Supplementary data

Appendix 1

**Methods**

**Study population**

The study population belongs to the Helsinki Birth Cohort Study (HBCS), which includes 8760 participants (4630 men and 4130 women) who were born between 1934- 1944 and who had attended child welfare clinics and resided in Finland in 1971 [1-4]. Of these 4630 men, we were able to identify 2786 (60%) Finnish male military conscript who took an intellectual ability test (the Finnish Defence Forces Basic Intellectual Ability Test) during their compulsory military service at a mean age of 20.3 years between 1952- 1972. In the year 2000 a random sample of 2901 members of the original HBCS were invited to participate in clinical examinations. 2003 persons (69 %) participated in the examinations between 2001 and 2004. Of them, 640 men had data available on the intellectual ability test in the early adulthood. In 2011 1404 participants (627 men and 777 women) of the original clinical study cohort (n=2003) who were alive and living within 100 km distance from Helsinki were invited to the follow-up clinical examinations. A total of 1094 participants (478 men and 616 women) attended the clinical examinations between 2011 and 2013 [5]. Complete data, i.e. military intellectual ability test score measured in early adulthood and both physical functioning assessments at age 61 and 71, were available for 360 participants. Those with missing data on follow-up examinations for physical functioning in 2013 were more likely to be older (p<0.001) and to have a father who had lower occupational status (p=0.003). They also had lower physical functioning scores at the first assessment (p<0.001) and lower military intellectual ability test scores in early adulthood (p<0.001). The study complies with the guidelines of the Declaration of Helsinki. The study was approved by the Coordinating Ethics Committee and Ethics Committee of Epidemiology and Public Health of the Hospital District of Helsinki and Uusimaa and that of the National Public Health Institute, Helsinki. All participants gave a written informed consent. Intellectual ability data were linked with permission from the Finnish Defence Forces.

**Intellectual ability**

The Finnish Defence Forces Basic Intellectual Ability Test was developed by the Finnish Defence Forces Educational Development Centre and was compulsory for all new recruits during the two first two weeks of their military service. Administration of the test has been described in detail previously [3, 6, 7]. Briefly, the test battery includes arithmetic, verbal and visuospatial reasoning subtests measuring general cognitive ability and logical thinking. Each subtest includes 40 multiple choice questions ordered by difficulty (range 0-40 points. The arithmetic reasoning subtest comprises four different types of questions. The subject has to complete a series of numbers according to a previous rule, solve verbal short arithmetic problems, compute simple arithmetic operations, and choose similar relationship between two pairs of numbers. The verbal reasoning subtest includes four different types of questions. The subject has to choose synonyms or antonyms of given words, choose a word belonging to the same category as a given word pair, select which word or word list does not belong in the group, and find similar relationship between two word pairs. The visuospatial reasoning subtest includes a set of matrices containing a pattern problem with one part missing. The subject is asked to decide which of the given figures completes the matrix. The task requires the subject to conceptualize spatial relationships ranging from the very obvious to the very abstract, analogous to Raven’s Progressive Matrices 22. Correct answers in each subtest were summed and the arithmetic mean was used as an index of intellectual ability.

**Legend for the Figure 1** Conceptual model of the effect of intellectual ability on longitudinal censored measurements of physical functioning including paths for intellectual ability predicting physical functioning at the first assessment (*β*1) and physical functioning follow-up (*β*2) and a path from the first assessment of physical functioning to follow-up (*β*3). We additionally calculated the indirect effect of intellectual ability on follow-up physical functioning via the first assessment of physical functioning (*β*1×*β*3) and total effect of *β*2 + ( *β*1×*β*3). In the model all three measurements were adjusted for age at measurement, childhood socioeconomic status and adult BMI.

**Figure 1.**

Intellectual

Ability

1952-1972

Physical

Functioning

2001-2004

Physical

Functioning

2013

*β*1

*β*3

*β*2

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