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Age-cognition relations and the personality trait of Conscientiousness

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ABSTRACT

Increasing age has been found to correlate with a decrease in many cognitive abilities and an increase in the personality trait of Conscientiousness. The first goal of this study was to examine whether an age-related decline in cognitive abilities, in particular Fluid ability, accounts for the age-related increase in Conscientiousness. The second goal was to investigate whether the role of cognitive abilities in the relation between age and Conscientiousness is similar among people of different levels of education.

Our results support the conclusion that the relation between age and Conscientiousness is mediated by fluid ability and working memory abilities, and that these effects are stronger in people with lower levels of education.

Altogether, these findings are consistent with the hypothesis that age differences in characteristics such as persistence, self-motivation and dutifulness may help compensate for age differences in cognition.

1. Introduction

Conscientious people are characterized as being well-organized, thorough, diligent and achievement-oriented (McCrae & John, 1992). They are also defined as being less distractible and more deliberate, systematic and persistent than people of low Conscientiousness (e.g., Demetriou, Kyriakides, & Avraamidou, 2003; Moutafi, Furnham, & Crump, 2006; Trautwein, Lüdtke, Roberts, Schnyder, & Niggli, 2009). Not surprisingly, the personality trait of Conscientiousness has repeatedly been found to be associated with many favorable consequences, such as greater academic and career success (Judge, Higgins, Thoresen, & Barrick, 1999; Lounsbury, Sundstrom, Loveland, & Gibson, 2003; Noftle & Robins, 2007; Ozer & Benet-Martinez, 2006; Preckel, Holling, & Vock, 2006), better physical and psychological health (e.g., Lodi-Smith et al., 2010; Wilson, Schneider, Arnold, Bienias, & Bennett, 2007), and better control and resistance to interference in typical measures of executive functioning (Booth, Schinka, Brown, Mortimer, & Borenstein, 2006).

However, studies looking at the relation between Conscientiousness and intelligence present a less positive picture. Few relations have been reported between Conscientiousness and either episodic memory or speed (e.g., Booth et al., 2006; Hultsch, Hertzog, Small, & Dixon, 1999; Soubelet & Salthouse, 2011). Additionally, there have been several reports of a negative relation between Conscientiousness and fluid ability (e.g., Chamorro-Premuzic & Arteche, 2008; Chamorro-Premuzic, Furnham, & Ackerman, 2006; Moutafi, Furnham, & Crump, 2003, 2006; Moutafi, Furnham, & Paltiel, 2004; see however Soubelet & Salthouse, 2011) and evidence for a negative relation between Conscientiousness and measures of short-term/working memory (Pearman, 2009). People who score higher on Conscientiousness questionnaires have been shown to score lower on measures of the *g* factor and abstract reasoning, and possibly on measures of short-term/working memory.

This finding is intriguing since it is contradictory to at least three previous results. First, it is apparently contrary to results suggesting that conscientious people are more systematic and persistent and that they put more effort in tasks than less conscientious people (e.g., Moutafi et al., 2006; Trautwein, Lüdtke, Kastens, & Köller, 2006; Trautwein et al., 2009). Second, it is inconsistent with the cited results above which contend that higher levels of Conscientiousness are associated with greater academic and career success (Judge et al., 1999; Lounsbury et al., 2003; Noftle & Robins, 2007; Ozer & Benet-Martinez, 2006; Preckel et al., 2006). Third, it is contrary to the recent finding supporting the hypothesis that higher levels of Conscientiousness are associated with decreased risk for Alzheimer's disease among older adults (Wilson et al., 2007).

Chamorro-Premuzic and Furnham (2004) suggested that the negative relation between Conscientiousness and intelligence might result from a compensatory mechanism. Less able individuals would become more organized, thorough and persistent over time to compensate for their lower levels of cognitive ability. In contrast, people with higher levels of cognitive functioning would be able to rely on their abilities when performing most cognitive tasks and therefore would not need to compensate and become so conscientious over time (see also Moutafi et al., 2003, 2004). In accordance with this idea, there has been some empirical evi-

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dence that Gf (fluid ability) mediates the relation between Conscientiousness and academic performance (e.g., Chamorro-Premuzic & Arteche, 2008).

We were interested in the possibility that such a compensatory mechanism occurs with aging. Consistent with this idea, previous reports of age relations in cognition and personality have supported an age-related decline in various domains of cognition (e.g., Salthouse, 2010a, 2004; Salthouse & Ferrer-Caja,, 2003; Tucker-Drob & Salthouse, 2008; see Craik and Salthouse (2008) for a review) and an age-related increase in the personality trait of Conscientiousness (McCrae, Martin, & Costa, 2005; Roberts & Mroczek, 2008; Srivastava, John, Gosling, & Potter, 2003; Terracciano, McCrae, Brant, & Costa, 2005). However, there has apparently not been any prior research on the possibility that the relations between age and cognition account for the relations between age and Conscientiousness.

The first goal of the current project was therefore to examine the possible mediating role of cognition, in particular fluid ability, in the relation between age and Conscientiousness. In the current project, participants performed eight cognitive tests designed to represent four cognitive abilities: fluid ability, episodic memory, perceptual speed and working memory.

We expected that higher levels of Conscientiousness would be associated with lower levels of fluid ability (e.g., Chamorro-Premuzic & Arteche, 2008; Chamorro-Premuzic et al., 2006; Moutafi et al., 2003, 2004, 2006) and working memory (Pearman, 2009). Only weak relations of Conscientiousness have been reported with measures of episodic memory and perceptual speed (e.g., Booth et al., 2006; Hultsch et al., 1999; Soubelet & Salthouse, 2011), but these cognitive abilities were examined in the current project for comparison purposes.

Based on prior studies, we also expected significant relations of age to cognitive abilities and to Conscientiousness (Craik & Salthouse, 2008; McCrae et al., 2005; Roberts & Mroczek, 2008; Salthouse, 2010a, 2004; Salthouse & Ferrer-Caja, 2003; Srivastava et al., 2003; Terracciano et al., 2005; Tucker-Drob & Salthouse, 2008), in the direction of lower levels of cognitive abilities and higher levels of Conscientiousness.

The second goal of this study was to investigate whether the mediating role of cognition in the relation between age and Conscientiousness was the same at different levels of education (moderated mediation model). Previous reports have indicated that levels of both Conscientiousness and cognition correlate with levels of education (e.g., Ganguli, Ratcliff, Huff et al., 1991; Lodi-Smith et al., 2010; Martin, Friedman, & Schwartz, 2007; Salthouse, 2010b). It is therefore possible that a compensatory mechanism involving changes both in Conscientiousness and cognitive abilities is also sensitive to a person's educational experience. Because gender and self-reported physical health have sometimes been reported to correlate with both Conscientiousness and cognitive ability (e.g., Burton et al., 2010; Costa, Terracciano, & McCrae, 2001; de Frias, Nilsson, & Herlitz, 2006; Feingold, 1994; Herlitz & Rehnman, 2008; Krueger & Salthouse, 2010; Lodi-Smith et al., 2010; Salthouse, 2010b), they were examined as possible confounding factors. Our results indicate that gender correlated with both cognitive measures and Conscientiousness. Therefore, it was included as a covariate in all analyses.

2. Method

2.1. Participants

The sample consisted of 164 adults, 62% female, ranging from 19 to 96 years of age (Mean age = 49.8; SD = 18.8). All had scores on the MMSE (Folstein, Folstein, & McHugh, 1975) of 27 or higher. The self-identified ethnicity of the participants was primarily Caucasian (86%) with about 7% African and the remainder split among different groups including mixed ethnicity. Most of the participants were moderately educated, with a mean of 14.3 years of formal education (SD = 3.6), and healthy, with a mean of about 7.4 (SD = 1.8) on a self-report scale ranging from 0 for "poor" to 10 for 'excellent". As a means of evaluating the representativeness of the sample, age-adjusted scaled scores were provided for four tests from the Wechsler Adult Intelligence Scale III (Wechsler, 1997), i.e. Block Design, Symbol Search, Letter–Number sequencing, and Matrix Reasoning subtests. These age-adjusted scores have means of 10 and standard deviations of 3 in the nationally representative normative samples. In the current sample, these age-adjusted scores have a mean of 10.6 and standard deviation of 2.3, and therefore it can be inferred that the current sample is functioning at the same level as the national norms.

Correlations of age with gender, education, health and age-adjusted cognitive scores were examined. The point biserial correlation coefficient for the relation between age and gender indicates that there are more females with increased age in the current sample ($r_{pb} = .22$ ($p < .01$). The Pearson correlation coefficient for the relation between age and education indicates that increased age is associated with lowers levels of education in the current sample ($r = -.43$, $p < .01$). There was no significant correlation between age and either health ratings or age-adjusted cognitive scores.

2.2. Materials and procedure

Participants were recruited through flyers, newspaper advertisements, and referrals from other participants. A 2-h session was conducted in the laboratory, during which participants completed a variety of cognitive tests and filled out a personality questionnaire.

2.3. Cognitive measures

Fluid ability was assessed with Matrix Reasoning and Block Design subtests from Wechsler (1997) and with the Spatial Relations test from the Differential Aptitude Test Battery (Bennett, Seashore, & Wesman, 1997). Speed was measured with the Symbol Search subtest from Wechsler (1997), Letter Comparison (Salthouse & Babcock, 1991), and Pattern Comparison (Salthouse & Babcock, 1991) tests. Episodic memory was assessed with a Word List Recall test that consisted of three free recall trials (Rey, 1964). Working Memory was assessed with Letter–Number sequencing subtest from Wechsler (1997). Composite variables were created by averaging the *z*-scores for the variables representing Fluid ability, Speed, and Episodic Memory.

2.4. Conscientiousness

Personality, and of particular relevance in the current report, Conscientiousness, was assessed with the Conscientiousness scale from the 50-item version of the Big-Five 5 Broad Domains (from the International Personality Item Pool; 50-item version; Goldberg, 1992, 1999). The internal consistency (coefficient alpha) of the Conscientiousness scale was .81.

3. Results

3.1. Data analysis

First, correlation and regression analyses were used to examine if our data corroborated previous findings regarding the relations