Research paper

The evolving relationship between premorbid intelligence and serious depression across the lifespan – A longitudinal study of 43,540 Swedish men

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ABSTRACT

Background: An association between higher intelligence and lower probability of serious depression has previously been established. Yet, to our knowledge, no large prospective study has examined the relationship across the lifespan.

Methods: A cohort of 49,321 Swedish men was followed from conscription in 1969–70 (age 18–20) through to 2008. Odds ratios (OR) for first time hospitalisation for depression (FTHD) were calculated in relation to intelligence for distinct time periods across the lifespan, while controlling for established risk factors for depression.

Results: There was a linear association between higher intelligence in youth and lower odds for FTHD during the entire follow-up period, 1973–2008. The association got progressively weaker across the lifespan. During 1973–80, one step down on the stanine scale was associated with an unadjusted increase in OR of 1.34 [95% confidence interval (CI) 1.26–1.42], adjusted OR 1.23 [1.15–1.32]; while, during 2001–2008, the ORs were less than half of the magnitude of the first period, unadjusted 1.14 [1.07–1.21], and adjusted 1.09 [1.01–1.17].

Limitations: The study includes men only, and the number of available places for in-patient care decreased during the follow-up period.

Conclusion: For the first time, we have shown that the association between lower intelligence and depression decreases over time. The attenuation of the association in the adjusted models suggests a slower accumulation of depressogenic stressors among people with a higher IQ-score. Further exploration of intelligence’s role in the etiology of depression across the lifespan is required in order to facilitate adequate diagnoses and ameliorating interventions.

1. Introduction

Depression is the principal cause of disability worldwide, with 350 million sufferers (World Health Organization [WHO], 2012). Depressive disorders affect physical, as well as social and role, functioning, and are associated with elevated risk of onset, as well as increased severity and persistence, of a range of secondary disorders. By extension, depression entails a higher risk of premature mortality, mainly due to physical disorders and suicide (Kessler and Bromet, 2013). The etiology is complex, since it is affected by several risk factors from multiple domains that act and change over time (Kendler et al., 2006).

Inverse associations between higher intelligence, or intelligence quotient (IQ), and risk of depression have been reported in several studies (Batty et al., 2007; Gale et al., 2010; Hung et al., 2016; Koenen et al., 2009; Zammit et al., 2004). Findings on one million Swedish men, during a mean follow-up period of 22 years, showed that a one standard deviation disadvantage at around age 18 was associated with a 50% greater risk of hospitalisation for mood disorders (Gale et al., 2010). A recent American study found low childhood IQ to be predictive of the recurrence and longer duration of depressive episodes, and increased the probability of hospitalisation for depression, as well as suicide ideation and attempt, during follow-up up to age 49 (Hung et al., 2016). In a sample of head injury survivors, higher premorbid IQ was identified as a resilience factor against comorbid depression (Salmond et al., 2006). A study of 1037 males and females in New
Zealand found lower childhood IQ to be associated with increased risk of major depression in adulthood, greater comorbidity at age 32, and more persistent depression from age 18–32 (Koenen et al., 2009).

However, to our knowledge, no large prospective study has investigated the association between intelligence and depression across the lifespan. Investigations of the same conscription cohort used for the present study demonstrate that associations between lower intelligence and risk factors for morbidity are observable early in life, and persist across the lifespan (Hemmingsson et al., 2008; Sörberg Wallin, 2015). A model from life-course epidemiology (Kuh et al., 2003) indicates that any one particular risk factor – in this case, low IQ – can cluster with, or affect, other risk factors. These risk factors can then accumulate over time, and create a trajectory towards morbidity and mortality. For instance, also using the same cohort as for the present study, we performed structural equation modeling to analyse the trajectories leading to attained socio-economic position (SEP), and found that intelligence and level of education explained a lot of the variance (β=.46 and β=.49, respectively) (Sorjonen et al., 2012). A lower adult SEP, in turn, is associated with more environmental risk factors for poor health, and decreased access to health care (Batty et al., 2006), thereby creating possible trajectories from intelligence to health outcomes.

Previous findings suggest that the associations between intelligence and health-related outcomes may not remain constant across the lifespan. A Scottish study found that there was no significant association with childhood IQ for deaths occurring after age 65, even though the unadjusted risk increased by 36% per standard deviation decrease in childhood IQ up to age 65 (Hart et al., 2005). We have previously found that the association between IQ in late adolescence and the receipt of disability pension decreased from earlier to later middle age (Sörberg et al., 2013b). Of note, the differences between follow-up periods decreased when controlling for personality aspects, smoking, risky use of alcohol, and other factors measured in childhood and adolescence, possibly indicating that an accumulation of risk factors associated with intelligence affects outcomes differently over time. Additionally, adjustment for socio-economic and work-related circumstances further reduced the differences between follow-up periods somewhat (Sörberg et al., 2013b). Regarding the association between intelligence and depression across the lifespan, it is possible that similar factors in childhood, adolescence and adult working life contribute to variations across the life course. For instance, the personality trait neuroticism (or similar constructs, such as low emotional control) is generally correlated with lower levels of intelligence (Chamorro-Premuzic and Furnham, 2004), and is an established risk factor for depression (Kendler et al., 2004). Lifestyle factors, such as risky use of alcohol or smoking, and structural factors, such as low SEP, are also associated with level of intelligence (Deary et al., 2010; Gottfredson, 2004; Hemmingsson et al., 2008), as well as increased risk of depression (Melchior et al., 2013). As such, they might contribute to the association between intelligence and depression, and possibly do so to varying degrees across the lifespan.

The Swedish conscription process, and the unique personal identification numbers all Swedish residents obtain, provide an opportunity to follow a large cohort free from any element of self-selection across the lifespan, while controlling for covariates from childhood through to later adulthood. The aim of this study is to examine the association between premorbid intelligence and first time hospitalisation for depression (FTHD) in distinct time periods across the lifespan, with an extended follow-up time up to age 59. By controlling for individual characteristics, social circumstances and socio-economic position at various points in time, we are able further to investigate the mechanisms that underlie the association, and how their roles might change over time.

2. Methods

2.1. Study population

The present study is based on 49,321 young Swedish males aged 18–20 who were conscripted for compulsory military service in 1969–70. This nation-wide survey was completed by 97–98% of all men in this age-group. Exclusions were mainly due to congenital disorders or severe handicaps. Ninety-eight percent were born 1949–51: the remaining 2%, who were born prior to 1949, were excluded from the cohort in order to increase the homogeneity of the sample. All conscripts underwent a two-day assessment to determine their suitability for military service. A detailed description of the Swedish conscription surveys has been presented elsewhere (Andreason et al., 1988; Larsson et al., 2002).

2.2. Exposure: intelligence

The information collected at the 1969–70 conscription examination covers four tests of intelligence: logic/inductive ability, verbal synonym detection, visuospatial/geometric perception, and technical/mechanical skills (with mathematical/physics problems). Outcomes were converted onto a normally distributed standard-nine (stanine) scale for each test. The scores were, in turn, combined and transformed into a global measure of intelligence, on a stanine scale corresponding to approximate IQ bands (mean 100, standard deviation 15) of <74, 74–81, 82–89, 90–95, 96–104, 105–110, 111–118, 119–126 and >126. The cognitive assessment has been reported on in detail elsewhere (Carlstedt, 2000; Hemmingsson et al., 2006). An intelligence score was available for 49,262 (99.9%) of the men.

2.3. Outcome: first time hospitalisation for depression

The outcome variable was first time hospitalisation for depression (FTHD) between 1973 and 2009. Data were collected from Swedish national hospital discharge registers, which covered 90% of cases of psychiatric inpatient care from 1973 to 1987, with an increase to in-effect full coverage from 1987 (Ludvigsson et al., 2011). During the long follow-up period, diagnoses were coded by clinical staff according to three different versions (8, 9 and 10) of the International Classification of Diseases (ICD). The outcome variable is, following Aberg et al. (2012), identified in accordance with the following diagnostic codes over time: ICD-8 (1973–1986): 296.00, 300.40 and 298.00; ICD-9 (1987–1996) 296B, 300E, 311 and 298A; ICD-10 (1997–2008): F32.

2.4. Covariates

2.4.1. Childhood socio-economic position

Information on socio-economic position (SEP) at age 9–11 was acquired from the National Population and Housing Census of 1960. SEP was measured as the occupation of the head of household, most commonly the father. Occupation was classified into six different groups: (1) unskilled workers; (2) skilled workers; (3) assistant non-manual employees; (4) non-manual employees at an intermediate or higher level; (5) farmers; (6) those not classified in any other socio-economic group (Hemmingsson et al., 2009).

2.4.2. Conscription data

As well as the above-mentioned assessment of intelligence, the conscription process included a full medical examination, the administration of questionnaires, and a structured interview with a trained psychologist. If a psychiatric diagnosis was suspected or reported, the conscripts were referred, if appropriate, to a psychiatrist for diagnosis according to the ICD-8 manual (ICD-8 codes 290–315; for depression, ICD-8 code 300.4).
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