3.6 Cognitive Function
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Introduction
Cognition can be divided into different domains of ability, which can be tested separately; the most important of these are orientation, memory, executive function (planning, sequencing) and language. Cognitive function in midlife is known to be influenced by many factors—including but not limited to genes, home environment in childhood, education, and occupation. Most aspects of cognitive ability have been shown to be relatively stable across the early life course, reflecting the strong influences of heredity, early environment and education (Richards et al. 2004). Cognitive decline is first detectable in the fifth decade, but only then by sensitive, effortful tests of cognition (Schaie 1989; Schaie 1994). Memory is often affected first, and most prominently. Age-related decline from this point onwards is the rule—however, only a minority would go on to suffer from clinically significant dementia. The prevalence of dementia in Europe is around 2% for those aged 65-70, and doubles with every five year increase in age, reaching around 25-30% for all those aged 85 years and over (Lobo et al. 2000).

In SHARE, we have measured cognitive ability using simple tests of orientation, memory (registration and recall of a list of ten words), verbal fluency (a test of executive function) and numeracy (arithmetical calculations). We also asked participants to rate subjectively their reading and writing skills.

SHARE provides a unique opportunity to compare cognitive function in ageing populations across Europe.

- Between country differences may be linked to a variety of underlying mechanisms. Of particular interest here is the impact of education, either boosting performance or perhaps even protecting against age-related decline.

- Age-related cognitive impairment is generally considered to be an organic process, linked to neurodegeneration. We would therefore anticipate that the effect of age upon cognitive ability be similar across countries. The effect of gender may vary particularly if confounded by educational opportunity.

- The core cognitive abilities assessed in SHARE might be expected to have an impact upon the socio-economic success of participants, indexed for example by income and wealth. Of interest here, would be 1) whether any independent effect of cognitive function was discernible, having controlled for education and occupational status 2) the extent to which any such effects were consistent between European countries.

Methods
We report each cognitive test score, and self-reported reading and writing skills as a function of age, sex, country and educational level. Detailed results appear in Tables 3A.17-3A.23 in the Appendix to this chapter. We also examined the effect of poor cognitive performance on a number of other economic, health and social functioning measures. To simplify the presentation we focused on three key cognitive domains memory (recall), executive function (verbal fluency) and numeracy. For these analyses we have re-coded each of the cognitive measures to a binary variable with as near as possible to 7% scoring as
impaired (this approximates to 1.5 standard deviations below the mean, a generally agreed criterion for relative cognitive impairment). In these analyses we always adjust for the effects of age, sex, and education, and stratify for country. Additional variables are included as appropriate and are mentioned as each set of results is presented and discussed.

Sampling weights were not applied, but we have taken account of the clustering into households. In the graphs we present the estimates from the models and a 95% confidence interval based on sandwich standard errors.

Results

1 Prevalence of cognitive impairment

Tables 3A.17-3A.22 describe all six cognitive outcomes, by age, gender and country. Figure 2 summarises the prevalence of impairment in the three key cognitive outcomes by age and country. For each domain; verbal fluency, memory recall and numeracy; prevalence of impairment rises with age. The age-related increase in impairment was most striking for memory recall. There are clear country differences with the countries bordering on the Mediterranean tending to have higher prevalences. In a predictive model, including the effects of age, gender, education and country, much but not all of the effect of country on each of the three cognitive outcomes could be explained by education.

Figure 1 The prevalence of cognitive impairment, by age and country
2 Cognitive impairment and education

Cognitive function, however measured, was strongly and consistently associated with education. The effects of education were broadly similar between countries, with the exception of numeracy where the association between less than full secondary education and impaired numeracy was much stronger in Greece, Spain, Italy, France and Switzerland than in the other mainly northern European countries. This finding is not discussed further.

Figure 2 The association between education and cognitive impairment, by country
3 Cognitive impairment, income and wealth

We modelled individual income and household wealth as log-normally distributed outcomes with outliers excluded. The effect of cognitive impairment was estimated, controlling for age, gender, education and employment status. Consistently across Europe, people with cognitive impairment as measured by memory recall have lower incomes than those who are not impaired. The effect of impairment in numeracy and verbal fluency was apparent in some but not all countries. For household wealth, cognitive impairment was associated with marked reductions, but only in northern European countries (the Netherlands, Germany, Denmark and Sweden).

**Figure 3** The association between income, wealth and cognitive impairment, by country
4 Cognition and support

The effect of relative cognitive impairment upon giving and receiving either emotional, practical or financial support was modelled using logistic regression, controlling for age, sex and education. Those with cognitive impairment were generally less likely to give, and more likely to receive support than others. The negative effect on giving support was less apparent in the southern European countries, Italy, Spain and Greece. The positive effect of receiving support was again perhaps more evident in these three Mediterranean countries.

![Figure 4 The association between cognitive impairment and support, by country](image-url)
5 Cognition and functioning

The effect of relative cognitive impairment upon performance of activities of daily living (ADL), performance of instrumental activities of daily living (IADL) and mobility was modelled using logistic regression, controlling for age, sex and education. Impairment in verbal fluency, memory recall and numeracy were all strongly associated with one or more limitations in ADL and IADL. These effects were not however apparent in Greece. Mobility was less clearly influenced, with significant effects only being apparent in some Northern European countries.

*Figure 3* The association between cognitive impairment and indicators of functioning, by country
6 Cognition and health

The effect of relative cognitive impairment upon self perceived health, physical symptoms and chronic illness was modelled using logistic regression, controlling for sex, age and education. There were clear and consistent negative effects of relative cognitive impairment (each domain) upon self perceived health. Cognitive impairment was less reliably associated with having 2 or more physical symptoms, and there was no clear pattern of association with having 2 or more chronic physical illnesses.

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**Figure 6** The association between cognitive impairment and health indicators, by country.
Conclusion

The prevalence of cognitive impairment increases sharply with increasing age, across the continent of Europe. This most likely reflects the organic process of neurodegeneration; the progressive neuronal loss associated with normal ageing, together with the pathological processes of Alzheimer’s Disease and cerebrovascular disease. Some of the variation in cognitive performance, particularly at younger ages, may relate to how intelligence and other cognitive abilities are acquired in early life, in particular the benefits of education, social and socio-economic advantage. Much of the between-country differences in cognitive performance in SHARE are explained by differences in educational experience. The Mediterranean countries, with the highest prevalences of relative cognitive impairment also have the lowest prevailing levels of education.

Relative cognitive impairment is associated with significant decrements in income and, at least in Northern Europe, household wealth. The associations were independent of education and current occupational status. Few studies have assessed these associations, and none with such detail as SHARE. The associations may reflect the cumulative effect of cognitive disadvantage over the life course upon career development and other opportunities for economic enhancement. Alternatively, decline in cognitive ability in later life may be associated with impairment in occupational functioning and consequent economic disadvantage.

Consistent with other literature, we have identified strong and fairly consistent associations between cognitive impairment and impaired functioning (limitations in ADL and IADL), poor self-reported health, and changes in the dynamic of giving and receiving support. Interesting differences emerged between southern and northern European countries. While conceding the risk of over-generalising, a pattern emerges in which relative cognitive impairment is more robustly associated in Northern Europe with reduced functioning, and more robustly associated in Southern Europe with receiving support. The obvious inference is that kin and non-kin social networks may be more intact in Southern Europe, hence allowing older people with cognitive decline to function at a higher level.

- The SHARE dataset is unique in providing information about cognitive functioning from nationally representative samples from more than one country.

- Although differences in the provision of education account for some of the North-South gradient they do not completely explain it.

- The relationship between cognitive functioning and economic disadvantage is intriguing but a fuller account must await longitudinal information about the pathway from working life to retirement.

References


