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## Does childhood intelligence predict variation in cognitive change in later life?

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### Abstract

Lower childhood cognitive ability may be a risk factor for greater cognitive decline in late life and progression to dementia. To assess variation in age-related cognitive change, it is helpful to have valid measures of cognitive ability from early life. Here, we examine the relation between childhood intelligence and cognitive change in later life in two samples, one born in 1921 and the other in 1936. All participants completed the same test of mental ability (one of the Moray House Test series) at age about 11 years, and were re-examined on Raven's Progressive Matrices at age 77 (1921-born) or age 64 (1936-born). Where possible, the 1921 sample was re-tested at the age of about 80 years old and the 1936 sample re-tested at about 66 years. After taking into account various covariates, including sex, education and occupation, childhood intelligence was a significant predictor of cognitive change in later life. Results were in the direction that participants with lower childhood mental ability experienced relatively greater cognitive decline, whereas those of higher childhood mental ability showed improved performance. This result suggests that higher premorbid cognitive ability is protective of decline in later life.

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## 1. Introduction

Understanding the possible determinants of individual differences in age-related cognitive change is important. Cognitive decline can impact greatly upon an individual's life, leading to reduced independence, lower quality of life (Logsdon, Gibbons, McCurry, & Teri, 2002) and increased risk of dementia and death (Hui et al., 2003). Cognitive ability is relatively stable and life-long. Indeed, some research has suggested that across over 60 years, about 50% of the variance in cognitive ability may be stable whereas the remaining 50% may represent change and measurement error (Deary, Whalley, Lemmon, Crawford, & Starr, 2000). There are important individual differences in people's cognitive change with age: With regard to their rank order, some improve, some decline and some stay about the same. The sources of these individual differences in age-related cognitive change are not fully understood, but are highly relevant to understanding how best cognitive abilities may be retained even into advanced old age.

One possible contributor to variation in age-related cognitive change is the initial level of cognitive ability itself. Thus, several papers have asked the question: "Is age kinder to the initially more able?" (see Deary, Starr, & MacLennan, 1999, for a review and data on this question). One problem in addressing this research question, however, is gaining a valid measure of cognitive ability prior to old age. A number of methods have been developed that can 'estimate' premorbid cognitive ability (e.g., NART) and these have been frequently used to estimate change in cognitive ability. However, such methods are not without their limitations. Some studies have shown that NART performance can be impaired in dementia patients (e.g., Cockburn, Keene, Hope, & Smith, 2000). Also, while such methods aim to provide an estimate of cognitive ability in earlier adult life, there is evidence that various lifestyle factors (e.g., smoking, alcohol consumption, exercise, diet) may affect cognitive abilities, even in early adulthood (see Gottfredson, 2004). Consequently, the earliest possible direct measure of cognitive ability is likely to provide the least contaminated estimate of premorbid cognitive ability. A direct examination of the relation between cognitive ability from early life and age-related cognitive decline would allow the related question of the "cognitive reserve hypothesis of cognitive ageing" to be tested in a manner that is not possible with other data sets. This hypothesis proposes that adults with higher initial cognitive ability are better able to compensate for the effects of ageing and dementia (Stern, 2003). The cognitive reserve hypothesis predicts that individuals of higher childhood cognitive ability will experience less cognitive decline in later life.

In order to achieve a direct examination of the relation between childhood mental ability and the amount of cognitive decline, it is preferable to obtain an accurate measure of childhood ability from earlier in life. Few studies of older people have cognitive data from early life. Some have used estimates of prior ability and have found evidence that people with lower initial ability decline more in verbal ability in old age (Deary et al., 1999). The "Nun study" (Snowdon et al., 1996) found that higher linguistic ability in early adulthood was associated with higher cognitive ability in later life and lower incidence of dementia. A follow-up study of the UK 1946 birth cohort examined the relation between cognitive ability at age 15 years and cognitive decline from 43 to 53 years (Richards, Shipley, Fuhrer, & Wadsworth, 2004). They found that childhood mental ability was predictive of decline, with participants of higher childhood ability experiencing less cognitive decline in later adulthood. Although Richards et al. found a relation between cognitive ability in adolescence and cognitive decline in mid-life; their sample was re-examined at an age

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