Neuroticism Does Not Affect Cognitive Functioning in Later Life

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In a cross-sectional study, Jorm and colleagues (1993, Personality and Individual Differences, 15, 721–723) found that neuroticism was related to poorer cognitive performance in the elderly. The present study was initiated to expand their findings using both cross-sectional and longitudinal data from the Maastricht Aging Study. In contrast to the findings of Jorm and coworkers, neuroticism was not associated with either current cognitive performance or cognitive decline over a period of 3 years.

The personality trait ‘neuroticism’ pertains to proneness to psychological distress (Pervin, 1996). People with high scores on neuroticism scales are worrying, nervous, insecure, inadequate, and hypochondriacal. Low scorers are calm, relaxed, unemotional, hardy, secure, and self-satisfied. There is reason to believe that neuroticism may affect cognitive functioning in older adults. Jorm et al. (1993) reported that neuroticism was related to poorer
performance on a number of cognitive measures in an elderly community sample. For women, there were correlations between neuroticism and two reaction time measures (r values were -0.20 and -0.21; p < .001); for men, there were correlations with global cognitive functioning, speed of information-processing, and episodic memory (r values were -0.26, -0.19, and -0.25 respectively; p < .001). Jorm et al. (1993) hypothesized that the correlations between neuroticism and cognitive performance reflect the effect of chronic stress on cognitive aging. Prolonged periods of stress would, via elevated levels of stress hormones, lead to atrophy of parts of the brain involved in learning and cognition. More recently, however, Schroder et al. (1998) found no association between neuroticism and cognitive functioning in the elderly. Note that Jorm et al. (1993) used the Eysenck Personality Questionnaire—Revised (EPQ-R) to measure neuroticism, whereas Schroder et al. (1998) employed the NEO Five-Factor Inventory (NEO-FFI). Although the use of different measures may have contributed to the contradictory findings, it has been shown that the neuroticism scale of the EPQ-R and the NEO-FFI tap the same construct (Draycott & Kline, 1995). Both Jorm et al. (1993) and Schroder et al. (1998) used a cross-sectional design. The present study was initiated to evaluate the notion that neuroticism affects cognitive performance in later life, using both cross-sectional and longitudinal data from the Maastricht Aging Study (MAAS) (Jolles, Houx, Van Boxtel, & Ponds, 1995; Van Boxtel et al., 1998).

METHODS

Subjects

The MAAS is a community-based, longitudinal study on the determinants and consequences of cognitive aging in southern Netherlands. Participants in the baseline of the MAAS were randomly drawn from a register of general practitioners affiliated with the University of Maastricht. Exclusion criteria were brain-related disorders, cerebrovascular disease, psychiatric disorders, mental retardation, or psychotropic drug use. The sample comprised 1869 research participants, stratified by age (12 discontinuous age classes [ranging from 25±1 years to 80±1 years]), gender, and occupational achievement (see Van Boxtel et al. [1998] for more information on the recruitment of participants and stratification). All participants underwent an extensive medical and cognitive examination. Three years after the 1993-1995 baseline measurement, all research participants aged 50 years and older were invited to undergo a second assessment of their cognitive functioning. A total of 838 older adults took part in the follow-up measurement.

The sample reported on here consisted of 185 middle aged and older adults who participated in the follow-up and completed the neuroticism scale of the short form of the Eysenck Personality Questionnaire Revised (EPQ-R) (Eysenck, Eysenck, & Barrett, 1985) at baseline. There were 88 women and 97 men (mean age 63.3 years, range 49-81 years). Mean (SD) neuroticism score was 3.23 (3.15). Reliability and validity of the Dutch version of the EPQ-R were found to be satisfactory (Sanderman, Eysenck, & Arrindell, 1991). Note that the other 703 participants who underwent a second cognitive assessment were not included in the present study because they had not been administered the EPQ-R at baseline.

Instruments

The following tests were selected as measures of cognitive functioning: the Mini-Mental State Examination (MMSE) (Folstein, Folstein, & McHugh, 1975); the Letter Digit Substitution Test (LDST), which is a modification of the Symbol Digit Modalities Test (Smith, 1973); the third subtask of the Stroop Color-Word Test (SCWT) (Houx, Jolles & Vreeburg, 1993); Category Fluency (Lutjens & Van der Plouw, 1983); and delayed recall from the Visual Verbal Learning Test (VVLT) (Brand & Jolles, 1985). The MMSE was used to assess orientation, short-term memory, and language, the LDST to assess information-processing speed, the SCWT to assess concentration, Category Fluency to assess retrieval from semantic memory, and the VVLT to assess episodic memory.

RESULTS

Multiple-regression analysis was used to examine the relationship between neuroticism and cognitive functioning. Adjusting for age, gender, and education, the effect of neuroticism on cognitive performance at baseline was determined. In addition, adjusting for age, gender, and education, cognitive performance at baseline, and time between baseline and follow-up, the effect of neuroticism (at baseline) on cognitive performance was determined at follow-up. Because Jorm et al. (1993) reported differential effects of neuroticism in women and men, additional analyses were performed for both females and males separately. To correct for multiple statistical testing, p < .01 was considered significant.

Table 1 shows the unstandardized regression coefficients of the association between neuroticism and cognitive functioning at both baseline and follow-up. None of the regression coefficients reached statistical significance (all p values > .05). The analyses for women and men separately also yielded no reliable association between neuroticism and cognitive functioning. Hence, it appears that neuroticism is not associated with current cognitive performance, nor does it predict cognitive decline over a period of 3 years.
TABLE 1. Unstandardized Regression Coefficients of the Association Between Neuroticism and Cognitive Functioning

<table>
<thead>
<tr>
<th>Cognitive test</th>
<th>Cross-sectional</th>
<th>Longitudinal</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMSE</td>
<td>-0.04</td>
<td>-0.03</td>
</tr>
<tr>
<td>LDST</td>
<td>-0.38</td>
<td>-0.15</td>
</tr>
<tr>
<td>SCWT</td>
<td>0.53</td>
<td>0.12</td>
</tr>
<tr>
<td>Fluency</td>
<td>-0.15</td>
<td>0.04</td>
</tr>
<tr>
<td>VVLT</td>
<td>-0.03</td>
<td>-0.01</td>
</tr>
</tbody>
</table>

DISCUSSION

The present findings are in line with those of Schroder et al. (1998), who also did not find any relation between neuroticism and cognitive functioning in a community sample of older adults. They are not in accordance with those of Jorm et al. (1993), who found that neuroticism was related to poorer cognitive functioning in an elderly community sample.

Do our results, as well as those of Schroder et al. (1998), differ from the results reported by Jorm et al. (1993)? Both the present investigation and the study by Jorm et al. (1993) used the neuroticism scale of the EPQ-R. However, the mean age of our research participants was 63.3 years, whereas those studied by Jorm et al. (1993) were all older than 70 years. We therefore conducted extra analyses excluding participants 70 years old and younger. Losing some statistical power, the results of these analyses did not differ from our initial results. Our sample was substantially smaller than the sample of Jorm et al. (1993), which consisted of 711 research participants. One could argue, therefore, that our study did not have enough statistical power to detect an association between neuroticism and cognitive functioning. However, a sample size of 200 participants is usually considered sufficient in behavioral research (cf. Meering, 1981). In contrast with the study by Jorm et al. (1993), who used a correlational approach, we used regression analysis to adjust for the effect of age, gender, and education. It is well known that these variables, especially age and education, affect cognitive aging (Jolles, 1986). Although Jorm et al. (1993) calculated partial correlations controlling for education, they did not control for age. Theoretically, it is possible that the correlations reported by Jorm et al. (1993) were confounded by age. Note that both the MAAS participants and the people studied by Schroder et al. (1998) were relatively healthy people, whereas the sample of Jorm et al. (1993) included participants with neurodegenerative diseases. Although cognitive deterioration is the hallmark of dementia (cf. Jolles, 1986), recent research has shown that personality also changes as a result of dementia (Straus & Pasupathi, 1994). Caregivers of dementia patients were asked to rate current and premorbid neuroticism levels of the patients under their care. Current neuroticism levels were substantially higher than premorbid levels, suggesting an increase in neuroticism brought about by neurodegenerative processes. Hence, the negative correlation of neuroticism with cognitive performance observed by Jorm et al. (1993) may partly be due to the inclusion of participants with dementia.

Jorm et al. (1993) argued that their findings were compatible with the idea that chronic stress leads to impaired cognitive functioning. High levels of neuroticism predispose to stress and animal research (cf. McEwen & Sapolsky, 1995) has shown that prolonged stress, via elevated levels of stress hormones, eventually leads to loss of neurons in the hippocampus. Hence, the association between neuroticism and poorer cognitive performance in their research participants would reflect the cumulative damage to the hippocampus as a result of chronic stress. In our opinion, this line of reasoning is problematic. Patients with hippocampal lesions, such as the famous patient H.M. (Parkin, 1996, perform poorly on memory tests but not on other cognitive measures. Although Jorm et al. (1993) found that neuroticism correlated with memory performance in men, this personality factor was also associated with global cognitive functioning and information-processing speed in men and reaction time in women.

Summing up, we failed to find an effect of neuroticism on cognitive functioning in an elderly community sample. In line with a previous study by Schroder et al. (1998), neuroticism was not associated with current cognitive performance. In addition, neuroticism did not predict cognitive decline over a 3-year period.

REFERENCES


Age Differences and Divided Attention: Is there a General Deficit?

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It was the goal of this study to determine whether there were age differences specifically associated with the ability to simultaneously execute two tasks, and whether cognitive costs correlated across different situations. Eighty-one young and 86 older adults underwent nine tasks, administered both in single and in dual conditions. Results showed large age differences in rare performances in all conditions. However, a larger cognitive cost in the older adults sample, as assessed by an Age \times Condition interaction, was observed only for four out of the nine tasks. Furthermore, age effects were greatly diminished once performance in the single tasks was controlled for. Correlations between the dual tasks, or between the cognitive cost scores, were very low once age was partialled out. Results do not support the notion of general coordination costs and speak against a generalized increase in divided attention costs with advancing age.

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