burst effect of stress reactivity (i.e., the level 1 association of stress exposure predicting NA; *Estimate* = 0.14, *pSD* = .006, $p < .001$, CrI_{95} [0.13, 0.16]) and a significant change in stress reactivity across bursts over 18 years. On days when an individual experienced a stressor, their negative affect was higher than nonstressor days. Furthermore, the average individual declined in stress reactivity over the 18 years (stress reactivity change *Estimate* = −0.02, *pSD* = .005, $p < .001$, CrI_{95} [−0.03, −0.01]). This indicated that the magnitude of the within-burst association between daily stress exposure and NA decreased longitudinally. Though the average person became less reactive to daily stressors as they aged, there was also significant between-person variation in the degree of change in stress reactivity across bursts (see between-person random effects estimate of stress reactivity change in Table 2). Specifically, some individuals were stable or becoming *more* reactive to daily stressors as they aged. The within-burst (Level 1) and between-burst (Level 2) effects of stress reactivity and stress reactivity change were consistent across all personality trait models.

Negative affect changes were positive and significant, which may be surprising at first. However, it is important to note that this effect

Table 1
Means and Standard Deviations of Study Variables

Variable	Wave 1 N = 1,499			Wave 2 N = 2,022			Wave 3 N = 1,176		
	M	*SD*	Range	*M*	*SD*	Range	*M*	*SD*	Range
Demographics									
Age	47.02	12.60	24–74	56.15	12.31	34–84	64.10	11.36	43–93
Female	0.55[a]	0.50	0–1						
Education	0.67	0.47	0–1						
Personality									
Agreeableness	3.48	0.48	1–4	3.45	0.49	1–4	3.44	0.49	1–4
Conscientiousness	3.44	0.44	1–4	3.46	0.44	1–4	3.46	0.46	1–4
Extraversion	3.21	0.56	1–4	3.12	0.57	1–4	3.10	0.57	1–4
Neuroticism	2.21	0.66	1–4	2.05	0.63	1–4	2.06	0.62	1–4
Openness	3.03	0.51	1–4	2.93	0.53	1–4	2.90	0.54	1–4
Burst-level variables									
Daily NA	0.19[b]	0.29	0–4	0.21[b]	0.28	0–4	0.17[b]	0.25	0–4
Daily stressor	0.40[c]	0.26	0–1	0.40[c]	0.27	0–1	0.39[c]	0.28	0–1

Note. NA = negative affect.
[a] Proportion of female participants. [b] Aggregated across daily assessments. [c] Proportion of stress days.

represents a *residual* change in negative affect after accounting for day-level and burst-level stress (and this is also different than the slope of stress reactivity over time, which was negative and more intuitive). Further, while recent evidence indicates that negative affect does decline on average across the lifespan, longitudinal changes in negative affect may have different patterns than cross sectional age-differences in negative affect (see Charles et al., 2023).

Longitudinal Trajectories of Personality Traits

Longitudinal changes in personality across the 18-year follow-up varied by personality trait. Individuals were stable over time in agreeableness, conscientiousness, and neuroticism (ps > .24; see Table 2 Personality Slope). Conversely, individuals displayed significant linear declines in extraversion (Estimate = −0.013, pSD = .004, p < .001, CrI_{95} [−0.019, −0.004]) and openness to experience (Estimate = −0.015, pSD = .005, p < .001, CrI_{95} [−0.025, −0.007]), indicating that the average person became less extraverted and less open to experiences as they aged. There were also significant individual differences in each of the Big Five traits.

Baseline Associations Between Stress Reactivity and Personality Traits

Individual differences in stress reactivity at baseline significantly predicted baseline personality in three of the five personality trait models. Individuals who were initially more reactive to daily stressors were lower in conscientiousness (Estimate = −0.763, pSD = .267, p = .01, CrI_{95} [−1.325, −0.244]) and extraversion (Estimate = −0.911, pSD = .362, p < .001, CrI_{95} [−1.711, −0.264]) relative to those who were less reactive at baseline. Individuals more emotionally reactive to daily stressors had higher neuroticism (Estimate = 1.879, pSD = .636, p < .001, CrI_{95} [1.156, 3.710]) than those less reactive at baseline. Stress reactivity at baseline was not significantly associated with levels of agreeableness or openness.

Interrelations Between Changes in Stress Reactivity and Changes in Personality Traits

Long-term changes in daily stress reactivity were associated with longitudinal changes in personality. As seen in Table 2 (see slope on stress reactivity change), individuals who were becoming more emotionally reactive to daily stressors as they aged were also becoming less agreeable (Estimate = −0.187, pSD = .059, p < .01, CrI_{95} [−0.271, −0.039]), extraverted (Estimate = −0.242, pSD = .095, p < .01, CrI_{95} [0.396, −0.053]), and open (Estimate = −0.336, pSD = .059, p < .001, CrI_{95} [−0.434, −0.209]) relative to those who were stable or becoming less reactive as they aged. These results can be seen in Figure 2A (for agreeableness), 2B (for extraversion), and 2C (for openness). Changes in stress reactivity were not associated with changes in neuroticism or conscientiousness.

Stress reactivity levels at baseline did not uniquely account for personality changes (Table 2, slope on stress reactivity). Personality at baseline was largely unrelated to changes in stress reactivity (Table 2, int on stress reactivity change). Thus, after accounting for changes in stress reactivity, those who were more reactive initially did not differ in their rates of change in personality relative to those who were less reactive at baseline.

Covariates

Regarding covariates, older participants tended to be more agreeable and less neurotic, on average. They also tended to decline in conscientiousness over time. On average, women reported higher levels of agreeableness, conscientiousness, extraversion, neuroticism, and lower levels of openness to experience. Women also tended to decline in conscientiousness over time. Compared with people with a high school diploma or less, those with at least some college education reported lower levels of neuroticism and higher levels of openness to experience, on average. Demographic characteristics were otherwise not significantly related to intercepts and slopes of stress reactivity and personality.

Table 2

Three-Level Structural Equation Modeling Analyses of the Effects of Daily Stress Reactivity on Personality

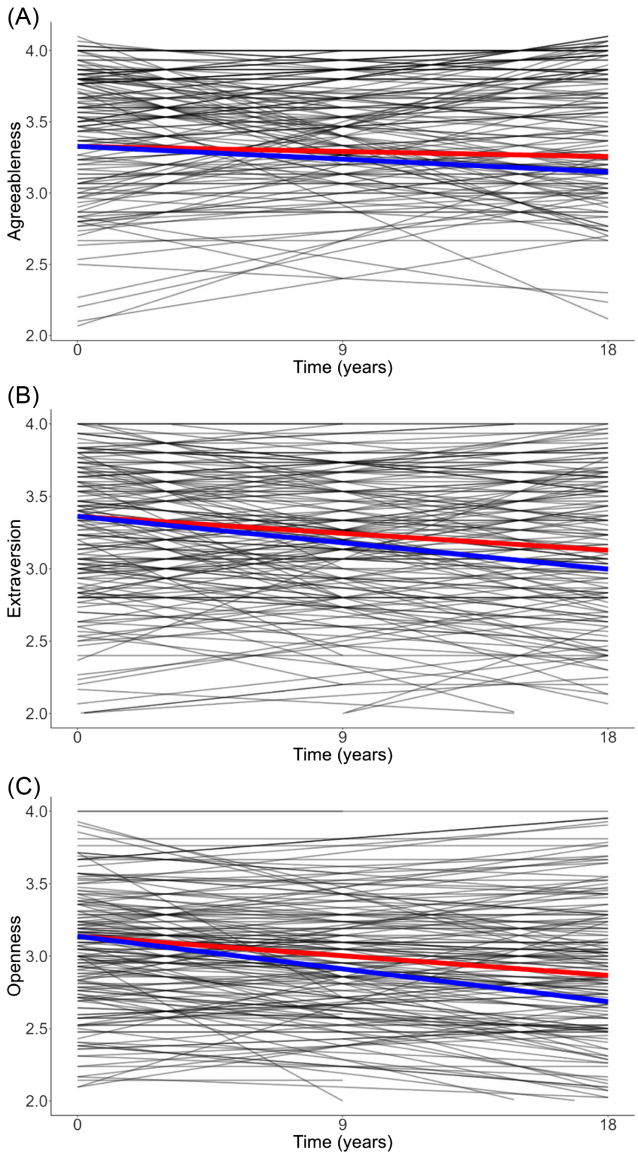
Variable	Agreeableness		Conscientiousness		Extraversion		Neuroticism		Openness to experience	
	Estimate (*pSD*)	95% CrI	Estimate (*pSD*)	95% CrI	Estimate (*pSD*)	95% CrI	Estimate (*pSD*)	95% CrI	Estimate (*pSD*)	95% CrI
Fixed effects										
Within-burst										
NA intercept	0.072 (0.008)***	[0.059, 0.088]	0.074 (0.008)***	[0.058, 0.090]	0.072 (0.008)***	[0.056, 0.087]	0.080 (0.008)***	[0.066, 0.096]	0.073 (0.008)***	[0.058, 0.089]
Baseline stress reactivity	0.141 (0.006)***	[0.129, 0.152]	0.140 (0.008)***	[0.125, 0.155]	0.140 (0.008)***	[0.125, 0.157]	0.140 (0.006)***	[0.128, 0.153]	0.143 (0.008)***	[0.127, 0.158]
Between-burst										
NA change	0.010 (0.004)*	[0.001, 0.017]	0.010 (0.004)**	[0.002, 0.019]	0.010 (0.004)**	[0.002, 0.019]	0.010 (0.004)**	[0.002, 0.017]	0.010 (0.004)*	[0.001, 0.018]
Stress reactivity change	−0.020 (0.005)***	[−0.029, −0.011]	−0.020 (0.007)***	[−0.034, −0.007]	−0.020 (0.007)***	[−0.036, −0.008]	−0.021 (0.005)***	[−0.031, −0.010]	−0.022 (0.007)***	[−0.034, −0.009]
Between-person predicting personality										
Personality intercept	3.328 (0.072)***	[3.204, 3.492]	3.488 (0.074)***	[3.299, 3.603]	3.361 (0.094)***	[3.165, 3.541]	2.028 (0.115)***	[1.765, 2.208]	3.137 (0.101)***	[2.970, 3.339]
Stress reactivity → Int	0.039 (0.261)	[−0.559, 0.541]	−0.763 (0.267)**	[−1.325, −0.244]	−0.911 (0.362)***	[−1.711, −0.264]	1.879 (0.636)***	[1.156, 3.710]	−0.543 (0.277)	[−1.071, 0.009]
Stress reactivity change → Int	0.765 (2.107)	[−2.856, 4.901]	−0.147 (2.194)	[−5.107, 3.296]	2.958 (2.453)	[−2.247, 7.113]	−0.152 (2.375)	[−5.052, 4.530]	6.184 (1.836)***	[2.566, 9.521]
NA → Int	−0.198 (0.007)**	[−0.352, −0.051]	−0.416 (0.070)***	[−0.551, −0.277]	−0.373 (0.092)***	[−0.552, −0.195]	1.153 (0.109)***	[0.938, 1.369]	−0.157 (0.081)*	[−0.313, −0.003]
Age → Int	0.013 (0.004)***	[0.006, 0.019]	0.003 (0.003)	[−0.004, 0.010]	0.003 (0.004)	[−0.006, 0.012]	−0.049 (0.005)***	[−0.059, −0.040]	−0.004 (0.004)	[−0.012, 0.004]
Sex → Int	0.264 (0.018)***	[0.229, 0.301]	0.124 (0.017)***	[0.092, 0.157]	0.096 (0.022)***	[0.054, 0.139]	0.107 (0.024)***	[0.059, 0.153]	−0.045 (0.020)*	[−0.085, −0.005]
Education → Int	−0.032 (0.021)	[−0.074, 0.005]	0.010 (0.018)	[−0.026, 0.045]	−0.012 (0.024)	[−0.060, 0.034]	−0.084 (0.026)***	[−0.135, −0.032]	0.213 (0.021)***	[0.173, 0.255]
Personality slope	−0.004 (0.004)	[−0.011, 0.003]	0.003 (0.004)	[−0.003, 0.012]	−0.013 (0.004)***	[−0.019, −0.004]	−0.002 (0.007)	[−0.015, 0.015]	−0.015 (0.005)***	[−0.025, −0.007]
Stress reactivity → slope	−0.013 (0.016)	[−0.043, 0.017]	0.010 (0.017)	[−0.030, 0.037]	0.021 (0.020)	[−0.020, 0.056]	−0.038 (0.028)	[−0.106, 0.011]	−0.011 (0.016)	[−0.041, 0.020]
Stress reactivity change → slope	−0.187 (0.059)**	[−0.271, −0.039]	−0.086 (0.093)	[−0.238, 0.094]	−0.242 (0.095)**	[−0.396, −0.053]	0.132 (0.183)	[−0.236, 0.407]	−0.336 (0.059)***	[−0.434, −0.209]
NA → slope	0.002 (0.005)	[−0.007, 0.013]	−0.014 (0.005)**	[−0.023, −0.004]	−0.017 (0.006)***	[−0.027, −0.006]	0.006 (0.008)	[−0.009, 0.021]	−0.007 (0.006)	[−0.019, 0.004]
Age → slope	0.000 (0.000)	[−0.001, 0.000]	−0.001 (0.000)***	[−0.002, −0.001]	0.000 (0.000)	[−0.001, 0.000]	0.000 (0.000)	[0.000, 0.001]	0.000 (0.000)	[0.000, 0.001]
Sex → slope	0.002 (0.001)	[−0.001, 0.004]	−0.002 (0.001)*	[−0.005, 0.000]	0.001 (0.001)	[−0.001, 0.004]	−0.001 (0.002)	[−0.004, 0.003]	0.001 (0.001)	[−0.001, 0.004]
Education → slope	−0.001 (0.001)	[−0.003, 0.002]	0.001 (0.001)	[−0.001, 0.004]	0.000 (0.001)	[−0.003, 0.002]	0.000 (0.002)	[−0.003, 0.004]	0.000 (0.001)	[−0.003, 0.002]
Random effects										
Within-burst NA	0.054 (0.000)	[0.053, 0.055]	0.054 (0.000)	[0.053, 0.055]	0.054 (0.000)	[0.053, 0.055]	0.054 (0.000)	[0.053, 0.055]	0.054 (0.000)	[0.053, 0.055]
Between-burst										
NA intercept	0.014 (0.001)	[0.012, 0.016]	0.014 (0.001)	[0.012, 0.016]	0.014 (0.001)	[0.012, 0.016]	0.014 (0.001)	[0.012, 0.016]	0.014 (0.001)	[0.012, 0.016]
Stress reactivity	0.024 (0.002)	[0.020, 0.028]	0.024 (0.002)	[0.020, 0.027]	0.024 (0.002)	[0.020, 0.028]	0.024 (0.003)	[0.019, 0.029]	0.024 (0.002)	[0.019, 0.028]
Between-person										
NA intercept	0.034 (0.002)	[0.031, 0.037]	0.034 (0.002)	[0.030, 0.037]	0.034 (0.002)	[0.030, 0.037]	0.034 (0.002)	[0.030, 0.037]	0.034 (0.002)	[0.031, 0.037]
Stress reactivity	0.011 (0.002)	[0.007, 0.016]	0.012 (0.002)	[0.008, 0.016]	0.011 (0.002)	[0.007, 0.015]	0.012 (0.003)	[0.006, 0.016]	0.011 (0.002)	[0.007, 0.016]
Stress reactivity change	0.001 (0.000)	[0.001, 0.001]	0.001 (0.000)	[0.001, 0.001]	0.001 (0.000)	[0.001, 0.001]	0.001 (0.000)	[0.001, 0.001]	0.001 (0.000)	[0.001, 0.001]
Residual variance										
Wave 1 personality	0.063 (0.008)	[0.049, 0.078]	0.066 (0.007)	[0.052, 0.078]	0.084 (0.009)	[0.062, 0.100]	0.145 (0.012)	[0.121, 0.171]	0.056 (0.007)	[0.042, 0.069]
Wave 2 personality	0.085 (0.004)	[0.076, 0.094]	0.068 (0.004)	[0.062, 0.075]	0.094 (0.005)	[0.085, 0.105]	0.133 (0.007)	[0.121, 0.147]	0.082 (0.004)	[0.074, 0.091]
Wave 3 personality	0.068 (0.009)	[0.051, 0.085]	0.065 (0.007)	[0.051, 0.077]	0.071 (0.009)	[0.050, 0.087]	0.111 (0.021)	[0.131, 0.214]	0.062 (0.008)	[0.048, 0.077]
Personality intercept	0.143 (0.008)	[0.126, 0.159]	0.105 (0.010)	[0.087, 0.124]	0.201 (0.019)	[0.151, 0.230]	0.180 (0.021)	[0.131, 0.214]	0.147 (0.023)	[0.099, 0.185]
Personality slope	<0.001 (0.000)	[0.000, 0.000]	<0.001 (0.000)	[0.000, 0.000]	<0.001 (0.000)	[0.000, 0.000]	<0.001 (0.000)	[0.000, 0.000]	<0.001 (0.000)	[0.000, 0.000]

Note. Results are based on 33,942 daily assessments (N = 2,880). Estimates of fixed effects are reported as unstandardized regression coefficients. Estimates of random effects are reported as variances. NA = negative affect; Int = Intercept; *pSD* = posterior standard deviation; CrI = credibility interval.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Figure 2

Change in (A) Agreeableness, (B) Extraversion, and (C) Openness Across 18 Years



Note. Red line represents the average change in personality trait across time. Blue line represents an accelerated decrease in personality for an individual who increased in stress reactivity over time (Δstress reactivity = +0.01). Black lines represent individual trajectories. See the online article for the color version of this figure.

Discussion

The present study examined correlated changes between stress reactivity and Big Five personality traits over 18 years. At baseline, people who had more dramatic stress reactivity tended to be lower in conscientiousness and extraversion and higher in neuroticism. Over time, increases in stress reactivity were associated with declines in agreeableness, extraversion, and openness to experience. Observing associations between daily processes and more macrolevel changes in personality constitutes an important first step in examining how and why personality changes across the lifespan and how individual differences in personality are associated with daily processes.

Normative Development of Personality and Stress Reactivity Across the Lifespan

Although we focused our analysis on a smaller subsample of the MIDUS study (i.e., those who completed the daily experience busts), our analysis reproduced previous work seen in MIDUS using the total sample, in that personality was relatively stable and showed very modest mean-level changes over time (O'Meara & South, 2019; Olaru & Allemand, 2022). Nevertheless, our results departed slightly from what was seen in previous research (Roberts & Caspi, 2003; Roberts & DelVecchio, 2000; Roberts & Mroczek, 2008; Roberts & Nickel, 2021). Specifically, extraversion and openness to experience declined on average over the duration of the study, but agreeableness, conscientiousness, and neuroticism did not show mean-level changes on average. This work is consistent with some existing frameworks that seek to characterize personality change, like the correspondence principle's description for why personality is so stable (e.g., that people seek out environments that reify their existing tendencies). For example, particularly during the working years of adulthood, conscientious people may continuously seek out work and social environments that reify their existing tendencies, which may make their conscientiousness more consistent and stable (and thus not increase or decrease over time as much). However, it is also inconsistent with some aspects of the maturity principle's description of how people increase in traits like conscientiousness and agreeableness (and decline in neuroticism) over time. Worth noting, personality changes are often less dramatic among middle-aged and older adults, and declines in these traits are more common in the second half of life, although there is heterogeneity in these patterns across studies and samples (Bleidorn et al., 2022). One potential explanation for the lack of consistent mean-level changes among these age groups is that their environments could be stabilizing in ways that reify their dispositional traits, such that they may be less likely to find themselves in trait-inconsistent environments that may have otherwise led to personality changes. Of particular importance was that, although there were no systematic mean-level changes in most personality traits in the current analysis, there were significant individual differences in personality changes. The same was true for changes in stress reactivity—although there were declines in stress reactivity on average, there were also individual differences in how stress reactivity changed over time (reproducing Almeida et al., 2023). We exploited this individual variation in linking personality changes to changes in stress reactivity.

Interrelations Between Big Five Personality Traits and Stress Reactivity

Integrative personality frameworks have historically tried to make sense of variation in people's behavior across multiple units of analysis, whether that be daily and state-level behavior or broader traits (Quintus et al., 2021; Wrzus & Roberts, 2017). For example, the TESSERA framework suggests that triggering situations in daily life may establish expectancies and differential exposure to certain states that may or may not be consistent with a person's personality.

The repetition of the thoughts, feelings, and behaviors in these situations is thought to reify (or change) people's tendencies and existing traits—resulting in longer term personality changes, primarily through positive reinforcement and feedback processes (Wrzus, 2021; Wrzus & Roberts, 2017). These frameworks and organization of individual differences in personality—and how they change—make a lot of intuitive sense. However, strong tests of their tenets are few and far between, and they might only test limited portions of the models over relatively short time frames (Fleeson & Gallagher, 2009; Quintus et al., 2021; Rauthmann et al., 2015; Sherman et al., 2015; van Zalk et al., 2020).

We redressed this limitation by examining covariation between daily stress processes and Big Five personality traits over 18 years. At baseline, we reproduced previous work showing that people higher in conscientiousness and extraversion and those lower in neuroticism had less negative affect in response to daily stressors (Leger et al., 2016, 2021; Mroczek & Almeida, 2004). People high in neuroticism tend to report greater exposure and reactivity to stressors, whether they be in daily life or controlled laboratory settings (Bolger & Schilling, 1991; Evans et al., 2016; Schwebel & Suls, 1999), with researchers suggesting that highly neurotic people might be hypersensitive (and hyperreactive) to stressors (Leger et al., 2016). People high in extraversion, characterized by higher positive affect and more effective coping strategies, also tend to show reduced stress reactivity (Carver & Connor-Smith, 2010; Evans et al., 2016; Leger et al., 2016). Likewise, conscientiousness is associated with reporting fewer daily hassles and less negative affect overall (DeNeve & Cooper, 1998; Gartland et al., 2012). These tendencies, paired with more effective coping strategies, might also explain why conscientious people have reduced negative affect in the context of daily stressors (Connor-Smith & Flachsbart, 2007).

However, the most significant contribution was examining how changes in stress reactivity across the lifespan were associated with changes in Big Five personality traits. There was evidence that improvements in stress reactivity over time are linked to improved well-being and physical health (Rush et al., 2019, 2024). However, to the best of our knowledge, the present study is the first empirical demonstration of the links between changes in proximal, short-term processes in daily life (i.e., stress reactivity) and changes in distal, long-term personality traits. Even in the scenarios in which there was significant codevelopment, the constituent changes were relatively modest. For example, among the largest effect, the decline in openness, the yearly decline of −.015 translates to approximately half a standard deviation decline over 18 years. Although this could be considered a moderate effect size, it is among the *largest* in the study and most effects are smaller than this or nonsignificant. Nevertheless, characterizing the codevelopment between personality and stress reactivity led to several novel insights; we highlight two specific insights below.

First, people who became more emotionally reactive to stressors over time (relative to those who were stable or less reactive) tended to decline in extraversion, openness to experience, and agreeableness. Extraversion and openness occasionally serve protective functions in stressful contexts (Evans et al., 2016; Leger et al., 2016; Oswald et al., 2006; Williams et al., 2009). However, increased stress reactivity could affect each of these traits differently. For example, given that positivity and energy levels are core facets of extraversion (Schwaba et al., 2020; Soto & John, 2017), increases in negative affect in daily life would compromise these aspects of extraversion. In fact, these more active and positive facets of extraversion decline most dramatically across life, whereas other facets (e.g., assertiveness) are more stable (Mõttus & Rozgonjuk, 2021; Soto et al., 2011). Higher levels of negative affect could downregulate extraversion and lower levels of extraversion might lead people to be more attentive to daily stressors and their consequences. Collectively, these triggering situations and accompanying state expressions for extraverts (which are trait-inconsistent) might lead to changes in their personalities. Likewise, stress-related negative affect might affect people's openness as well, primarily through the situations they select. People higher in openness to experience tend to seek out self-expansion opportunities—situations that increase the diversity and complexity of life, primarily through exposure to novel resources, perspectives, and people (DeYoung et al., 2012; Schwaba & Thalmayer, 2024). Negative affectivity is associated with a lower likelihood of engaging in such self-expanding activities (Hughes et al., 2020; McIntyre et al., 2023), which might explain why declines in openness correspond to increases in stress-related negative affect. Finally, although agreeableness has not been as commonly linked to stress processes, there is some research to suggest that, to the extent that stress makes it harder to act in an agreeable manner, stress reactivity might be associated with declines in agreeableness. Indeed, higher levels of agreeableness are associated with less negative affect on average but also more prosocial and effective ways of navigating interpersonal stress and conflict (Graziano & Eisenberg, 1997; Graziano et al., 1996; Jensen-Campbell & Graziano, 2001; Wilmot & Ones, 2022). However, there is also an alternative perspective on agreeableness, in that it more closely resembles a "resource" that can potentially be depleted. Indeed, studies have found that, in the context of stress and other situations that tax people's attention and control resources, agreeable people do not show these benefits and, in some cases, respond more negatively to stressors (Finley et al., 2017; Ode & Robinson, 2007; Ruci et al., 2018). As a result, stressors and stress-related reactivity might reduce people's tendencies to be agreeable, and more disagreeable people might select situations that induce more interpersonal stress (Bresin & Robinson, 2015).

Second, changes in conscientiousness and neuroticism were not significantly associated with changes in stress reactivity despite their baseline associations. Although prior research had linked higher levels of conscientiousness to reduced stress reactivity (a finding we reproduced here), *changes* in stress reactivity were unrelated to *changes* in conscientiousness. It could be the case that reductions in stress reactivity might be one of the mechanisms linking conscientiousness to better health and longevity over time, but improvements in stress regulation may not necessarily translate to people's responsibility, organization, effort, pursuit of goals, or adherence to norms (all hallmarks of conscientiousness). In a way, changes in these characteristics might be driven by other factors, and improvements in emotion regulation might be more closely related to changes in other personality traits that are more closely linked with emotion regulation. Having said that, the null neuroticism association was the most surprising finding in that, historically, it has been more clearly implicated in the study of stress adaptation. Indeed, the facets of neuroticism can be nearly characterized by negative affect (Butler et al., 2023; Costa & McCrae, 1995; Zinbarg et al., 2016)—neuroticism is composed of things like anxiety, depression, hostility, self-consciousness, and vulnerability. Improvements in people's ability to deal with and navigate stressful situations are thought to be one of the

mechanisms behind why people tend to decline in neuroticism over time on average (Bleidorn et al., 2022; Mroczek & Almeida, 2004; Mroczek & Spiro, 2007). Nevertheless, reductions in stress reactivity were not associated with reductions in neuroticism. It could be the case that highly neurotic people could be resilient to improvements in stress-regulation processes. In other words, because of their hypersensitivity and hypervigilance to stressors, they may continue to have strong adverse reactions to stress, even though most people encounter fewer stressors and react less dramatically across life. This explanation would be consistent with other research showing a greater orientation and attention toward the negative aspects of situations and a potential catastrophizing of stress by highly neurotic people (Derryberry & Reed, 1994; Kitayama et al., 2018; Wilson et al., 2006). Indeed, within the TESSERA model and others, it is posited that people might seek out situations that are consistent with their existing dispositional tendencies and selectively interpret those situations in ways that reify those tendencies (Roberts & Caspi, 2003; Roberts & Jackson, 2008; Roberts & Mroczek, 2008; Roberts & Nickel, 2017; Wrzus & Roberts, 2017). Thus, even when stress reactivity declines across the lifespan, highly neurotic people's hypervigilance to these stressors might prevent them from deriving benefits (by reducing their neuroticism). It also might be the case that the reflective and associative processes are not taking place for highly neurotic people. Specifically, it could be that stress reactivity does decline across the lifespan but neurotic people do not integrate these changes as part of their identity, resulting from their actions, or perhaps notice that these improvements are happening. Finally, the lack of correspondence in the changes could also be the result of relatively enduring influences from biological and genetic sources (Briley & Tucker-Drob, 2014; McCrae et al., 2000). These possibilities could potentially explain why there are strong associations between baseline neuroticism and stress reactivity but little correlated changes in these characteristics over time.

Limitations and Future Directions

The strengths of this study must be understood alongside its limitations. The national probability sample of U.S. adults was diverse in age, gender, and geographical location within the United States. However, the sample's lack of diversity in racial/ethnic composition and individuals in the lowest socioeconomic stratum are limitations for generalizing the present findings. With the population increasingly becoming diverse in socioeconomic, racial, and ethnic composition, it is crucial for future research to evaluate how current findings may vary by critical sociodemographic dimensions.

Although multiple bursts are necessary to model the processes described above, elements of the study design might have also been suboptimal in testing these processes. Specifically, the number of bursts, the time interval between assessments, and how both of these features align (or do not align) with the TESSERA model can also be considered limitations of the present study. First, with only three bursts, we were limited in our ability to test more nuanced patterns of stress reactivity and personality changes beyond linear changes. Further, our ability to examine changes in stress reactivity might have been compromised by only having three bursts. Having more bursts would yield more reliable and robust estimates of stress reactivity changes across life. Second, although the length of the study is a strength, the time interval *between* assessments might have been too large to capture dynamic codevelopment in stress reactivity and personality. It could be that a more optimal timescale exists to capture these processes (e.g., 2- or 4-year intervals). Third, related to these two points, we chose MIDUS to examine our question because of the availability of multiple bursts and personality assessments. However, it is possible that there might be a mismatch between the design characteristics of the sample, the questions asked, and the theoretical model. For example, in addition to the number and timing of bursts, additional variables regarding daily situations would have greatly enhanced our ability to test various parts of the TESSERA model. Knowing more about situation selection, expectancies, and reflective processes (among others) would have provided a stronger test of various components of the TESSERA model. Because of some ambiguity regarding the time scale and bursts required to capture these phenomena, we encourage future researchers to test some of these same questions over varying timescales and study designs while greatly enhancing content more relevant to the TESSERA model.

Finally, the present study focused primarily on the interrelations between changes in daily stress reactivity and changes in Big Five personality traits. Still, we did not examine the underlying mechanisms behind these coactive phenomena. Although this is the first study, to our knowledge, to model co-occurring macrolevel changes among proximal stress reactivity processes and personality, we had no tests of causality or mechanistic processes. Thus, future research should formally evaluate the lived experiences (e.g., life events; Bleidorn et al., 2018), psychosocial factors (e.g., goal processes; Hudson et al., 2019), and physical/biological factors (e.g., declines in physical health; Maresova et al., 2019) that may explain why increases in stress reactivity correspond with decreases in extraversion, agreeableness, and openness (but do not relate to trajectories of neuroticism or conscientiousness). Another potential future direction is adopting a more focused approach to examining how different types of stress might lead to personality changes. We lumped a variety of different stressors together and assumed that they would have had equal influences on personality changes. However, it is also possible that the diversity of stressors or their presence in different domains (e.g., social relationships, professional settings, global/external stressors) and perceptions of these stressors (e.g., their controllability) might exert differential effects on the processes that ultimately engender personality change (Haehner et al., 2023; Koffer et al., 2016). We encourage future research to deliberately test these potential mechanisms to help clarify if and why changes in daily experiences covary with personality changes across the adult lifespan.

Conclusion

To our knowledge, this is the first study to empirically demonstrate a connection between changes in proximal short-term processes (i.e., daily stress reactivity) and changes in distal long-term developmental processes (i.e., Big Five personality traits) across nearly 20 years of adult development and aging. Our findings indicate that increases in stress reactivity over time co-occur with changes in personality traits, specifically in extraversion, agreeableness, and openness. Understanding how a modifiable daily stress process co-occurs with personality changes can guide efforts that optimize personality maturation and promote healthy aging in daily life.

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