



# Correlated change of Big Five personality traits across the lifespan: A search for determinants



Theo A. Klimstra<sup>a,\*</sup>, Wiebke Bleidorn<sup>a</sup>, Jens B. Asendorpf<sup>b</sup>, Marcel A.G. van Aken<sup>c</sup>, Jaap J.A. Denissen<sup>a</sup>

<sup>a</sup> Department of Developmental Psychology, Tilburg University, The Netherlands

<sup>b</sup> Department of Psychology, Humboldt University Berlin, Germany

<sup>c</sup> Department of Psychology, Utrecht University, The Netherlands

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## ABSTRACT

Correlated change between different personality traits has recently caught the attention of researchers studying personality development. We conducted two studies to examine age effects (Study 1) and effects of cognitive ability (Study 2) on this phenomenon. Results indicated that correlated change was relatively stable from adolescence through adulthood, and then increased after age 70. Second, correlated change was greater among traits that have been linked to the same developmental processes (e.g., social investment or maturation of specific neurological systems). Third, cognitive ability was negatively associated with correlated change. Collectively, our findings suggest that personality change is partly driven by broad mechanisms affecting multiple traits. Associations with age and cognitive ability provide important leads regarding the possible nature of these mechanisms.

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## 1. Introduction

Research on personality stability and change is flourishing (Denissen, van Aken, & Roberts, 2011). Knowledge about rank-order and mean-level personality development in adulthood has assumed a more concrete shape (Roberts & DelVecchio, 2000; Roberts, Walton, & Viechtbauer, 2006). One phenomenon that has recently attracted the field's attention concerns the question of whether changes in different personality traits are interrelated or independent across individuals, also known as the degree of *correlated change*. Correlated change concerns the degree to which *changes* in the level of one trait are related to *changes* in the level of another trait. For example, positive correlated change between two personality traits, such as agreeableness and conscientiousness, would indicate that the same individuals who show substantive increases in agreeableness also increase in conscientiousness, whereas individuals showing decreases in agreeableness also decrease in conscientiousness.

Correlated change promises interesting insights into the nature and underlying mechanisms of personality development. According to Soto and John (2012), the degree of correlated change between personality traits can be considered an informative measure indicating whether adult personality development is predominantly influenced by broadly acting mechanisms that

simultaneously affect multiple trait domains, or by narrowly acting mechanisms each affecting only one single trait domain.

It should be noted that correlated change is different from trait differentiation, which refers to the extent to which traits are correlated with one another at a certain point in time. Yet, patterns of correlated change are often similar to patterns of trait differentiation (e.g., Allemand, Zimprich, & Martin, 2008). If this is the case, it is likely that a factor that caused the initial correlation simply persists across time. However, it is also possible that previously correlated traits show no correlated change, while previously uncorrelated traits may show correlated change. The first situation could indicate that a causal factor that is shared by two traits is removed or at least does not lead to similar changes in two traits across a particular period, whereas the latter situation could indicate that a new shared causal factor is introduced. Thus, correlated change and trait differentiation are two analytically independent concepts. Whereas the degree of trait differentiation is particularly informative with regard to question about the structure of personality, correlated change is important for gaining greater insight into the dynamics of personality development. The present article was dedicated to study the nature and meaning of correlated change in personality traits.

Only a handful of studies (Allemand, Zimprich, & Hertzog, 2007; Allemand et al., 2008; Soto & John, 2012) have explicitly examined this phenomenon, yielding inconsistent results. Therefore, our main research question, addressed in two large-scale longitudinal studies, was to first examine whether or not there was consistent evidence for correlated change. The heterogeneous findings of

\* Corresponding author. Address: Department of Developmental Psychology, Tilburg University, Postbus 90153, 5000 LE Tilburg, The Netherlands.

E-mail address: [theoklimstra@online.nl](mailto:theoklimstra@online.nl) (T.A. Klimstra).

previous studies may also point to the existence of moderator factors. Our two-study design allowed us to examine two of such moderators. In Study 1 we examined how the degree of correlated change varied with age. In Study 2, we examined whether possible age-effects could be explained by differences in cognitive abilities. In both studies, we also examined whether there were specific trait pairs among which evidence for correlated change was stronger.

### 1.1. Potential sources of correlated change

A number of broadly acting mechanisms affecting multiple trait domains have been proposed as sources of correlated change. There are, for instance, several theoretical reasons to expect associations among changes in agreeableness, conscientiousness, and emotional stability. Digman (1997) proposed that changing to a personality profile consistent with socially approved behavior would be reflected in mean-level increases in the three aforementioned trait-domains. Thus, socialization might be a broad-acting developmental process responsible for correlated change among these traits. In a somewhat related manner, a prominent theoretical principle of personality development, the Social Investment Principle (SIP; Roberts, Wood, & Smith, 2005), holds that transitions to, and increased investment in normative roles of adult social life (e.g., starting a career, a serious relationship, or a family) predict changes in agreeableness, conscientiousness, and emotional stability. Finally, it has been argued that the aforementioned three traits are all related to the serotonergic neurobiological system (DeYoung & Gray, 2009; DeYoung, Peterson, & Higgins, 2002).

There are also theoretical grounds to assume that changes in extraversion and openness would be related to one another. Specifically, Digman (1997) proposed associations among these traits because both traits have linkages with the broad concept of personal growth and self-actualization. Personal growth involves exploration, which, in turn, is linked to the dopaminergic neurobiological system. Hence, along the same lines, DeYoung et al. (2002); DeYoung & Gray, (2009)) proposed that the dopaminergic system might simultaneously affect extraversion and openness.

Neurobiological systems such as the dopaminergic system are known to change throughout the lifespan (e.g., Weickert et al., 2007). If the abovementioned theoretical ideas would hold, then changes in, for example, the dopaminergic system should affect levels of extraversion and openness simultaneously producing correlated change between these two traits. Similarly, mechanisms affecting agreeableness, conscientiousness, and emotional stability simultaneously should lead to correlated change between these three traits. Thus, there are several reasons to expect correlated change in general, with the strength of the correlated change being dependent on the particular trait pair that is considered.

### 1.2. Previous research on correlated change

There already is some research that has addressed the concept of correlated change. The first of these studies (Allemand et al., 2007) focused on cohorts of middle-aged individuals (i.e., 42–46 years of age) and older individuals (i.e., 60–64 years of age). In both cohorts, there was a considerable amount of correlated change across a four-year period. In particular, changes in emotional stability were strongly associated with changes in extraversion and conscientiousness, and changes in extraversion and conscientiousness were also strongly associated with one another. The overall amount of correlated change appeared to be about equal in the two age cohorts.

The older cohort was reassessed 8 years later, which allowed Allemand et al. (2008) to examine correlated change in older individuals across a 12-year period. Interestingly, this follow-up yielded quite different results, despite that the same analyses were

applied. That is, changes in emotional stability were no longer significantly associated with changes in other Big Five traits. However, changes in all other Big Five traits were substantially associated with one another. Especially the amount of correlated change of conscientiousness with extraversion and agreeableness was considerable, with coefficients larger than .60. The fact that the patterns of correlated change observed in the same cohort across 4 years did not replicate across 12 years might suggest that the interval between measurement occasions plays a role.

Adding to the inconsistency observed in previous studies, a recent third study examining correlated change between ages 21 and 61 (Soto & John, 2012) found no evidence for correlated change in Big Five traits at all. However, this study employed a small non-representative sample exclusively consisting of women who graduated from college in the 1960s. As a result of the multiple differences in sample composition, the discrepancies between the amounts of correlated change reported by Soto and John (2012) and Allemand et al. (2007, 2008) might be due to age differences, gender differences, and differences in educational level between samples. Furthermore, the possibility that broad mechanisms may lead to greater amounts of correlated change in some trait pairs than in others has not been formally tested. Finally, and perhaps most importantly, the inconsistency in the findings of previous studies suggests that it may also be warranted to examine possible moderators of correlated change.

### 1.3. Potential moderators of correlated change

A comparison of the samples that were employed in previous studies on correlated change already provides some leads of what factors may have contributed to their inconsistent results. First, the samples were differently aged. There are theoretical reasons for why age might be an important moderator of correlated change and may hence have contributed to inconsistency in findings across previous studies. That is, the aforementioned developmental mechanisms may be more active and neurobiological systems may undergo more changes at particular points in the lifespan. In this context, it may already be worth mentioning that the previously discussed SIP mainly applies to young adults (Roberts et al., 2005). This is because the transitions to and increases in investment in social roles of adult life, which are thought to cause increases in agreeableness, conscientiousness, and emotional stability, mainly take place in young adulthood (Roberts et al., 2005). Furthermore, there generally is more change in the structure of neural systems, and hence likely also more change in neurobiological systems, in adolescence and late adulthood/old age than in early and middle adulthood (Giedd et al., 1999; Ziegler et al., 2012). Thus, if broadly acting mechanisms such as the SIP and neurobiological systems are indeed responsible for producing correlated change, the strength of correlated change should mirror developmental trends in these systems. In that case, it is likely that there are curvilinear age-related patterns of correlated change with the highest levels in the period from adolescence to young adulthood and in late adulthood.

Furthermore, developmental processes in personality are often thought to be related or even partly attributable to changes in cognitive ability. For instance, the finding that trait differentiation among the Big Five is low in adolescence, increases towards middle adulthood, and increases again from late adulthood onwards, has often been explained as a consequence of developmental increases in general cognitive ability and verbal comprehension (Allik, Lai-dra, Realo, & Pullmann, 2004; Soto, John, Gosling, & Potter, 2008). Indeed, several studies have reported more trait differentiation in individuals with high cognitive abilities versus individuals with lower cognitive abilities (Austin et al., 2002; Bowler, Bowler, & Phillips, 2009; Di Blas & Carraro, 2011; Mottus, Allik, & Pullmann,

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