

Challenging intellectual, behavioral and educational prerequisites for interventions aimed at school aged children in foster care. A compilation of Swedish test results



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ABSTRACT

Children in foster care constitute a vulnerable group with higher risks for exposure to poorer health, adverse experiences during childhood and poor performance in school. School success is considered one of the most important factors to prevent future adversity and there is a growing interest in society for school results for children in foster care or other out-of-home care arrangements. The purpose of this study was to outline prerequisites for interventions aimed at school performance for children in foster care, related to those in normal population studies. In this study assessments of intelligence, literacy and numeracy skills, mental and behavioral conditions were compiled from 856 children in foster care, between preschool class and 7th grade from 22 Swedish municipalities. Results show lower scores in *intelligence*, most prominent in *working memory*, *adaptive behavior*, *literacy and numeracy*, and more *behavioral problems*. Ingroup comparisons showed less favorable scores for boys than girls in general, except in *mathematics*. These findings call for a need to adapt learning conditions in school by individual assessments of children in out-of-home care, rather than assuming age-typical prerequisites.

1. Introduction

Children in out-of-home care represent a group in society with higher risks for exposure to poor health (Lehmann & Kaye, 2018), violence (Tordön et al., 2019), substance abuse (Havlicek, Garcia, & Smith, 2013) and poorer school performance (Hansson & Gustafsson, 2018; Kaarijala, Berlin, Lausten, Hiilamo, & Ristikari, 2018). It has been argued that non-failure in school, with eligibility to higher levels of education, might serve as a key factor for the reduction of other risk factors (Berlin, Vinnerljung, & Hjern, 2011; Cameron, Jackson, Hauari, & Hollingworth, 2012). Factors contributing to the obstacles to succeed in school for children in out-of-home care have been debated (Leve et al., 2012). Circumstances preceding the placement, the transition itself to new schools and families, detrimental events during placement, poor support in care all contribute to a poorer outcome in school and thus possibly transitional effects in health or quality of life onwards (Almqvist et al., 2018; Bruce, Naccarato, Hopson, & Morrelli, 2010).

Prerequisites for school performance are, in our understanding, the aggregated sum of different building blocks, ranging from psychosocial conditions, epigenetic conditions, intelligence, learned adaptive behaviors, social skills, to numeracy and literacy. These specific areas interact to strengthen or weaken each other in different directions that

science yet haven't explored. In this study, we take the first step to describe measures of some of these building blocks for children in foster care, and we intend to follow up in a coming paper on the dynamic potential for change over time when specific deficits and strengths are addressed in school.

A comparison of cognitive and educational outcome for children in long term foster care versus adopted children and children from a normal population (Vinnerljung & Hjern, 2011) showed lower cognitive outcome in studies of young men at conscription with a history of foster care placement, these results were also evident in a recent Danish register study by Hegelund, Flensburg-Madsen, Dammeyer, and Mortensen (2018), also using cognitive measures of young men, age 18, at a draft board. Separations from parents, as a form of early life stress events, have been shown to decrease intellectual ability by -0.19 SD in a study by Pesonen et al. (2011), again on males later in life.

Interventions aimed at improving efforts to support school results specifically in this group as early as possible, and preferably as a preventive action, has been developed and evaluated over the previous decades (Forsman & Vinnerljung, 2012; Haggman-Laitila, Saloekkilä, & Karki, 2019; Liabo, Gray, & Mulcahy, 2013). Reviews of interventions have stressed the importance of collaboration (Männistö & Pirttimaa, 2018), the general weak study design but positive outcome of

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interventions (Woodgate, Morakinyo, & Martin, 2017), factors associated with educational outcome (O'Higgins, Sebba, & Gardner, 2017), and specific interventions aimed at stronger school performance (Evans, Brown, Rees, & Smith, 2017; Forsman & Vinnerljung, 2012). For example, literacy skills by Paired Reading showed improvements in reading tests and reading age after a 16-week intervention, and vocabulary subtests in intelligence testing for a group of 81 foster children (Vinnerljung, Tideman, Sallnäs, & Forsman, 2014). The letterbox club, an intervention designed to enhance literacy by providing adapted book mailings and simple games to children in foster care (Griffiths, 2012), has shown small effects on literacy in a Swedish evaluation (Forsman, 2019), but also to enhance reading engagement and carer involvement. Tutoring programs for literacy or mathematics skills have shown improvements in spelling, reading decoding and promising but more moderate effects on mathematic skills (Harper & Schmidt, 2012). Programs aimed to strengthen foster parents' abilities in school-related issues, such as Kids in Care project, has shown improvements in sentence comprehension, reading composite and mathematical computation (Flynn, Marquis, Paquet, Peeke, & Aubry, 2012). This has later inspired a trial in Denmark with results showing improvements in cognitive measures and reading, but still on a lower level than peers after the intervention (Kragh Andersen, Eiberg, & Blomqvist, 2018).

In Sweden, a working model was developed aiming to strengthen school results for children in foster care in both numeracy and literacy (Tideman, Vinnerljung, Hintze, & Aldenius Isaksson, 2011). It was named *Skolfam* and built on the idea of mapping prerequisites with standardized tests, adapting to these prerequisites through continuous monitoring and consultative support to school staff twice every semester, and after two years evaluation of the progress in a renewed assessment. Another aim with *Skolfam* was to strengthen collaboration between social services, school, healthcare and other areas of the welfare system that could improve the situation for the child, for example, libraries and leisure activities. The original study was replicated in another setting 2012 showing similar positive outcomes from the intervention as the original study (Tordön, Vinnerljung, & Axelsson, 2014) and *Skolfam* has since been implemented in 25 municipalities in Sweden. A similar trial that built on the same basic design and core ideas has been performed in Finland (Pirttimaa & Väliavaara, 2017), showing improvement in some academic skills at group level and individual improvements in psychosocial wellbeing.

Recently, a study with a quasi-experimental design evaluated the outcome of *Skolfam* in nine municipalities with 54 participants in the intervention group and 37 participants in the control group with moderate but promising results for the relatively short timeframe of 24 months (Durbeej & Hellner, 2017). The study lacked enough participants to show significant results based on sufficient statistical power in most measures, but the tendencies in results were in favor of the intervention.

In Sweden, foster care is the single most common choice of out-of-home care for children, 48% in ages 0–20 years. It can be voluntary under the Social Service Act, or compulsory by a court decision. 31% are in the age span of 7–14 years, representing around 1% of corresponding age cohorts of the population (National Board of Health and Welfare, 2017). Adoption of Swedish children are extremely rare, and most cases relate to children in foster care who apply themselves for adoption by their foster parents when they are legally adults at 18 years.

The network of Swedish *Skolfam* municipalities keeps track of the results on an aggregated national level by annual surveys to the teams, where numbers of foster children that finish compulsory school with and without eligibility to further studies in upper secondary school are reported. These surveys reveal that in the long run, eligibility for further education is around 75 to 80% for foster children within the *Skolfam* model 2015 – 2018 (Tengwall & Tordön, 2018). These numbers are to be compared to the national mean of 52 to 60% eligibility for all foster children in Sweden (National Board of Health and Welfare,

2016a).

Still, there is a need to further explore prerequisites for school for children in foster care to inform teachers, social services and foster parents in order to adapt expectations and teaching methods and thereby promote scholastic progress as good as possible for this group. Furthermore, there is a need to explore differences according to gender and native language in standardized test results in a sample large enough to facilitate these comparisons. In Sweden, results in international comparisons of mathematics skills, there are very small differences according to gender (TIMSS 2015 International Reports, 2015). National registry data from Swedish National Agency for Education (2018), show that school results for children with another native language than Swedish are poorer. For the group of children in foster care, neither gender nor native language is representative for general population (National Board of Health and Welfare, 2017) and are therefore of interest to explore.

Thus, the aim of this study was, in order to inform practice, particularly for interventions aimed at strengthening school results in out-of-home children, to explore language and mathematical skills, intellectual properties, psychosocial status, and adaptive behavior in children in compulsory school, placed in foster care and compare the outcome with standardized tests for the normal population.

2. Material and methods

The *Skolfam* municipalities have since the start 2005 until 2018 assessed 1 034 children in foster care from preschool year (typically 6 years age) to school year 7 at inclusion in the working model. These assessments are done by multi-professional teams consisting of a psychologist, a special education teacher, a social service worker, and a foster home consultant, following a manual guided method. The teams are supported by a national network providing coordination, training, conferences, and consultation.

2.1. Participants

All Swedish municipalities that use, or have been using the *Skolfam* work model, were invited to participate in the study. From the annual survey report in the *Skolfam* network, the teams reported that 1 034 children have been assessed since the start in 2005, Fig. 1. At the time for data collection, October 2018 to April 2019, there were 40 teams from 25 municipalities engaged in the *Skolfam* network. Three discontinued teams, representing 61 children could not participate and another three active teams declined participation, representing 43 children. In total, data from 39 teams in 22 municipalities with a total of 930 children were possible to reach. From those, 856 data sets were collected. Data from 74 cases were not reported and are considered as an external dropout.

Inclusion criteria, as stated in the framework guideline for the *Skolfam* working model are:

- Placed in foster care by a municipality committed to the *Skolfam* working model, regardless of residing in the same municipality or another.
- Placed in foster care with a long-time prospect, i.e. no temporary placements.
- In preschool-class, typically age 6, to 7th year of compulsory school.
- Does not meet the criteria for inclusion in school for children with learning disabilities (mental retardation).

No other prioritizations or selections are advised by the regulations in the framework and manual, in order to maintain the working model's ambitions. The description and basic information of the participants' socio-demographic background are presented in Table 1. The sample is regarded as reflecting the population of foster care children in regular school well since the inclusion to *Skolfam* is open to all foster children

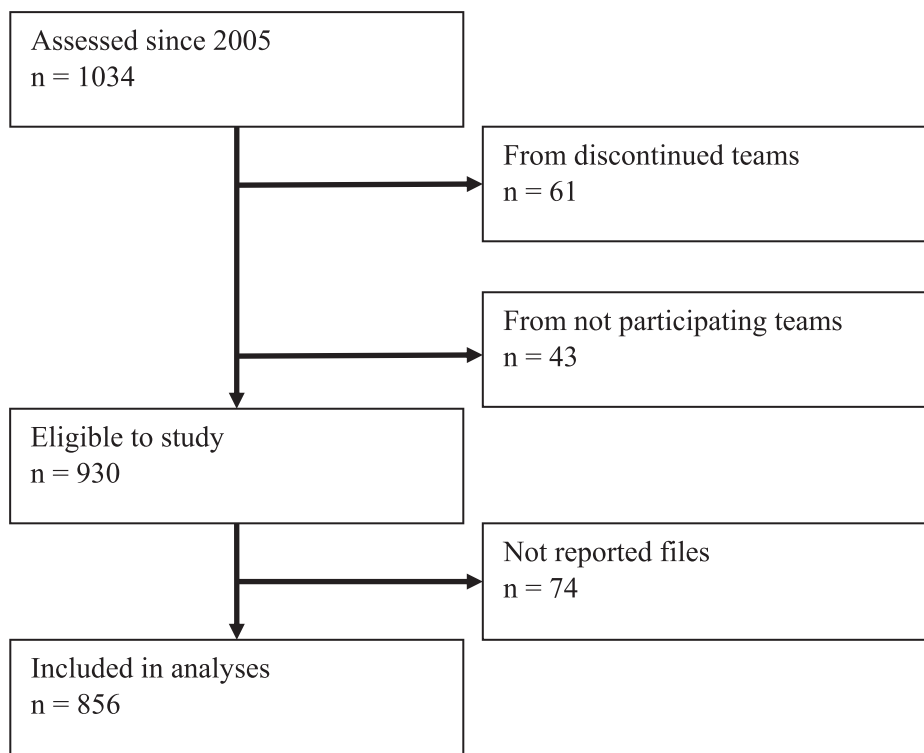


Fig. 1. Flowchart of participants.

Table 1
Socio-demographic background data, n & (%).

<i>Gender</i>	
Boy	467 (54.6)
Girl	382 (44.6)
Missing or unknown	7 (0.8)
<i>Native language</i>	
Swedish	545 (63.7)
Non-Swedish	220 (25.7)
Unknown	91 (10.6)
<i>School year</i>	
Preschool-3	377 (44.0)
4-6	334 (39.0)
7-9	81 (9.5)
Unknown	64 (7.5)
<i>No. placements</i>	
1	287 (33.5)
2	157 (18.3)
3 or more	120 (14.0)
Unknown	292 (34.1)
Placement length (months), mean/SD	43.3/34.4
Placement length (months), median/min-max	35/1-160

Note: Actual age was not available in the dataset, only school year, which provides a crude approximation of age distribution.

and excludes only those with a diagnosed mental retardation. However, the *Skolfam* municipalities are skewed regarding population size, where the mean population size is 142 200, compared to the national mean population size in the municipalities of 35 300.

According to public register data from Statistics Sweden (National Board of Health and Welfare, 2016b) on the total number of children in foster care at any time during 2016, age 7–14 it was 6 453, representing 34.7% of all children 0–20 years in foster care. Of these 3 456 (53.6%) were boys and 2 997 (46.4%) girls.

Our sample does not reflect the whole population of children in Swedish foster care since children younger than 7 (2 918, 15.7%) and older than 14 (9 196, 49.5%) were not included. The reason for this is a

deliberate ambition in *Skolfam* municipalities to include children as early as possible, due to the preventive orientation in the model.

The study was approved by the Regional Ethical Board of Linköping March 20th 2018, registration number 2018/96-31. Written informed consent to take part in *Skolfam*, where depersonalized data will be collected for research purposes, was given by caregivers or if cared under compulsory law, by the child's social worker at inclusion. No data that could identify children were collected, but in each municipality, the teams were asked to write and store a code key for traceability if needed in the future. No additional contacts or actions engaging the children were taken as a result of this study.

2.2. Measures

The *Skolfam* assessment battery comprises tests and questionnaires to aid the valuation of intelligence, adaptive behavior, mental problems, language, and mathematics. In order to make progress over time possible to assess, instruments are age-standardized with reliable norm data. The test battery is provided at the time for inclusion in the program and repeated after two years. The main objective for the use of standardized measures is to assess prerequisites for school performance for each individual child, in order to find strengths as well as gaps that need to be addressed in daily schoolwork to create optimal conditions for development. The second objective for using standardized test instruments is to monitor and validate that interventions and adaptations result in measurable progress for the child.

The validated and standardized instruments included in the *Skolfam* model, in Swedish versions, are:

Wechsler Intelligence Scale for Children, versions III to V. Intelligence was assessed by the Wechsler Intelligence Scale for Children, WISC (Wechsler, 1991, 2003, 2014). WISC assesses intelligence in different composite index scales and as a full-scale intelligence gradient on a standardized score with a fixed mean of 100 and a fixed range of 15 points for one standard deviation. Wechsler intelligence tests are used in most countries since the 1950's (Wechsler, 1949) and considered as reliable in measuring intelligence according to the theoretical model

chosen by its designer (Canivez, Watkins, & Dombrowski, 2017; Kaufman, Flanagan, Alfonso, & Mascolo, 2006).

The first 25 children from 2005 to 2008 were assessed using the third edition. From 2008 and onward, the fourth edition was used for 633 children. Recently, the fifth edition has been available and used to assess 134 children. Some index scales overlap between versions and these data have been combined in the analyze.

Adaptive Behavior Assessment System (ABAS-II), version II. The ABAS-II assesses adaptive behavior in nine domains, presented in conceptual, social and practical composite indexes and a general ability composite index. The assessments are done by parents and teachers. In *Skolfam*, foster parents answer the parent questionnaire. Adaptive behavior is sometimes referred to as *daily life skills*, reflecting how an individual can adapt their behavior to cope with different conditions or tasks in life (Harrison, 2008).

Strengths and Difficulties Questionnaire, the Swedish (SDQ). Strengths and difficulties were assessed by the SDQ (Goodman, 1997) and compared to the UK teacher test norms (Meltzer, Gatward, Goodman, & Ford, 2003), due to the lack of Swedish norms for teacher rating, and the most recent Swedish parent norms (Bjornsdotter, Enebrink, & Ghaderi, 2013). The instrument has 25 items in four scales reflecting problems (*emotional-, conduct-, hyperactivity-, and peer relations*) and one strength scale (*prosocial behavior*). The range is 0–10 in each scale and 0–40 in the *total difficulties* score, reflecting more problems the higher score, except for the prosocial behavior scale where scores are inverted and not included in the total score.

Reading Chains [Swedish “Läskedjor”] versions I and II. Reading chains are primarily aimed at assessing skills in visual decoding of letters/digits, words or sentences. During the years 2005 to 2014 the first edition of these tests was used (Jacobson, 2001), and from 2014 Reading Chains-2 (Jacobson, 2014). *Letter chains* were used instead of *Digit chains* in the first school year and *Sentence chains* from the second school year, explaining the variance in the number of results. There are no norm means or standard deviations spanning over all schoolyears reported from the standardization studies in the pedagogical tests, making a more precise calculation impossible.

Diagnosis in Reading and Spelling (Swedish “DLS”). A test for reading and writing skills broader aimed than just visual decoding is DLS with subtests developed by Järpsten (2002) including Word comprehension, Reading, Reading comprehension, Spelling, and Reading speed. Subtest Reading is done in school year 1 and 2, Spelling and Word comprehension in school year 3–9, Reading comprehension in school year 2 and 3 and Reading speed in school year 4–9.

Reading and Spelling (Swedish “LäSt”) for decoding and reading index. LäSt reading index is a test measuring text decoding of non-words and words, which reports a result in percentiles reflecting these aspects called “Reading index” this test was developed by Elwér, Fridolfsson, Samuelsson, and Wiklund (2013). In the *Skolfam* setting used in school years 1–5 but occasionally also in the 6th year.

Olof Magne Mathematics Diagnoses (Swedish). Numeracy skills were assessed with the Olof Magne mathematics series of tests, standardized in three studies 1977, 1986 and 2002 in a municipality with around 2 000 pupils in compulsory school (Engström & Magne, 2003). The Magne diagnostic tests aim to assess numeracy skills in different areas, such as number- or quantity perception, number values, position, basic algebra, units and applied numeracy comprehension.

The *Skolfam* manual, in Swedish, is available online (Children's Welfare Foundation, 2018), at www.skolfam.se/artiklar-och-rapporter-om-skolfam/

2.3. Procedure

Each municipal team was asked to compile data from test documentation in an Excel template with background data, test results, and a unique code for each data set, but no personal information revealing identity. Each team was also asked to set up a code key to be kept

locally to enable future validation.

Each individual file contains data of prerequisites for school achievement as measured by the instruments in the *Skolfam* standard test battery, test date, gender, school year, native language, number of placements and length of the present placement.

2.4. Statistical analyses

Comparable index scales in WISC-IV and WISC-V, -verbal, working memory, processing speed and full-scale IQ, were combined. Means for scales in the different instruments were calculated along with standard deviation and compared to norm groups from sources either in manuals or from published literature. T-tests for independent means were performed to calculate differences. Kolmogorov-Smirnov statistics was used to assess that the cognitive outcome variables could be approximated by the gaussian distribution.

In-group comparisons were made based on gender, native language, and the number of placements. Multivariable linear regression where the cognitive outcomes were controlled for gender, native language, and placement length. The statistical analyses were performed using IBM SPSS Statistics 25 (IBM Inc., Armonk, NY, USA). Statistical significance was initially set at $p < 0.05$ (two-sided). However, due to multiple comparisons and thus minimizing the risk for Type-I error, the p-value for statistical significance was adjusted to $p < 0.005$ (0.05/10).

3. Results

3.1. Intelligence

In comparison to the age-matched normal population, children in foster care scored significant lower on standardized tests of intelligence, both on the *Full-scale IQ* ($M = 90.7$, $SD = 13.7$ vs. $M = 100.2$, $SD = 13.3$, $p < 0.001$) and all subscales. Results for each scale are presented in Table 2.

In-group comparisons of gender showed no difference in aspect to *Full-scale IQ*, but girls scored significantly higher than boys on both *Working memory* ($M = 88.0$, $SD = 14.5$ vs. $M = 85.4$, $SD = 13.0$, $p < 0.01$) and *Processing speed* ($M = 95.4$, $SD = 12.8$, vs. $M = 89.7$, $SD = 14.6$, $p < 0.001$), Table 2.

In-group comparisons of not native Swedish versus native Swedish language showed a difference in *Verbal function*, *Perceptual function*, and *Full-scale IQ*. Those with native Swedish scored higher than those with other native language than Swedish in *Verbal function* ($M = 95.1$, $SD = 13.3$ vs. 87.9 , $SD = 15.4$, $p < 0.001$), in *Perceptual function* ($M = 99.9$, $SD = 13.2$ vs. $M = 92.2$, $SD = 14.2$, $p < 0.001$) and *Full-Scale IQ* ($M = 92.4$, $SD = 13.0$ vs. $M = 86.2$, $SD = 14.1$, $p < 0.001$), Table 2.

In the multivariate model, including 379 of 756 cases, results from the univariate analyses were confirmed. Controlling for gender resulted in ($\beta = 2.1$, $p = 0.120$), placement length ($\beta = -0.01$, $p = 0.758$), and native language ($\beta = 6.2$, $p < 0.001$). Table 2.

3.2. Adaptive behavior

Children in foster care revealed substantial lower scores on Adaptive behavior according to the ABAS-II assessments by teachers as well as foster parents in all composite- and total scales, Table 2. The *General ability composite* mean was 85.5 , $SD = 21.2$, $p < 0.001$ in teachers' and 77.3 , $SD = 20.8$, $p < 0.001$ in foster parents' assessments.

Girls had significantly higher means than boys in both the teachers' and the foster parents' assessments in all composites, Table 2. *General ability composite* in the teacher assessments for girls was ($M = 92.8$, $SD = 18.9$), in relation to boys ($M = 79.7$, $SD = 21.1$, $p < 0.001$). In-group comparison according to native language indicated lower means,

Table 2
Cognitive and adaptive behavior functioning, sample versus norms and ingroup comparisons of gender and language.

	Test results n/mean/SD	Norm data n/mean/SD	p-value ¹	Ingroup comparisons				Multimodel
				Gender girls/boys		Language native/non native		
				mean, SD	p-value	mean, SD	p-value	
WISC 4² & 5³								
Verbal function ⁴	765/93.0/14.4	780/99.6/14.1	< 0.001	93.0,13.8/93.2,14.9	0.927	95.1,13.3/87.9,15.4	< 0.001 ⁷	
Perceptual function ⁵	633/97.8/14.0	780/100.3/13.3	< 0.001	97.5,14.3/98.0,13.8	0.637	99.9,13.2/92.2,14.2	< 0.001	
Visuospatial function ⁶	130/89.7/17.1	660/99.9/14.2	< 0.001	89.0,17.7/91.2,16.3	0.463	92.3,14.9/86.3,20.7	0.101	
Fluid reasoning ⁶	134/93.7/15.4	660/100.0/14.7	< 0.001	92.6,14.5/95.4,16.4	0.306	94.0,15.3/93.8,16.6	0.965	
Working memory ⁴	760/86.6/13.8	780/99.6/14.8	< 0.001	88.0,14.5/85.4,13.0	0.010	87.2,13.9/84.8,13.5	0.037	
Processing speed ⁴	761/92.3/14.0	780/99.9/13.0	< 0.001	95.4,12.8/89.7,14.6	< 0.001	92.4,13.8/91.3,14.6	0.392	
Full scale IQ ⁴	756/90.7/13.7	780/100.2/13.3	< 0.001	91.6,13.5/90.1,13.9	0.130	92.4,13.0/86.2,14.1	< 0.001	
Multivariable model Full scale IQ					0.120		< 0.001	Placement 0.758
ABAS-II Teacher								
Conceptual composite	705/85.1/20.4	496/101.9/14.4	< 0.001	90.8,18.7/80.6,20.6	< 0.001	84.4,20.4/85.3,20.7	0.638	
Social composite	699/84.1/21.4	496/103.0/14.1	< 0.001	90.5,20.5/78.9,20.8	< 0.001	82.6,21.7/87.3,20.5	0.011	
Practical composite	699/87.4/22.2	496/101.6/14.5	< 0.001	95.0,18.8/81.2,22.7	< 0.001	85.9,22.6/89.7,21.1	0.047	
General ability comp.	693/85.5/21.2	496/101.9/14.5	< 0.001	92.8,18.9/79.7,21.1	< 0.001	84.2,21.4/87.8,20.5	0.057	
Multivariable model General ability					< 0.001		0.319	Placement 0.305
ABAS-II Foster parent								
Conceptual composite	707/74.5/23.0	496/100.5/14.8	< 0.001	78.3,22.8/71.2,22.6	< 0.001	73.2,23.3/77.1,2.4	0.063	
Social composite	707/74.6/21.3	496/101.2/14.4	< 0.001	79.4,20.9/70.4,20.7	< 0.001	73.3,21.3/78.2,22.0	0.012	
Practical composite	707/82.1/20.1	496/100.0/14.4	< 0.001	86.5,20.1/78.3,19.3	< 0.001	80.5,20.2/85.2,20.4	0.010	
General ability comp.	706/77.3/20.8	496/100.3/14.5	< 0.001	82.1,20.6/73.2,20.0	< 0.001	75.9,20.9/80.8,21.3	0.009	
Multivariable model General ability					< 0.001		0.026	Placement 0.043

Notes: ¹ Sample means vs. norm data (*t*-test of independent samples), ² UK standardization study, *n* = 780, Table C.1 in Swedish manual, ³ UK Standardization study, *n* = 660, Table 2.8 in Swedish manual, ⁴ Results from WISC-IV and V combined in the comparable index, related to WISC-IV norms, ⁵ Results only from assessments done with WISC-IV, ⁶ Results only from assessments done with WISC V, ⁷ Children with 2 placements had a higher score compared to children with one or more than 2 placements.

Table 3
Language and numeracy skills.

	Test results n/mean/SD	Norm data n/mean/SD	p-value ¹	Ingroup comparisons				Multimodel
				Gender Girls/boys		Native language Native/non native		
				mean, SD	p-value	mean, SD	p-value	
Reading Chains								
Letter Chains	330/4.19/1.95	3850/5.00/2.00	< 0.001	4.63,1.96/3.88,1.86	0.001	4.36,1.88/4.01,2.03	0.168	
Digit Chains	269/3.93/1.90	3850/5.00/2.00	< 0.001	3.98,2.01/3.89,1.80	0.699	4.04,1.97/3.61,1.78	0.100	
Word Chains	659/3.95/2.01	3850/5.00/2.00	< 0.001	4.20,2.07/3.75,1.92	0.004	4.16,1.99/3.41,1.98	< 0.001	
Sentence Chains	478/3.75/1.87	3850/5.00/2.00	< 0.001	3.96,1.90/3.60,1.83	0.037	3.99,1.81/3.08,1.68	< 0.001	
Multivariable model Sentence chains					0.019		< 0.001	Placement 0.931
DLS (Read & Write)								
Word comprehension	344/4.07/1.96	2400/5.00/2.00	< 0.001	3.96,1.85/4.20,2.05	0.247	4.26,1.89/3.52,2.04	0.004	
Reading	113/3.99/2.14	600/5.00/2.00	< 0.001	4.53,2.23/3.51,1.98	0.012	4.43,2.34/3.30,1.61	0.023	
Read comprehens.	275/3.95/1.98	2140/5.00/2.00	< 0.001	3.98,2.06/3.95,1.90	0.886	4.06,1.95/3.75,2.08	0.295	
Spelling	623/4.07/2.09	2840/5.00/2.00	< 0.001	4.25,2.01/3.92,2.15	0.043	4.21,2.08/3.66,1.95	0.003	
Reading speed	400/3.90/1.90	5600/5.00/2.00	< 0.001	3.85,1.80/3.95,1.97	0.589	4.21,1.82/3.20,1.72	< 0.001	
Multivariable model Reading speed					0.764		0.001	Placement 0.199
LäSt²								
Reading Index	288/53.0/29.1	824/50.0/13.8	0.021	52.1,28.0/54.3,30.0	0.524	55.4,28.9/49.8,28.8	0.147	
Magne Mathematics								
Total score	752/3.58/2.27	1966/5.00/2.00	< 0.001	3.35,2.08/3.77,2.39	0.011	3.63,2.30/3.33,2.07	0.094	
Multivariable model					0.318		0.093	Placement 0.105

Notes: ¹ Sample means vs. norm data (*t*-test of independent samples) ² No standard deviation from norm studies available. Approximated to 13.76 based on Finnish norms.

Table 4
Strengths and difficulties in teacher and foster parents' assessments.

	Test results n/mean/SD	Norm data n/mean/SD	p-value ¹	Ingroup comparisons				
				Gender Girls/boys		Native language Native/non native		Multimodel
				Mean, SD	p-value	Mean, SD	p-value	
SDQ Teacher²								
Emotional symptoms	711/1.9/2.0	8208/1.4/1.9	< 0.001	1.8,2.0/2.0,2.0	0.301	2.0,2.0/1.8,1.9	0.375	
Conduct problems	712/2.0/2.3	8208/0.9/1.6	< 0.001	1.5,2.0/2.5,2.4	< 0.001	2.2,2.4/1.8,2.0	0.027	
Hyperactivity	712/4.9/3.3	8208/2.9/2.8	< 0.001	3.7,3.1/5.9,3.2	< 0.001	5.1,3.3/4.6,3.2	0.084	
Peer problems	712/2.2/2.2	8208/1.4/1.8	< 0.001	1.9,2.1/2.4,2.3	0.001	2.2,2.3/1.9,2.1	0.097	
Prosocial behavior	710/6.5/2.8	8208/7.2/2.4	< 0.001	7.3,2.6/5.8,2.8	< 0.001	6.3,2.8/6.8,2.8	0.052	
SDQ total problems	714/11.1/7.6	8208/6.6/6.0	< 0.001	8.9,6.9/13.0,7.6	< 0.001	11.6,8.0/10.1,6.8	0.016	
Multivariable model								
Total problems					< 0.001		0.302	Placement 0.846
Prosocial behavior					< 0.001		0.164	Placement 0.038
SDQ Fosterparent³								
Emotional symptoms	708/2.8/2.4	946/1.4/1.7	< 0.001	2.7,2.3/2.8,2.4	0.498	2.7,2.4/2.8,2.4	0.565	
Conduct problems	709/2.6/2.3	946/1.1/1.3	< 0.001	2.3,2.2/2.9,2.3	< 0.001	2.8,2.4/2.3,2.1	0.020	
Hyperactivity	709/5.2/3.0	946/2.3/2.1	< 0.001	4.5,2.9/5.7,3.0	< 0.001	5.3,3.0/4.8,2.9	0.037	
Peer problems	709/2.6/2.4	946/1.2/1.5	< 0.001	2.3,2.3/2.8,2.5	0.011	2.7,2.5/2.4,2.2	0.090	
Prosocial behaviour	709/6.7/2.6	946/8.5/1.6	< 0.001	7.1,2.6/6.4,2.6	0.001	6.7,2.5/7.0,2.7	0.126	
SDQ total problems	711/13.1/7.6	946/6.1/4.8	< 0.001	11.8,7.3/14.2,7.7	< 0.001	13.5,7.7/12.2,7.4	0.044	
Multivariable model								
Total problems					0.001		0.164	Placement 0.038
Prosocial behavior					< 0.002		0.004	Placement 0.001

Notes: ¹Sample means vs. norm data (*t*-test of independent samples), ²Norm data from SDQ British standardization study (Meltzer et al., 2003), ³Norm data from Swedish standardization study, *n* = 946, (Bjornsdotter et al., 2013).

but not reaching statistical significance after Bonferroni adjustment of the significance level, for children with native Swedish language compared to children with other native languages in the teachers' assessments of *Social composite* ($M = 82.6$, $SD = 21.7$ vs. $M = 87.3$, $SD = 20.5$, $p = 0.011$), and *Practical composite* ($M = 85.9$, $SD = 22.6$ vs. $M = 89.7$, $SD = 21.1$, $p = 0.047$). In the foster parents' assessments, the same pattern of lower scores for children, though not reaching significance after Bonferroni adjustment, with native Swedish language was found in the scales compared to children with other native languages: *Social composite* ($M = 73.3$, $SD = 21.3$ vs. $M = 78.2$, $SD = 22.0$, $p = 0.012$), *Practical composite* ($M = 80.5$, $SD = 20.2$ vs. $M = 85.2$, $SD = 20.4$, $p = 0.010$). The *General ability composite* was consequently lower, though not significant on a 0.005 level, among children with Swedish as their native language compared to children with other native languages than Swedish ($M = 75.9$, $SD = 20.9$ vs. $M = 80.8$, $SD = 21.3$, $p = 0.009$), Table 2.

In the multivariate model, including 442 cases for teacher assessments and 458 cases in foster parents' assessments, results from the univariate analyses of ABAS-II *General ability composite* were confirmed. In addition, the foster parents' assessments indicated a positive association, for the factor placement length ($\beta = 0.06$, $p = 0.043$), though not reaching significance using the Bonferroni adjusted significance level. Associations for gender and native language are presented in Table 2.

3.3. Language and numeracy skills

Text decoding skills were assessed by Reading chains, comprising subtests *Letter chains*, *Digit chains*, *Word chains*, and *Sentence chains*. Children in foster care showed significant lower results than norms in *Word Chains* ($M = 3.95$, $SD = 2.01$) and *Sentence Chains* ($M = 3.75$, $SD = 1.87$), calculated with the normal distribution in the stanine scale range 1 – 9, mean 5.00 and $\sigma = 2$, Table 3.

In the in-group comparison, girls scored higher than boys on *Letter Chains* ($M = 4.63$, $SD = 1.96$, vs. $M = 3.88$, $SD = 1.86$, $p = 0.001$), *Word Chains* ($M = 4.20$, $SD = 2.07$ vs. $M = 3.75$, $SD = 1.92$, $p = 0.004$). *Sentence Chains* also indicated gender difference ($M = 3.96$, $SD = 1.90$

vs. $M = 3.60$, $SD = 1.83$, $p = 0.037$), Table 3. Regarding native language, those with native Swedish scored higher on *Word Chains* ($M = 4.16$, $SD = 1.99$ vs. $M = 3.41$, $SD = 1.98$, $p < 0.001$, and *Sentence Chains* than those with other native languages ($M = 3.99$, $SD = 1.81$ vs. $M = 3.08$, $SD = 1.68$, $p < 0.001$).

In the DLS tests, measuring reading and writing skills in a broader sense, children in foster care scored lower on all subscales compared with the norms, Table 3. The only difference between gender in the ingroup comparisons was seen in *Reading* with girls scoring higher than boys ($M = 4.53$, $SD = 2.23$, vs. $M = 3.51$, $SD = 1.98$, $p = 0.012$), and in *Spelling* ($M = 4.25$, $SD = 2.01$ vs. $M = 3.92$, $SD = 2.15$, $p = 0.043$). However, using the adjusted Bonferroni adjusted significance, this difference was no longer present. The ingroup comparison between children with the native Swedish language and those without Swedish as native language showed a significantly higher score for children with Swedish native language on three of the five subscales, Table 3.

The multivariate model, including 308 cases in *Sentence chains* confirmed results from the univariate analyze, with higher results for girls and children with the native Swedish language, and no additional impact for placement length. *Reading Speed* ($n = 243$), also confirmed results in univariate analyses with no gender or placement length impact, and native language showed a positive association to higher scores ($\beta = 0.80$, $p < 0.001$). Table 3.

The test Läst, combining visual decoding of words and non-words indicated a difference compared to norms in mean percentile for the *Reading index* of 53.0, $SD = 29.1$, $p = 0.021$, in the group of 288 foster children, reflecting a mean slightly above the norm (50th percentile), but no in-group differences according to gender or native language, Table 3.

Numeracy results from the *Magne Mathematic diagnoses* showed a mean score of 3.58, $SD = 2.27$ on the stanine scale, reflecting lower scores ($p < 0.001$) than the norm group. As opposed to results from the literacy tests, girls presented tendencies of lower mean scores than boys ($M = 3.35$, $SD = 2.08$ vs. $M = 3.77$, $SD = 2.39$, $p = 0.011$), but no in-group differences according to native language, Table 3.

Multivariate models of 471 cases in *Magne mathematic diagnoses* confirmed results from univariate analyses of numeracy skills, but when

placement length was included, the previously found higher scores for boys disappeared ($\beta = -0.20, p = 0.318$). [Table 3](#).

3.4. Strengths, difficulties, and emotional and social impairment

The study group of foster children scored higher on every scale reflecting problems and lower on prosocial behavior in both teachers' and foster parents' assessments, related to norms, [Table 4](#). Ingroup comparisons revealed lower (less problems) scores for girls than boys in teacher assessments in the scales *Conduct problems* ($M = 1.5, SD = 2.0$ vs. $M = 2.5, SD = 2.4, p < 0.001$), *Hyperactivity* ($M = 3.7, SD = 3.1$ vs. $M = 5.9, SD = 3.2, p < 0.001$), *Peer problems* ($M = 1.9, SD = 2.1$, vs. $M = 2.4, SD = 2.3, p < 0.001$). Consequently, girls showed lower scores than boys in the *Total problem score* ($M = 8.9, SD = 6.9$, vs. $M = 13.0, SD = 7.6, p < 0.001$). *Prosocial behavior* score was higher (better) for girls than boys ($M = 7.3, SD = 2.6$ vs. $M = 5.8, SD = 2.8, p < 0.001$). Foster children with Swedish as native language scored higher, but not significantly so after Bonferroni adjustment, than children who did not have Swedish as native language on the *Conduct problem scale* ($M = 2.2, SD = 2.4$ vs. $M = 1.8, SD = 2.0, p < 0.027$) and the *Total problem score* ($M = 11.6, SD = 8.0$ vs. $M = 10.1, SD = 6.8, p < 0.016$), [Table 4](#).

Multivariate model analyses of the SDQ *Total problem scores* in teacher assessments ($n = 439$) erased the previously found higher scores for children with Swedish as a native language ($\beta = 0.8, p = 0.302$). Results according to gender, with girls having fewer problems were confirmed. Adding placement length as a factor did not affect scores ($\beta = 0.0, p = 0.846$).

In SDQ *Prosocial behavior* score, multivariate analyses of teacher assessments erased the difference previously found according to the native language ($\beta = -0.4, p = 0.157$). [Table 4](#).

In the foster parent assessments, gender differences were observed, where girls scored significantly lower in all problem scales included in the *Total problem scale compared to boys* ($M = 11.8, SD = 7.3$, vs. $M = 14.2, SD = 7.7, p < 0.001$), except for the *Emotional symptoms scale* ($M = 2.7, SD = 2.3$, vs. $M = 2.8, SD = 2.4, p = 0.498$). Girls scored higher than boys on *Prosocial behavior*, ($M = 7.1, SD = 2.6$, vs. $M = 6.4, SD = 2.6, p = 0.001$), [Table 4](#). Native language difference reflecting a higher score for children with Swedish as native language compared to non-native speakers of Swedish was observed in scales *Conduct problems*, *Hyperactivity*, and the *Total problems score*.

Multivariate model analyses of the SDQ *Total problem scores* in foster parents' assessments ($n = 435$), confirm, though not with a Bonferroni adjusted significance, univariate model results with fewer problems for girls and added impact for placement length ($\beta = -0.02, p = 0.038$). In the *Prosocial behavior* scale, results from univariate models were confirmed. When adding placement length to the model, this resulted in a positive association with higher scores ($\beta = 0.01, p = 0.001$). [Table 4](#).

4. Discussion

The results in the present study underline that school prerequisites for school-aged children in foster care, in general, were worse than of their peers. This is a well-known fact but could inform practice on a systemic or policy level about the need for individual assessments of children in out-of-home care. In particular, the design of interventions targeting these children's school performance.

The results add to the knowledge by describing the magnitude, what domains that were most affected, and specific vulnerability related to gender and native language in a fairly large sample of children in foster care. The results could be summarized in three main findings.

First, the magnitude of difference to their peers that children in Swedish foster care perform, was considerable. In intelligence, literacy, numeracy and adaptive behavior, means were close to one full standard deviation below peers. Previous studies have shown ([Tordön et al.,](#)

[2019](#)) that experiences of abuse is more common in children in out-of-home care, and could be regarded as one plausible cause to some of the variation observed. In a meta-analyse study of cognitive, adaptive, and behavioral functioning of children in foster care ([Goemans, van Geel, van Beem, & Vedder, 2016](#)), results showed lower levels of functioning in comparison to the general population. A review of the effects of early life stress on cognitive and affective functions found support for a decreased intellectual function as well ([Pechtel & Pizzagalli, 2011](#)). There is no data in the current study suggesting that out-of-home care in foster homes would be detrimental. On the contrary, if conditions preceding placement are detrimental, as for example in abandoned children, foster care could facilitate cognitive recovery to some extent ([Nelson et al., 2007](#)).

Second, the diversity in the results from the ingroup calculations revealed gender differences. In intelligence and literacy as well as social-emotional measures, boys' results were poorer than those of girls. One exception is notable where the boys outscore girls in numeracy skills, but still far below means for the normal population. The latter is an interesting result in light of the most recent international TIMSS, Trends In Mathematics and Science Study of 2015 ([TIMSS 2015 International Reports, 2015](#)). In Sweden, mathematics results in the 4th grade showed very small differences, but in earlier TIMSS studies 2007 and 2011 boys scored higher than girls in 4th grade and in 8th grade in the 2011 study. There was a trend shift between 2007 and 2011 when girls had slightly higher scores in 2007.

Third, differences in regard to native language were not as coherent as in gender. There were no signs of lower intellectual capacity for children with a non-native Swedish language when the potential assessment bias from verbal processing was considered. Adaptive behavior seems to be an area where non-native Swedish language children surpassed their Swedish native language peers. In literacy, not surprisingly, results were generally lower. Sweden has, during the latter part of the timeframe studied, seen a large migration of refugee children, many of these not accompanied by parents, where foster care placement was regarded as the primary choice, resulting in a disproportionately larger share of children with non-native Swedish language in foster care, and therefore also literacy measures. In social-emotional assessments, children with non-native Swedish language are comparable with or scored better than their native Swedish language peers.

Research in cognitive abilities for children placed in foster care is rare, and often based on retrospective comparison of test results from males at conscription or later. Or, based on toddlers ([Jacobsen, Moe, Ivarsson, Wentzel-Larsen, & Smith, 2013](#)) or children earlier placed in institutions ([Johnson et al., 2010](#)), where conditions preceding foster care can be seen as obviously detrimental to cognitive development. To our knowledge, there are very few, if any, previous studies of this group, including intelligence tests on children in compulsory school age with a history preceding placement that reflect naturalistic conditions in a developed welfare society. A review by [Goemans et al. \(2016\)](#) found only five studies 1978–2013 comparing cognitive functioning in foster care versus the general population. Of these, one was a non-peer reviewed dissertation, three studied preschool children ([Jacobsen et al., 2013; Johnson et al., 2010; Pears & Fisher, 2005](#)), and one with only three 8-year-olds in the foster care sample ([Tizard & Hodges, 1978](#)).

Literature gives more substance when searches about cognitive ability and behavioral prerequisites are not limited to children in out-of-home care. For example, [Deary, Strand, Smith, and Fernandes \(2007\)](#) report a strong correlation, 0.81 between cognitive tests taken at age 11 and examinations at age 16. A recent study ([Zheng, Rijdsdijk, & Arden, 2018](#)), based on adoption twin studies, suggests that there might be a distinct developmental impact on intelligence that is greater for some children than others. Closing in on specific environmental conditions, [Pechtel and Pizzagalli \(2011\)](#), reports that early life stress can explain impairments in more complex, higher-order functions. They also conclude that the cognitive functioning seems to be subject to a catch-up

following relieve of the stressor, while affective functioning appears to be more resistant.

4.1. Strengths and limitations

There are several strengths to this study. It includes a large sample of children in foster care. The 856 assessments and 92% compliance are considered as factors strengthening the reliability of the results.

It is also a naturalistic study based on ordinary children in foster care from 22 municipalities in Sweden. Thus, the collected data originates from prospective assessments done in regular practice in Swedish municipals working with children in foster care since 2005. Therefore including children with and without Swedish as a native language, children in kinship care and non-kinship care, children with or without neuropsychiatric symptoms or diagnoses, experience of traumatic events or other conditions that might influence measures. As such, it reflects a representative sample of school-aged children in foster care in Sweden, which strengthens the validity of results. On the other hand, data might be difficult to compare with other studies making use of more controlled and homogenous inclusion criteria. No participant was diagnosed with mental retardation before the assessments were done, all children were placed in foster care with a long-term prospect (no acute temporary placements) and all attended school between pre-school class (age 6) to the 7th year in compulsory school.

However, there are also limitations related to the generalizability of the results. The *Skolfam* municipalities are skewed regarding population size, where the mean population size is 142 200, compared to the national mean population in Swedish municipalities of 35 300. The mean age of participants is younger than all foster care children in Sweden, due to an intentional strive in *Skolfam* municipalities to deliver interventions as soon as possible.

The methodological approach, to collect data from tests done with a primary purpose to inform operational practice, rather than a strict and sole scientific purpose, can be regarded as controversial. Limitations related to such procedure are: less control of how the assessors conduct tests, their fidelity to the method or test manuals, risks of large internal dropout in subtests not performed and individual adaptations where alternative tests are used as substitutes. Internal dropout also affects the reliability of the multivariate model analysis, where 45–70% of cases have missing data in some of the included background variables, calling for high caution when drawing conclusions from those results. Another limitation related to the use of data collected for a primarily operational purpose is that background data was limited such as the socioeconomic background, parents' or foster parents' education level, time spent in care since first placement or previous special education needs.

4.2. Implications

Children in out-of-home care are one of the most exposed groups for adverse experiences and future poor outcomes. School success is known to be one of the most or maybe the single most important preventive factor for reducing these risks. In order to facilitate school success, prerequisites need to be known by teachers, social workers, foster carers and decision-makers.

This study shows that children in foster care are having problems with their ability to manage school. This was most evident in terms of intelligence, literacy, and numeracy, but also in other areas such as having more behavioral problems, in line with findings from Lehmann, Bøe, and Breivik (2017). It is important, as Ferguson and Wolkow (2012) stated, to avoid school failure and improve educational attainment for this group of vulnerable children. These findings call for a need to adapt learning conditions in school by individual assessments of children in out-of-home care, rather than assuming age-typical prerequisites. Also, teaching methods need to be adapted to each child's conditions (tailor-made education).

Declaration of conflicting interests

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