



## Educational attainment and cognitive competence in adopted men – A study of international and national adoptees, siblings and a general Swedish population

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### ABSTRACT

Internationally and nationally adopted young men were recently reported to have lower than average scores on intelligence tests at military conscription, compared with non-adopted conscripts in Sweden. In this study we used the Swedish national registers to analyse how this lower cognitive competence influences the educational attainment of adoptees. Intelligence test scores at conscription were analysed in relation to educational attainment at follow-up at 25–34 years in male international ( $n=2314$ ) and national ( $n=1153$ ) adoptees, compared with the general population in the same birth cohorts.

Korean adoptees more often had obtained a post-secondary education compared with the general population while Non-Korean and national adoptees less often had such an education at follow-up. The international adoptees had a better chance than the general population to complete a post-secondary level and a lower risk to remain at a basic level when their cognitive competence, as measured by intelligence test scores, had been accounted for. This effect was quite similar in biological children in families of international adoptees who had the best test scores, in the Korean adoptees who had slightly better test scores than the general population, and in the Non-Korean adoptees who had considerably lower test scores. National adoptees had similar outcomes in these respects as the general population when test scores had been accounted for. Higher age at adoption was associated with a lower educational attainment in the Non-Korean but not in the Korean adoptees, an effect that was attenuated when test scores were accounted for.

We conclude that a lower than average cognitive competence did influence the educational attainment of the Non-Korean international and the Swedish-born adoptees in this study. International but not national adoptees had attained a higher educational level than predicted from their scores on intelligence tests. This education promoting effect was similar in the Korean adoptees, who had high test scores in comparison with the general population, and the Non-Korean adoptees who had comparatively low test scores.

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## 1. Introduction

Educational attainment among international adoptees has become an important issue in Western Europe in recent years since many adoptees have reached young adulthood and have to cope with the high educational demands of the labour market in post-industrialised societies. An important determinant of educational attainment is cognitive competence. A delayed cognitive development and a lower than average cognitive competence seems to be more prevalent in national as well as international adoptees than in non-adopted individuals (Bohman & Sigvardsson, 1990; Brodzinsky, Schechter, & Henig, 1992; Dalen, 1995, 2001; van IJzendoorn, Juffer, & Klein Poelhuis, 2005; Verhulst, Althaus, & Verluis-den Bierman, 1990, 1992). A general pattern in previous studies is a great disparity between subgroups of international adoptees (Odenstad et al., in press). Results from research on cognitive competence in international adoptees are not conclusive. According to a recent meta-analysis, cognitive competence is equal in adoptees and non-adoptees (van IJzendoorn et al., 2005). Contrarily, in a recent national cohort study we found lower scores on intelligence tests in male internationally adopted conscripts than in non-adopted Swedish residents in the same age (Odenstad et al., in press). Non-Korean adoptees, for instance, had a mean 3.4 on the 9-graded global scale compared with a mean of 5.3 points in non-adopted conscripts.

Cognitive competence is closely connected with school performance and educational attainment. Many studies have reported that international adoptees do not perform as well as non-adoptees in school (Dalen, 2001; Kvifte-Andresen, 1992; van IJzendoorn et al., 2005). The meta-analysis carried out by van IJzendoorn et al. (2005) concludes that there is a gap between the international adoptees' cognitive competence and their school performance, meaning that the adoptees perform on a lower level than their cognitive potential would indicate, an "adoption decalage". This gap was reported to be largest among children with an extremely deprived background and among children with an adoption age above one year. Using education attainment as outcome measure in a study of whole national cohorts of international adoptees ( $n=5,942$ ), Lindblad, Hjern, and Vinnerljung (2003) extended previous research about academic performance by reporting equal risks for remaining at the basic level/reaching university level in international adoptees and the majority population in age and sex adjusted models. Compared with the biological offspring in these adoptive families, however, fewer international adoptees had obtained a post-secondary education.

Many factors may influence cognitive competence in adoptees. A common way to discuss these matters is to focus on pre-adoption and post-adoption factors. Among the former, pre-natal conditions such as maternal malnutrition and pre-natal alcohol exposure during pregnancy may be influential just as post-natal conditions like neglect and maltreatment (Miller, 2000; Mitchell, 2001). One example of potential neglect is being placed in an institution with insufficient resources for stimulating children's development, a common experience among international adoptees (Gunnar & Kertes, 2005; Johnson, 2002; Rutter, 2005; Vorria et al., 2006). Studies on institutionalized children adopted from Romania have reported significantly reduced activation in a number of brain areas believed to be involved in higher cognitive functioning (Becket et al., 2006; Chugani et al., 2001; Rutter, 2005).

A general problem when studying the development of international adoptees is that information about experiences before adoption is scarce. If the child is exposed to pre-adoption adversity, age of adoption may serve as a proxy of the magnitude of this exposure (Croft et al., 2007; Gunnar & Kertes, 2005; Juffer & van IJzendoorn, 2005; Marcovitch et al., 1997; O'Connor et al., 2000; Rutter, 2005; Rutter et al., 2007; van IJzendoorn et al., 2005). Thus, studies on adoptees from Romania indicate that age of adoption has some effects on children's further cognitive development (Becket et al., 2006; Croft et al., 2007; O'Connor et al., 2000). Becket et al. (2006) found that children with an adoption age less than 6 months did not have a delayed cognitive development and their IQ scores were similar compared with nationally adopted children in UK. However, children adopted later than 6 months had signs of a delayed cognitive development, and these children did not catch up with the comparison group. In a Swedish register study an age at adoption above four was associated with a lower educational attainment (Lindblad et al., 2003).

Interestingly, in most studies adoptees from South Korea display higher cognitive competence and better language skills as well as school performances than adoptees from other countries of origin (Bagley, 1993; Dalen, 2001; Frydman & Lynn, 1989; Kim, 1995; Kim, Shin, & Carey, 1999; Kvifte-Andresen, 1992; Lindblad et al., 2003; Odenstad et al., in press; Verhulst et al., 1990, 1992). One reason is likely to be the quality of care before adoption (Chandra, Abma, Maza, & Bachrach, 1999). For many decades, South Korea has been known for its high-level control of adoption agencies. Since the 1960ies, agency staff requirements include a psychologist, a physician and a nurse. At least 50% of the children's counsellors must have four year college level social work training (Kim & Carrol, 1975). In addition to well functioning orphanages, adoption agencies in Korea have also operated pre-adoptive foster family homes for many years as an alternative to infant residential care (Tahk, 1986). Another reason may very well be the selection of children put up for international adoption in Korea. The literature indicates strongly that the main bulk of Korean adoptive children, born in the 1970ies and the 1980ies, was born out of wedlock and relinquished by their mothers due to socio-cultural prejudices toward single parenthood, not unlike the situation in Sweden during the 1950ies (Bohman & Sigvardsson, 1990; Kim, 1995; Tahk, 1986). Selection criteria and quality of care of the biological mother as well as of the child to be adopted in other donor countries probably vary considerably more, thus indicating that Korean adoptees are favoured on both these aspects (Fonseca, 2002; Triselotis, 2000). Henceforth, for the analyses in this paper we have hypothesised that country of origin (Korean/Non-Korean), in addition to age at adoption, may serve as a crude proxy of pre-adoption conditions.

When it comes to post-adoption factors, adoption in itself seems to have a positive effect on children's intellectual and cognitive development (Bohman & Sigvardsson, 1990; Dennis, 1973; Hodges & Tizard, 1989; Rutter, Kreppner, O'Connor, & ERA Study Team, 2001; van IJzendoorn & Juffer, 2006; van IJzendoorn et al., 2005). The process of adoption usually involves a move from deprived institutional or unfavourable settings to better environmental conditions in the adoptive family. Particularly positive effects on cognitive development have been found when adoption has brought about radical changes of environment as

in children adopted from Romania during the 1990's (Becket et al., 2006; Croft et al., 2007; Rutter et al., 2001, 2007). Adoptive parents also seem to offer better than average prerequisites than other parents in some respects like parental education and socio-economic conditions (Hjern, Lindblad, & Vinnerljung, 2002; Juffer & van IJzendoorn, 2005; Lindblad et al., 2003; Verhulst et al., 1992).

National adoptees constitute a group with somewhat different pre- and post-adoption prerequisites when compared with international adoptees. Although the number of national adoptions in Sweden has decreased greatly during the last thirty years, there are today a considerable number of Swedish-born adoptees in middle age. One would expect that the pre-adoption conditions for domestic adoptees were generally more favourable than for children adopted from abroad, since the major reason for domestic adoption was birth to single (mostly young) mothers rather than poverty (Nordlöf, 2001). Furthermore, children who actually became adopted were a selected group among all children given up for adoption by Swedish mothers in the 1950ies and 1960ies. Infants displaying early signs of developmental problems, or were suspected to carry “genetic risks” for unfavourable development (e.g. having a parent with a learning disability or mental health problems), were not considered “adoptable”. They were placed in long term foster care instead (Bohman, 1995; Hedberg, 1964; Vinnerljung, 1992). Also, there is evidence of common matching in the adoption processes after presumed “intelligence level” of birth and adoptive parents (Hedberg, 1964; Nordlöf, 2001). Many nationally adopted children were placed in their adoptive families at an earlier age than international adoptees. Another possibly significant difference between national and international adoptees is the visibility of the latter group as children with a “non-Swedish background”. National adoptees are not immediately recognized as adoptees because of their physical appearance. In sum, there are several reasons to expect international adoptees to be more vulnerable for cognitive delays and educational problems than Swedish-born adoptees.

To conclude, there is still controversy regarding the academic performance of adoptees in relation to their cognitive capacity. The impact of pre-adoption factors on cognitive competence and educational attainment has yet to be fully elucidated. In this study we used data from Swedish national registers and from intelligence test scores in the comprehensive National Military Service Conscription Register in Sweden to approach these areas. The specific research questions were:

- Does a lower than average cognitive competence, as measured by test scores at military conscription, influence the educational attainment of adoptees?
- Does adoption have a promoting effect on educational achievement when cognitive competence has been accounted for?
- Does cognitive competence mediate possible effects of pre-adoption conditions, e.g. continent of origin (Korean/Non-Korean) and age at adoption on attained education in adulthood?

## 2. Methods

This study was based on Swedish national registers held by the National Board of Health and Welfare, Statistics Sweden and the National Service Administration. During the years covered by this study all male Swedish citizens, with the exception of individuals with an obvious and severe disability, were obliged by law to attend conscription for military service. At conscription the young men underwent a standardized physical health examination and – since 1944 – an intelligence test. The original test battery has been revised several times. The “Enlistment battery 80” was used between 1980 and 1994, measuring intellectual competence by four subtests representing logical, spatial, verbal, and technical capabilities (Carlstedt, 2000). The results from these tests are recorded in the Military Service Conscription Register (MSCR) with the unique personal identification (ID) number assigned to all Swedish residents at birth or immigration. By using this unique ID number record linkages were made between the MSCR and several other national registers including the Register of the Total Swedish Population (RTP), the Swedish Multi-Generation Register (MGR) (Statistics Sweden, 2005), the Population and Housing Censuses (PHCs) of 1985 and 1990 the Swedish Educational Register of 2001. The study was approved by the regional ethics committee at Karolinska Institutet.

### 2.1. Study groups

The study population was drawn from all male residents in Sweden born between 1968 and 1976 who were conscripted before 20 years of age at a time when the “Enlistment battery 80” was still in use (before October 1994) and were still residents in Sweden at follow-up in December 2001. Further admissibility criteria for inclusion in the study population were to have complete information on all four intelligence test variables. Six study groups were created based on information about adoption from the MGR and information about country and year of birth and immigration of the study subjects and their parents from the RTP. The international adoptee groups consisted of individuals born outside the Western countries (Europe, North America and Australia) that had immigrated to Sweden before 7 years of age with two Swedish-born adoptive parents. The international adoptees were divided into two groups, *Korean adoptees* ( $N=780$ ) and *Non-Korean international adoptees* ( $N=1558$ ). *National adoptees* were defined as all adoptees recorded to be born in Sweden ( $N=1153$ ). Biological offspring of women that were recorded to also be an adoptive mother were divided into two groups; *Siblings of international adoptees* ( $N=357$ ) and *Siblings of national adoptees* ( $N=286$ ). The *general population group* consisted of Swedish-born offspring of two Swedish-born parents with no record of ever having adopted a child ( $N=342\ 526$ ).

94.6% of Korean and 89.3% of Non-Koreans had a registered date of conscription compared with 93.9% in the general population. The attrition because of incomplete test scores and/or conscription after October 1994 was highest in the general population (8.5%) and lowest in the Korean adoptees (6.5%).

## 2.2. Educational outcomes

The highest completed education was obtained from the Swedish Educational Register of 2001 and categorised into 9 or less years of primary school (basic), two or three years of secondary school (secondary) and post-secondary education (Statistics Sweden, 2000). Dichotomised outcome variables were created by defining basic education only as “Low” education and having completed a post-secondary education as “High”.

### 2.2.1. Test scores at conscription

The “Enlistment battery 80” mentioned above includes four subtests. The scores were standardised so that all test scores, and a global score derived from the four subtests, had a Gaussian distribution of scores between 1 and 9. Higher values indicate enhanced cognitive competence. Due to military secrecy, the tests are not available for persons outside the Swedish conscription authority. However, a construct validity analysis of the global scale has been published (Carlstedt & Mårdberg, 1993). In a confirmatory factor analysis using the LISREL program, it was demonstrated that the global score could be “... seen as a good estimate of general intellectual capacity defined as an ability to solve complex problems” (Carlstedt & Mårdberg, 1993). The logical test measures the capacity for understanding written instructions and applying them for solving a problem. In the spatial test, the task is to determine which three-dimensional object (out of examples presented) will result from folding up a given one-dimensional object, which has marked lines, indicating where to fold (the “folding” is performed mentally). The verbal test measures the knowledge of synonyms; the subject should determine which out of four alternatives is the synonym of a given word (40 words are presented as such key words). The aim of the verbal test is to measure “linguistic understanding and ability to use oral and written language” (Carlstedt, 2000). The technical test, “technical comprehension” also measures knowledge of chemistry and physics and implies a component of general knowledge. All tests are presented in succession to the conscripts as written questionnaires.

### 2.3. Independent variables/potential confounding factors

Data on maternal education was obtained from the Swedish Population and Housing Census 1990 and categorised in the same manner as the educational outcome defined above. The socio-economic status (SES) of the household was identified in the Swedish Population and Housing Census of 1985. Socio-economic groups were defined according to a classification created by Statistics Sweden, which is based on occupation but also takes the level of education, type of production and position at work of the head of the household into account (Statistics Sweden, 1982). The community where the study subjects resided was categorised from urban to rural in six categories based on a nine-category variable (h-region) created by Statistics Sweden.

Age at adoption was defined as date of immigration minus date of birth, and categorized as 0–6 months, 7–12 months, 13–24 months, 2 to 3 years, 4–6 years at adoption. Unfortunately, no information on age at adoption was available for the national adoptees.

### 2.4. Statistical analyses

Logistic regression was used to test our hypotheses. Since ordinary logistic regression with high-frequency outcomes produces odds ratios that are somewhat difficult to interpret, we used logistic regression on the log scale to calculate estimates equivalent to relative risk ratios (RR) (Xhang & Yu, 1998). The dichotomised educational variables described above were used as outcome variables. In the first model year of birth was introduced as a three category dummy variable; 1967 to 1970, 1971 to 1973, or 1974 to

**Table 1**  
Socio-demographic variables in the study groups

|                      | N=                         | Korean   | Non-Korean             | Siblings of international | National | Siblings of national | General    |
|----------------------|----------------------------|----------|------------------------|---------------------------|----------|----------------------|------------|
|                      |                            | adoptees | international adoptees | adoptees                  | adoptees | adoptees             | population |
|                      |                            | 780      | 1558                   | 357                       | 1153     | 286                  | 342 526    |
|                      |                            | %        | %                      | %                         | %        | %                    | %          |
| Year of birth        | 1968–70                    | 27.8     | 13.6                   | 36.1                      | 50.7     | 43.7                 | 36.2       |
|                      | 1971–73                    | 45.7     | 36.0                   | 38.7                      | 33.0     | 39.2                 | 37.6       |
|                      | 1974–76                    | 26.5     | 50.4                   | 25.2                      | 16.3     | 17.1                 | 26.1       |
| Maternal education   | Basic                      | 19.1     | 14.9                   | 7.8                       | 30.8     | 36.7                 | 28.0       |
|                      | Secondary                  | 40.2     | 34.3                   | 32.2                      | 41.3     | 38.5                 | 47.3       |
|                      | Post-secondary             | 40.7     | 50.8                   | 59.7                      | 25.7     | 24.8                 | 24.6       |
|                      | Missing data               | 0.0      | 0.1                    | 0.3                       | 2.3      | 0.0                  | 0.1        |
| SES                  | Unclassified               | 4.3      | 5.2                    | 14.3                      | 9.3      | 24.8                 | 20.6       |
|                      | Manual workers             | 8.9      | 5.6                    | 12.3                      | 13.5     | 30.8                 | 30.0       |
|                      | Skilled workers            | 9.2      | 6.1                    | 4.2                       | 10.8     | 5.6                  | 7.5        |
|                      | White collar 1             | 13.8     | 12.5                   | 12.9                      | 15.3     | 18.2                 | 18.9       |
|                      | White collar 2             | 30.9     | 29.5                   | 33.3                      | 25.1     | 12.9                 | 16.7       |
| Geographic residency | White collar 3             | 33.0     | 41.0                   | 23.0                      | 26.1     | 7.7                  | 6.4        |
|                      | Stockholm, Göteborg, Malmö | 23.8     | 26.4                   | 26.6                      | 20.6     | 21.5                 | 22.5       |
|                      | Other city                 | 59.3     | 58.2                   | 56.6                      | 58.0     | 57.6                 | 55.9       |
|                      | Rural community            | 16.9     | 15.4                   | 16.8                      | 21.3     | 20.9                 | 21.6       |

**Table 2**  
Test scores by study group

| N            | Korean adoptees |      | Non-Korean international adoptees |      | Siblings of international adoptees |      | National adoptees |      | Siblings of national adoptees |      | General population |      |
|--------------|-----------------|------|-----------------------------------|------|------------------------------------|------|-------------------|------|-------------------------------|------|--------------------|------|
|              | 780             |      | 1558                              |      | 357                                |      | 1153              |      | 286                           |      | 342526             |      |
|              | Mean            | SD   | Mean                              | SD   | Mean                               | SD   | Mean              | SD   | Mean                          | SD   | Mean               | SD   |
| Logic        | 5.29            | 1.97 | 3.90                              | 1.81 | 6.23                               | 1.77 | 4.59              | 1.93 | 5.33                          | 1.99 | 5.22               | 1.94 |
| Synonyms     | 5.42            | 1.77 | 4.26                              | 1.81 | 6.05                               | 1.63 | 4.72              | 1.80 | 5.11                          | 1.85 | 5.00               | 1.78 |
| Spatial      | 5.36            | 1.99 | 3.95                              | 1.80 | 5.93                               | 1.95 | 4.50              | 1.91 | 5.23                          | 2.06 | 5.16               | 1.93 |
| Technical    | 5.14            | 1.81 | 3.62                              | 1.78 | 5.84                               | 1.85 | 4.54              | 1.83 | 5.16                          | 1.89 | 5.11               | 1.84 |
| Global score | 5.32            | 1.92 | 3.68                              | 1.74 | 6.21                               | 1.80 | 4.53              | 1.91 | 5.26                          | 2.01 | 5.13               | 1.90 |

1976. In the second model the global test score was introduced as a continuous variable and in the third model we added maternal education, SES and residency as dichotomised dummy variables. We calculated 95% confidence intervals using the test-based method. All analyses were made by using the SAS 9.0 software.

### 3. Results

In Table 1 the socio-demographic characteristics of the study groups are presented. International adoptees and siblings in these families more often lived in households with a high SES and more often had mothers with a post-secondary education compared with the general population. The national adoptees lived in households with a SES lower than the households of international adoptees but higher than the general population.

Siblings of international adoptees had the highest scores on the conscription tests of cognitive competence (Table 2). Adoptees from Korea had the second best scores on all the cognitive tests followed by biological siblings in families who had adoptees born in Sweden, general population, adoptees born in Sweden and Non-Korean international adoptees.

Siblings of international adoptees had attained the highest educational level of all study groups, 66% with a post-secondary degree, followed by the Korean adopted group, 48% (Table 3). The Non-Korean international adoptees had the lowest proportion, 24%. Swedish-born adoptees had the highest proportion with basic education only, 11%.

The risk ratios (RR:s) for reaching post-secondary level was 1.37 in the Korean, 0.68 in the Non-Korean and 0.75 in the Swedish-born adoptees when the analysis was adjusted for year of birth only (Table 4a; Model 1). When the educational attainment was adjusted for test scores at conscription (Table 4a; Model 2), the relative risks for attaining a high education were highest and quite similar (RR:s 1.21–1.29) in the three study groups raised in homes with international adoptees. The RR:s of attaining a high education of siblings to national adoptees did not differ from the general population and were also quite similar to the national adoption group after adjusting for test scores (RR 0.95 and 1.05, Table 4a). Adding maternal education, SES and residency to the regression analysis (Table 4a; Model 3) lowered the estimates in the study groups raised in the homes of adoptees. For Koreans and siblings of international adoptees, however, the risk of having obtained a post-secondary education was higher compared with the general population even after these adjustments.

Table 4b demonstrates the regression analysis of attaining a basic education only. Adoptees from Korea and siblings of international adoptees had the lowest RR for this outcome in a year of birth and sex adjusted model (Table 4b; Model 1). Non-Korean international adoptees had markedly lower risk ratios when test scores had been accounted for (Table 4b; Model 2) while Swedish-born adoptees had quite similar risk ratios compared with the general population. The siblings of the international adoptees had a pattern more similar to the general population. Because of the low frequency of this outcome variable, however, the risk estimates concerning low education were not very precise as demonstrated by the wide confidence intervals.

Age at adoption had some effect on the mean score on the global test score for Non-Korean international adoptees (Table 5). Adoptees with an adoption age of less than 6 months had a higher mean score ( $M=4.14$ ) than children adopted when they were older. The lowest test scores were found for individuals adopted after four year of age ( $M=3.32$ ). For the adoptees from Korea, age of adoption had nothing but a marginal effect on the mean score.

**Table 3**  
Highest completed education by study group

| N=             | Korean Adoptees | Non-Korean international adoptees | Siblings of international adoptees | National adoptees | Siblings of national adoptees | General population |
|----------------|-----------------|-----------------------------------|------------------------------------|-------------------|-------------------------------|--------------------|
|                | 780             | 1558                              | 357                                | 1153              | 286                           | 342526             |
|                | %               | %                                 | %                                  | %                 | %                             | %                  |
| Basic          | 5.2             | 10.0                              | 4.2                                | 10.6              | 8.7                           | 7.7                |
| Secondary      | 46.7            | 66.1                              | 29.4                               | 63.5              | 51.4                          | 57.3               |
| Post-secondary | 48.1            | 23.9                              | 66.4                               | 25.9              | 39.9                          | 35.0               |

**Table 4**

Logistic regression on the log scale of educational outcomes

|   | Model 1          | Model 2          | Model 3          |
|---|------------------|------------------|------------------|
|   | RR (95% CI)      | RR (95% CI)      | RR (95% CI)      |
| <i>a. High (completed post-secondary education)</i> |                  |                  |                  |
| Korean adoptees                                     | 1.37 (1.23–1.52) | 1.26 (1.14–1.40) | 1.15 (1.04–1.28) |
| Non-Korean IA                                       | 0.68 (0.62–0.75) | 1.21 (1.03–1.34) | 1.01 (0.91–1.12) |
| Siblings of international adoptees                  | 1.90 (1.67–2.16) | 1.29 (1.14–1.47) | 1.15 (1.01–1.31) |
| National adoptees                                   | 0.75 (0.67–0.84) | 0.95 (0.84–1.06) | 0.88 (0.79–0.99) |
| Siblings of national adoptees                       | 1.12 (0.94–1–35) | 1.05 (0.88–1.27) | 1.08 (0.90–1.30) |
| General population                                  | 1                | 1                | 1                |
| <i>b. Low (basic education only)</i>                |                  |                  |                  |
| Korean adoptees                                     | 0.67 (0.49–0.91) | 0.73 (0.53–0.99) | 0.94 (0.68–1.29) |
| Non-Korean IA                                       | 1.36 (1.16–1.59) | 0.76 (0.65–0.89) | 1.06 (0.90–1.24) |
| Siblings of international adoptees                  | 0.93 (0.56–1.59) | 0.93 (0.56–1.54) | 1.14 (0.69–1.90) |
| National adoptees                                   | 1.35 (1.13–1.61) | 1.02 (0.85–1.22) | 1.18 (0.99–1.42) |
| Siblings of national adoptees                       | 1.12 (0.76–1.66) | 1.12 (0.76–1.66) | 1.06 (0.72–1.61) |
| General population                                  | 1                | 1                | 1                |

**Table 5**

Mean summarised test scores by age at adoption

| Age          | Korean adoptees |           | Non-Korean International adoptees |           |
|--------------|-----------------|-----------|-----------------------------------|-----------|
|              | Mean            | 95% CI    | Mean                              | 95% CI    |
| 0–6 months   | 5.41            | 5.01–5.82 | 4.14                              | 4.00–4.28 |
| 7–12 months  | 5.11            | 4.89–5.23 | 3.79                              | 3.61–3.97 |
| 13–24 months | 5.76            | 5.44–6.12 | 4.04                              | 3.82–4.26 |
| 25–48 months | 5.69            | 5.41–5.97 | 3.52                              | 3.32–3.72 |
| 49–83 months | 5.08            | 4.70–5.36 | 3.32                              | 3.12–3.52 |

For the Korean adopted group, age at adoption did not interfere with attaining a post-secondary education (Table 6a). For the Non-Korean group, an adoption age below two years gave the best chance of attaining a post-secondary degree (Table 6a). Adding test scores to this analysis of Non-Korean adoptees decreased the magnitude of age at adoption as a predictor for educational attainment, from RR 0.78 (95% CI 0.60–1.02) to 0.87 (0.67–1.13) for those adopted at 2–3 years and from 0.54 (0.39–0.75) to 0.69 (0.50–0.96) for those adopted at 4–6 years of age compared with those adopted before their second birthday.

For attaining a basic education only the magnitude of the risks was lower and the patterns not as distinct as for high education (Table 6b).

**Table 6**

Attained education by age at adoption in the international adoptee study groups

| Age   | Korean adoptees |      | Non-Korean adoptees |      |
|---|-----------------|------|---------------------|------|
|   | N               | %    | N                   | %    |
| <i>a. High (completed post-secondary education)</i> |                 |      |                     |      |
| 0–6 months  | 75              | 50.7 | 501                 | 28.1 |
| 7–12 months   | 237             | 44.7 | 339                 | 28.6 |
| 13–24 months  | 143             | 52.4 | 246                 | 29.3 |
| 25–48 months  | 202             | 49.5 | 246                 | 19.9 |
| 49–83 months  | 123             | 47.2 | 226                 | 15.0 |
| Total   | 780             | 48.3 | 1558                | 25.2 |
| <i>b. Low (basic education only)</i>                |                 |      |                     |      |
| 0–6 months  | 75              | 2.7  | 501                 | 8.8  |
| 7–12 months   | 237             | 5.1  | 339                 | 6.2  |
| 13–24 months  | 143             | 5.6  | 246                 | 10.6 |
| 25–48 months  | 202             | 5.4  | 246                 | 14.6 |
| 49–83 months  | 123             | 6.5  | 226                 | 9.7  |
| Total   | 780             | 5.0  | 1558                | 9.6  |

## 4. Discussion

In this register study in a national cohort of young men, including international ( $n=2.314$ ) and national ( $n=1.153$ ) adoptees, we analysed educational attainment at 25–34 years of age in relation to cognitive competence as measured by tests at conscription for military service. A lower than average cognitive competence stands out as the main explanation of the low educational level of the Non-Korean and Swedish-born adoptees in this study, while the Korean-born had higher test scores and attained a higher educational level compared with the general population. Higher age at adoption was related to a lower educational attainment in Non-Korean adoptees but not in Korean-born adoptees, while we lacked data to test such an effect in the Swedish-born adoptees. This difference by age at adoption in the Non-Korean adoptees seemed to be mediated to a considerable degree by a lower than average cognitive competence, since risk ratios were attenuated when test scores were accounted for. All international adoptees – as well as their “siblings” – had attained a higher educational level than the general population with similar scores on the intelligence tests.

The most striking finding of this study was the positive impact of adoption on the educational level in the international adoptees. To put into other words: given their cognitive competence they had a better chance than the general population to reach the university level. Corresponding results for basic level education were similar. These results seem to demonstrate an education promoting ability of these adoptive families with their social embedding. This is further underlined by the more than average educational outcome of the biological children of these adoptive parents. In contrast, national adoption did not have a positive effect on educational attainment and this was not explained by the lower socio-economic level in these families compared with the adoptive families of international adoptees. This seems to imply that visibility is not a major issue in the educational attainment of adoptees in Sweden, although such discriminatory influences may not be completely ruled out in a study such as this. Further studies are needed to explain this intriguing disparity in the promotion of education between national and international adoptees in Sweden.

Our results do not give much support to the “adoption decalage”-hypothesis as suggested by [van Ijzendoorn et al. \(2005\)](#) and referred to above, meaning that adoptees perform less than average at school while they have an average cognitive potential. Our results clearly demonstrate that a lower than average cognitive competence is indeed a problem in relation to educational attainment for certain groups of adoptees. The outcomes in this study, however, were not measures of school performance but educational attainment. Thus an “adoption decalage” may certainly still reflect one of the several processes influencing school performance at certain periods in the life of adoptees. In order to shed further light upon “the adoption decalage” we need to study measures of school performance/in relation to cognitive competence.

Some of our findings highlight the importance of pre-adoption factors. One obvious example is the higher test scores and the higher educational attainments of Korean adoptees ([Dalen, 2001](#); [Lindblad et al., 2003](#)). This finding is in line with the better care and the selection of healthy children for adoption in Korea mentioned in the Introduction section ([Selman, 2000](#)). The importance of pre-adoption factors is further illustrated by the impact of age at adoption in the Non-Korean group and the lower than average cognitive competence as a mediator of this effect. Since there was no such relation in the Korean group, our interpretation follows the often proposed hypothesis that the various effects of age at adoption are mainly due to the relation between length of time before adoption and degree of adverse experiences during the pre-adoption period. Our results clearly show that age of adoption is not a proxy for early adversity in the Korean group, while the opposite holds true for adoptees from other regions.

A good education is a valuable tool for professional success and may also be related to improved self-esteem, which in itself is an important prerequisite for mental health. Similarly, academic failure is a risk factor for developing psychological symptoms. For example, a perception of low academic performance in young adolescents seems to be associated with suicidal behaviour ([Richardson, Bergen, Martin, Roeger, & Allison, 2005](#)). Such an influence may increase with age ([Martin, Richardson, Bergen, Roeger, & Allison, 2005](#)). A related question is if parental expectations of a good educational performance for children with low cognitive capacity can have negative health effects. Findings from Dutch studies on adolescents adopted from Thailand suggest that adoptive parents may have a stronger tendency to choose advanced theoretical educational programmes for their children than the average parents of non-adopted children ([Geerars, Hoksbergen, & Rooda, 1996](#)). US studies on national adoptions have found higher rates of adoption disruptions in families with high SES than in other families (e.g. [Barth & Berry, 1988](#)), possibly explained by too high academic expectations. Recently a Swedish population study reported that low IQ among men with highly educated parents had a threefold adjusted risk for suicide in adolescence, compared with other peers ([Gunnell, Magnusson, & Rasmussen, 2005](#)).

### 4.1. Limitations

Our study included only men and the results cannot be generalized to women. It should be noted, however, that a recent meta-analysis on adoption and cognitive development failed to demonstrate any gender differences, neither for IQ nor for school attainment ([van Ijzendoorn et al., 2005](#)). Another obvious limitation is the lack of information on the exposure to environmental and heritable risk factors for intellectual impairment in the adopted young men prior to adoption.

The fact that the psychological conscription tests are secret creates some uncertainty about how the results should be interpreted and how they relate to results from other established cognitive tests, even if this limitation to a certain degree is balanced by the theoretical and empirical bases of these tests, the available surveying descriptions of the subscales, the referred examination of the construct validity and the comprehensive previous research using these registers. However, since cognitive competence is a fairly constant personality trait, these circumstances probably have only minor – if any – influence on the results.

The main strengths of the study are the use of large national cohorts with a limited attrition that enabled us to analyse subgroups of adoptees and siblings in multivariate statistical analyses with adjustment for important confounders.

#### 4.2. Conclusions

In conclusion, a lower than average cognitive competence had a negative influence on the educational attainment of the Non-Korean international and the national adoptees in this study. International but not national adoptees had attained a higher educational level than predicted by their scores on tests at military conscription.

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