



Executive functions in individuals with intellectual disability

Henrik Danielsson^{a,b,c,*}, Lucy Henry^d, Jerker Rönnerberg^{a,b,c}, Lars-Göran Nilsson^{e,f}

^a The Swedish Institute for Disability Research, Linköping, Sweden

^b Linnaeus Centre HEAD, Linköping University, Sweden

^c Department of Behavioural Sciences and Learning, Linköping University, Sweden

^d London South Bank University, London, UK

^e Stockholm University, Stockholm, Sweden

^f Stockholm Brain Institute, Stockholm, Sweden

ARTICLE INFO

Article history:

Received 1 July 2010

Accepted 9 July 2010

Keywords:

Executive functions

Intellectual disability

Adults

Inhibition

Working memory

ABSTRACT

The aim of the present study was to investigate executive functions in adults with intellectual disability, and compare them to a closely matched control group longitudinally for 5 years. In the Betula database, a group of adults with intellectual disability (ID, $n = 46$) was defined from measures of verbal and non-verbal IQ. A control group, with two people for every person with intellectual disability ($n = 92$), was chosen by matching on the following criterion in order of priority: IQ higher than 85, age, sex, sample, level of education, and years of education. Three types of tasks of executive functions were included on two occasions, with 5 years between testing sessions: The Tower of Hanoi, executively loaded dual task versions of word recall, and verbal fluency. Adults with ID showed significant impairments on verbal fluency and on the executively loaded dual task word recall task (at encoding but not at recall). There were no group differences on the Tower of Hanoi. No significant differences between the two test occasions were found. The results are interpreted in terms of individuals with ID having problems with speed of accessing lexical items and difficulties with working memory-related executive control at encoding, which includes shifting between tasks. There are, however, not necessarily problems with inhibition. The dual task results additionally imply that the adults with intellectual disability were more sensitive to strategy interruptions at encoding, but that dividing attention at recall did not have such detrimental effects.

© 2010 Elsevier Ltd. All rights reserved.

1. Introduction

The aim of the present study was to investigate executive functions in adults with intellectual disability, and compare them to a closely matched control group longitudinally for 5 years.

Executive functions (EFs) are processes that control and regulate thought and action. There is increasing evidence that EFs can be divided, or “fractionated”, into different subcomponents. Miyake et al. (2000) found evidence supporting the existence of three EF subcomponents: inhibition; updating; and shifting. These subcomponents were separable but still partially correlated constructs. Other tasks that include EFs are planning, decision making, problem solving, fluency and working memory-related dual tasks (e.g. Pennington & Ozonoff, 1996).

* Corresponding author at: Department of Behavioural Sciences and Learning (IBL), Linköping University, SE-581 83 Linköping, Sweden. Tel.: +46 13 28 21 99; fax: +46 13 28 21 45.

E-mail address: henrik.danielsson@liu.se (H. Danielsson).

Several studies have found evidence that EFs are related to performance on tasks closely associated with intelligence (e.g. Carpenter, Just, & Shell, 1990; Miyake, Friedman, Rettinger, Shah, & Hegarty, 2001; Salthouse, Fristoe, McGuthry, & Hambrick, 1998). However, with the division of EFs into subcomponents this picture has become more nuanced. Friedman et al. (2006) found that updating was highly correlated with the intelligence measures, but inhibiting and shifting were not. Arffa (2007) also found that IQ was related to EF tests of sorting, fluency and inhibition, but not to trail making.

Maehler and Schuchardt (2009) made a distinction between learning and intelligence by including both a group with learning difficulty and normal IQ and a group with learning difficulty and low IQ. No differences were found between the two groups on EF measures, but both performed more poorly than a control group without learning problems and normal IQ. This was interpreted as evidence for the fact that EFs are not necessarily related to intelligence, but rather to learning ability. Avila et al. (2009) also found differences between groups with high and low levels of education on a range of executive function tests (digit span backwards, trail making, stroop, and verbal fluency).

There are relatively few studies of EFs in individuals with intellectual disability. However, existing evidence supports the view that such individuals may perform at their mental age (MA) level. For example, Van der Molen, Van Luit, Jongmans, and Van der Molen (2007) carried out a comprehensive assessment of EFs children with ID. They included measures of category fluency, letter fluency, dual task performance, mazes and random number generation. Children with ID performed on par with MA peers on all tasks, which for the dual task performance also was on par with chronologically aged (CA) matched peers. Similarly, in a study on the problem-solving task, Tower of Hanoi, adults with ID performed on par with MA comparison groups (Numminen, Lehto, & Ruoppila, 2001). Performance at the same level as MA comparison groups has also been found on executive-loaded working memory task for both adults (Numminen, Service, & Ruoppila, 2002) and children (Brown, 1974; Conners, Carr, & Willis, 1998; Henry & MacLean, 2002; Henry & Winfield, 2010; Maehler & Schuchardt, 2009) with ID. Many studies have also shown below CA comparison group performance for persons with ID (e.g. Conners et al., 1998; Levén, Lyxell, Andersson, Danielsson, & Rönnberg, 2008). There is however one study that has found contradictory results. Russell, Jarrold, and Henry (1996) found that children with ID performed worse than MA peers on three executive-loaded working memory measures. Nevertheless, there is rather more evidence favouring the conclusion that both children and adults with ID perform at levels commensurate with their mental age.

Like many other cognitive measures, EFs have been shown to be age-related (Bucur & Madden, 2010). One weakness with many of the studies above is that there is almost no evidence concerning adults with ID across the lifespan. Most of the research in this area concerns children or teenagers and is cross-sectional. Hence, the purpose of the current study was to examine EFs in an adult sample of individuals with ID and investigate possible developmental changes in EFs across a relatively long period.

Comparison groups matched for MA were not feasible given that the database we were examining only included people aged 35 years and older. Therefore, a chronological age comparison group was selected, but we were extremely careful to match individuals in the comparison group to the adults with ID on several important measures including sex, age (chronological), years of education and level of education. All matching procedures were carried out at an individual level, as previous studies have generally only used group-matching procedures. It has been reported that level of education correlates with executive functions (Avila et al., 2009) and people with ID seldom continue to higher education such as university level. Therefore, controlling for education in the current study represents a considerable methodological improvement compared to previous work.

The present study uses the longitudinal Betula database (Nilsson et al., 1997, 2004) with background and cognitive measures for more than 2000 people to: (1) operationally define a group with IQ below 70; and to (2) define a control group matched on age, sex, level of education and years of education. Individual matching was successful on most measures and participants (see Section 2 for details) and successful matching at the group level was also obtained.

Thus, the research questions were: (1) do adults with ID perform more poorly on executive function tasks compared to a control group matched on age, sex, level of education, and years of education? (2) are there developmental effects on executive functions for persons with ID over a period of 5 years?

2. Method

2.1. Participants

The participants in the present study were a subsample of those in the Betula study. The Betula study is a prospective cohort study where the participants take part in extensive health and memory examinations, and interviews about social factors (Nilsson et al., 1997, 2004), the main purpose being to study the development of health and memory functions in adulthood and old age, risk factors of dementia, and premorbid memory functions.

One sample in Betula was tested the first time at T1 (Sample 1, S1). One thousand people were randomly selected from the population registry of Umeå, a city in northern Sweden with a population of about 110,000 inhabitants. The participants in S1 were 35, 40, 45, 50, 55, 60, 65, 70, 75, and 80 years of age when tested at T1 in 1988–1990. There were 100 people in each of these 10 age cohorts. Participants in S1 were tested again at T2 (1993–1995), at T3 (1998–2000), and at T4 (2003–2005). There were 716 participants still remaining in S1 at T3 and 554 S1 participants at T4. The main cause of attrition at each wave of data collection was death (about 10%). Some participants had moved from Umeå (about 2%), and some did not want to take part again or were unable to participate due to illness (2%). An additional two samples, S2 and S3, were tested for the first

متن کامل مقاله

دریافت فوری ←

ISIArticles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات