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School performance is age appropriate with support services in very preterm children at 11 years of age

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ABSTRACT

Aim: This Finnish regional birth-cohort study compared the school performance of very preterm and full-term children when they reached 11 years of age.

Methods: Teachers rated the educational abilities of 123 preterm children and 133 full-term controls at the age of 11 years as well as the support services they received. The children were all born in the Turku University Hospital between 2001 and 2005. In the preterm group, neurosensory impairments were confirmed at two years of corrected age, and full-scale intelligence quotient (IQ) was assessed at 11 years of age using the Wechsler Intelligence Scale, Fourth Edition.

Results: Educational abilities, including academic skills and classroom functioning, did not differ between the two groups after excluding the children with a full-scale IQ < 70. However, 40% of the preterm group and 26% of the controls had received at least one support service ($p < 0.02$). The 13 preterm children with a full-scale IQ <70 and the 10 with neurosensory impairment received more support services. Boys in both groups displayed more classroom-functioning problems than girls.

Conclusion: A full-scale IQ ≥ 70 and age-appropriate educational abilities do not exclude a significant need for support services in very preterm children at the age of 11 years.

INTRODUCTION

Very preterm children are at high risk for academic and sociobehavioural problems (1). Specific vulnerabilities in mathematics, attention and social competence have been reported to disturb their educational performance (2–4). These difficulties may increase or become apparent as very preterm children age and academic expectations increase (5), highlighting the need for long-term follow-up of their educational abilities (6). A growing body of knowledge suggests that despite disabilities, a significant majority of very preterm infants function better than expected in adulthood (7,8). Teachers can offer invaluable insights regarding the educational abilities of very preterm born children by providing information on their functional outcome (9–13). Despite this, we are unaware of any other reports of comprehensive, teacher-rated evaluations of very preterm children covering both the academic and the sociobehavioural aspects of their educational abilities and including information on the support services they receive.

An increased need for support services in preterm children compared to their peers has commonly been reported to mirror their educational deficits (14,15). High educational resource dependency has been reported in very preterm children with neurosensory impairments (NSI) (16), and high rates of educational deficits are reported in very preterm children with cognitive impairment (10,17). Yet a comprehensive picture of the educational abilities of very preterm children with and without severe cognitive impairment and NSI, as well as the support services they receive, is lacking. Furthermore, educational outcome of preterm boys is reported comparable to girls (10) but they have been suggested to perform worse than girls in cognitive domains requiring attentional skills (18).

Abbreviations
IQ, Intelligence quotient; NSI, Neurosensory impairment; SD, Standard deviation.

Key notes

- Reports on very preterm children's daily school performance, including educational abilities and the support services they receive, are lacking.
- The teacher-rated educational abilities of 11-year-old very preterm children with a full-scale intelligence quotient ≥70 were age appropriate.
- The future studies evaluating school performance of very preterm children should consider including the information about support services.

The primary aim of this study was to evaluate the educational abilities and support services of a cohort of 11-year-old very preterm children and their controls based on teacher rating of classroom and academic functioning. Children with and without severe cognitive delay and NSI were studied separately. We also examined whether gender differences existed in academic and classroom functioning or in the support services received by the children. We hypothesised that the educational abilities of preterm children without severe cognitive deficits are comparable to those of the control group.

PATIENTS AND METHOD

Participants

This study is part of a prospective, multidisciplinary follow-up study called PIPARI (Development and Functioning of Very Low Birthweight Infants from Infancy to School Age). All very-low-birthweight (≤1500 g) infants born at Turku University Hospital between 2001 and 2006 who lived in the catchment area were eligible. From the beginning of 2004, the inclusion criteria were expanded to include all infants born below 32 weeks of gestation, regardless of their birthweight. At least one of the parents had to speak either Finnish or Swedish, which are the two official languages of Finland. The data regarding the prenatal period, delivery, neonatal morbidities, brain-imaging findings and developmental outcomes were collected systematically as a part of the PIPARI study protocol. Children with severe congenital anomalies or diagnosed genetic syndromes affecting their development were excluded. This study included infants born in 2001–2004 (n = 153). Of these infants, 128 participated in cognitive testing. A flowchart outlining how these study subjects were recruited was reported previously (18). The subjects' teachers were invited to rate their classroom and academic functioning along with any support services the children received.

The control group consisted of healthy full-term infants born at Turku University Hospital from 2001 to 2004. The parents of the full-term control infants were recruited at the maternity ward during the infant's first week of life. The parents of the first boy and the first girl born each Monday were invited to take part in the study. If they refused, the parents of the next boy and girl were invited. The full-term infants were born at or above 37 weeks of gestation, had at least one parent speaking either Finnish or Swedish and were not admitted to a neonatal care unit during their first week of life. The exclusion criteria were any major congenital anomalies or genetic or chromosomal syndromes, the mother's use of illicit drugs or alcohol during the pregnancy and a birthweight at least two standard deviations (SD) below the mean for age and gender according to age- and gender-specific Finnish growth charts.

The PIPARI study protocol was approved by the Ethics Review Committee of the Hospital District of Southwest Finland in December 2000 and again in January 2012. All parents who agreed to participate in the study gave written informed consent at the neonatal intensive care unit after they had received written and oral information. At 11 years of age, the children also gave their own written informed consent after receiving written information.

Measures

School performance

The teacher-rated educational ability questionnaire was designed for the purposes of the present study. Each child's teacher was advised to assess whether the pupil had problems in educational abilities, that is in academic and classroom functioning compared to the average age-level expectations. The teachers were asked to rate the pupil's academic functioning in reading, reading comprehension, spelling, text production and mathematics. The teachers were also asked to rate the pupil's classroom functioning in social skills, group work, independent work, persistency and concentration in three categories: average or above, mild problems, and severe problems. The ratings were dichotomised to average or above average and mild or severe problems. Teachers were asked to compare the pupil's performance to the age-appropriate evaluation criteria of the Finnish National Core Curriculum for Basic Education. The pupil's school performance is followed according to these standards also in full-time special education.

Finland's school system is public, but 40/2467 (1.6%) of the schools are private (19). Children enter the compulsory education system in the autumn of their seventh birthday year regardless of prematurity. The educational ability questionnaire included questions about the received support services possibly received by the children: studying at one grade below their own age group, full-time special education, part-time special education and assistant services. Children can enter school one year later if it is suspected that they are not mature enough for school. Children can also repeat a class if their basic academic skills seem to be immature. Part-time special education is intended to provide support in a specific area, such as literacy or mathematics. Full-time special education is intended to meet a need for long-term support and it mainly consists of individualised education plans in one or more subjects. Full-time special education is available at special schools or in special classes, or it can be integrated into a mainstream school class. Assistant services are available as the sole form of support or along with other support services. A child's need for support services is assessed through a multi-professional evaluation of their school performance.

The educational ability questionnaire was rated by the teachers during the first semester of the school year during which the children turned 11 years of age and most of them started fifth grade. Teachers received the questionnaires and self-addressed envelopes from the parents as a part of the PIPARI follow-up protocol. The parents of the preterm children were given the questionnaires at the 11-year cognitive assessment. The parents of the controls were sent the questionnaires by mail. The teachers were advised to

return the completed questionnaires within two weeks. If the pupil was new to them, the teachers were allowed more time to get to know the pupil before returning the questionnaire. The questionnaire was sent to the child's regular teacher who teaches all or a majority of subjects to a class in a Finnish system. The regular teacher was advised to fill the questionnaire with other teachers if needed. If the child was in a support class, then his/her regular teacher was a special education teacher.

Cognitive development

The cognitive development of the very preterm children was assessed using the Wechsler Intelligence Scale, Fourth Edition, Finnish translation (20,21). Cognitive development was considered extremely low when the child's full-scale intelligence quotient (IQ) was less than 70 (SD < −2). The norm references were based on the test manual and the standard deviations from the test means of a Finnish normative sample (21). The Finnish standardisation of the Wechsler Intelligence Scale, Fourth Edition, was published recently (20,21). Details of the cognitive assessment have been described previously (18). We did not correct IQ for prematurity at 11 years of age.

Neurosensory impairment

For the children who were born very preterm, an NSI was defined as having at least one of the following diagnoses: cerebral palsy, severe hearing impairment or severe visual impairment. When present, cerebral palsy was defined based on the classification proposed by Himmelmann et al. (22). A child neurologist (LH) confirmed a diagnosis of cerebral palsy by two years of corrected age, after a systematic clinical follow-up. Severe hearing impairment was defined as hearing loss requiring amplification in at least one ear. Severe visual impairment was defined as a Snellen visual acuity <0.3 or blindness.

Statistical analyses

Continuous variables were characterised using means, standard deviations and minimum and maximum values. Categorical variables were characterised using frequencies and percentages. Associations between categorical and ordinal variables were studied using chi-square tests for trends. Differences in school performance between the preterm children and the controls were analysed using logistic regression. Results are presented with odds ratio and 95% confidence interval. The analyses were repeated after excluding children with full-scale IQ < 70. In addition, the analyses were repeated after adjusting for paternal education. However, since the results remained unchanged, the repeated results were not reported. Logistic regression was also used to analyse school performance between girls and boys in both groups. Differences in school performance between the preterm children with full-scale IQ < 70 and with full-scale IQ ≥ 70 and between the preterm children with NSI and without NSI were analysed using chi-square tests. Statistical analyses were carried out using SAS for Windows version 9.4 (SAS Institute Inc., Cary, NC, USA), and p values <0.05 were considered to be statistically significant.

RESULTS

The educational ability questionnaire was returned by 123/128 (96%) of the teachers of very preterm children who participated in cognitive testing at 11 years of age. The educational ability questionnaire was returned by 133/185 (72%) of the teachers of controls who were included in the study at 11 years of age. Of the very preterm children, 10 (8%) had NSI. The neonatal and background characteristics of the study groups are shown in Table 1. The mean (SD) full-scale IQ of the five preterm children whose teachers failed to return the questionnaire was 83.2 (10.9). There were no statistically significant differences in gender or maternal education between the very preterm children and the controls. On average, the fathers of very preterm children had lower education levels (≤12 years) than the fathers of the children in the control group (p = 0.05).

School performance in all children

The mean (SD) full-scale IQ of the present study cohort was 87.8 (18.2). The mean (SD) ages at the time of the educational ability assessment were 11.3 (0.3) years for the very preterm children and 11.4 (0.3) years for the controls. School performance of the children in both groups is presented in Table 2. Problems with reading, text production and performing mathematics were more common in the very preterm children than the controls. Problems with independent work and persistency were also more common in very preterm children. They did not, however, have more problems with social skills or group work than the controls. The very preterm children received full-time special education and assistant services more often than the controls and were more often one grade below the controls. The results did not change after adjusting for paternal education.

School performance in very preterm children with and without severe cognitive delay

The full-scale IQ was <70 for 13 (11%) of the children who were born very preterm. In addition, after excluding children with full-scale IQ < 70, the preterm group did not differ significantly from the controls in educational abilities but continued to have significantly more support services (Table 2).

School performance in very preterm children with full-scale IQ < 70 and/or neurosensory impairment

School performance of these two more impaired subsets of children is presented in Table 3. School performance of the very preterm children with full-scale IQ < 70 differed significantly from the very preterm children with full-scale IQ ≥ 70. Text production and received support services of the very preterm children with NSI differed significantly from the very preterm children without NSI. Of the children with NSI, eight out of ten had cerebral palsy and

Table 1 Characteristics of the very preterm children and the controls

Characteristics	Very preterm children (n = 123)	Controls (n = 133)
Antenatal corticosteroids, n (%)	118 (96)	
Gestational age (weeks) Mean ± SD (min–max)	28.9 ± 2.7 (23.0–35.9)	39.6 ± 1.2 (37–42)
Birthweight (g) Mean ± SD (min–max)	1080 ± 291 (400–2025)	3680 ± 427 (2570–4810)
Small for gestational age, n (%)*	49 (40)	
<28 weeks/≥28 weeks	44/79	
<32 weeks/≥32 weeks	107/16	
≤1500 g/>1500 g	118/5	
Male, n (%)	63 (51)	63 (47)
Apgar < 6 at five minutes, (%)	27 (22)	
Multiple birth, n (%)	44 (36)	
Postnatal corticosteroids, n (%)	19 (15)	
Treated retinopathy of prematurity, n (%)	2 (2)	
Operated necrotising enterocolitis, n (%)	6 (5)	
Chronic lung disease†, n (%)	17 (14)	
Magnetic resonance imaging, n (%)		
Normal	67 (55)	
Minor	22 (18)	
Major	32 (27)	
Maternal education, n (%)		
≤9 years	12 (10)	4 (3)
Over 9–12 years	34 (28)	47 (39)
>12 years	75 (62)	69 (58)
Paternal education, n (%)		
≤9 years	12 (10)	9 (8)
Over 9–12 years	70 (57)	48 (42)
>12 years	40 (33)	58 (50)

*Defined as a birthweight of <−2.0 SD according to the age- and gender-specific Finnish growth charts.
†Defined as a need for supplementary oxygen at the corrected age of 36 gestational weeks.

Table 2 Below average school performance in very preterm children and controls

	All very preterm children (n = 123)			Very preterm children with full-scale IQ ≥ 70 (89%, 110/123)			Controls (n = 133)
	n (%)	OR (95% CI)	p	n (%)	OR (95% CI)	p	n (%)
Academic functioning below average							
Reading	33 (27)	2.1 (1.1–3.8)	0.02	22 (20)	1.4 (0.7–2.7)	0.32	20 (15)
Spelling	43 (35)	1.4 (0.8–2.4)	0.19	35 (32)	1.2 (0.7–2.2)	0.44	36 (27)
Text production	39 (32)	1.8 (1.0–3.2)	0.04	28 (25)	1.3 (0.7–2.4)	0.36	27 (20)
Reading comprehension	34 (28)	1.3 (0.7–2.3)	0.37	22 (20)	0.9 (0.5–1.6)	0.61	30 (23)
Mathematics	48 (39)	1.9 (1.1–3.2)	0.02	36 (33)	1.4 (0.8–2.5)	0.22	34 (26)
Classroom functioning below average							
Social skills	22 (18)	0.9 (0.5–1.8)	0.85	17 (15)	0.8 (0.4–1.6)	0.50	25 (19)
Group work	26 (21)	1.5 (0.8–2.9)	0.21	20 (18)	1.3 (0.6–2.5)	0.51	20 (15)
Independent work	35 (28)	2.2 (1.2–4.2)	0.01	24 (22)	1.6 (0.8–3.0)	0.17	20 (15)
Persistency	35 (28)	1.8 (1.0–3.3)	0.05	25 (23)	1.3 (0.7–2.5)	0.37	24 (18)
Concentration	40 (33)	1.6 (0.9–2.8)	0.10	30 (27)	1.2 (0.7–2.2)	0.48	31 (23)
Received support services							
Full-time special education	20 (16)	6.3 (2.1–18.9)	0.001	11 (10)	3.6 (1.1–11.6)	0.03	4 (3)
Part-time special education	23 (19)	1.2 (0.6–2.2)	0.67	17 (15)	0.9 (0.5–1.8)	0.80	22 (17)
Assistant services	35 (28)	2.3 (1.2–4.2)	0.01	23 (21)	1.5 (0.8–2.9)	0.23	20 (15)
One grade below	30 (24)	5.8 (2.4–13.8)	<0.001	19 (17)	3.8 (1.5–9.3)	0.004	7 (5)
Receiving at least one support service	57 (46)	2.5 (1.5–4.2)	<0.001	44 (40)	1.9 (1.1–3.3)	0.02	34 (26)

The outcomes for the very preterm children are compared with those of the controls.
Results are presented with odds ratio (OR) and 95% confidence interval (CI).

Table 3 Below average school performance in very preterm children with a full-scale IQ < 70 and in those with neurosensory impairments

	Very preterm children (n = 123)			
	Full-scale IQ < 70 (11%, 13/123) n (%)		Neurosensory impairment (8%, 10/123) n (%)	
	n (%)	p	n (%)	p
Academic functioning below average				
Reading	11 (85)	<0.001	4 (40)	0.33
Spelling	8 (62)	0.03	5 (50)	0.30
Text production	11 (85)	<0.001	6 (60)	0.04
Reading comprehension	12 (92)	<0.001	5 (50)	0.10
Mathematics	12 (92)	<0.001	4 (40)	0.95
Classroom functioning below average				
Social skills	5 (38)	0.04	3 (30)	0.30
Group work	6 (46)	0.02	3 (30)	0.47
Independent work	11 (85)	<0.001	5 (50)	0.12
Persistency	10 (77)	<0.001	5 (50)	0.12
Concentration	10 (77)	<0.001	6 (60)	0.05
Received support services				
Full-time special education	9 (69)	<0.001	8 (80)	<0.001
Part-time special education	6 (46)	0.007	2 (20)	0.91
Assistant services	12 (92)	<0.001	6 (60)	0.02
One grade below	11 (85)	<0.001	6 (60)	0.006
Receiving at least one support service	13 (100)	<0.001	10 (100)	<0.001

The outcomes for the very preterm children with a full-scale IQ < 70 are compared with the very preterm children with a full-scale IQ ≥ 70.
The outcomes for the very preterm children with neurosensory impairment are compared with the very preterm children without neurosensory impairment.
Differences are analysed using chi-square tests.

they all received full-time special support at least due to their motor disability. Of them, two (25%) were within the average cognitive range but had spastic diplegia. In addition, two other (25%) children had a full-scale IQ in the range of 70–79; one had spastic diplegia and the other had spastic tetraplegia. The remaining four children (50%) had a full-scale IQ < 70; two had spastic diplegia, one had spastic tetraplegia and one had spastic hemiplegia. Of the children with NSI, two out of ten had hearing impairment and both had a full-scale IQ within the average range. There were no preterm children with severe visual impairment.

School performance in boys and girls

As the moderating effect of gender on the group differences was not significant in any analyses, we present comparisons separately for very preterm children and controls (Table 4). There were no gender differences in any aspects of the academic functioning of the very preterm group. In the control group, boys only had weaker skills than girls with regard to text production. Classroom functioning, on the other hand, was weaker in boys than girls in both groups in all other aspects apart from social skills. Boys born very preterm received at least one support service more often than the girls.

DISCUSSION

This study showed that children who were born very preterm had significantly more problems with educational abilities, that is academic and classroom performance, and they received significantly more support services than the controls. Educational abilities were age appropriate in very preterm children with a full-scale IQ ≥ 70. In comparison with the controls they did, however, have a significant need for support services. The need for support services accumulated in the children who had NSI or extremely low cognitive scores. In both groups, the boys also had more classroom-functioning problems than the girls, even though there were no gender differences in academic functioning skills in the preterm group.

A substantial proportion of children who were born very preterm have been reported to lag behind their peers across multiple academic tests, most prominently in tests involving mathematics (3,10). Additionally, school-age children who were born preterm have been shown to have sociobehavioural vulnerabilities, especially concerning attention and social competence (2,4). In our study, the problems in academic functioning were evenly distributed across various academic skills. For the very preterm children, classroom-functioning problems were especially common in independent work and persistency, which is consistent with attention problems (2). In a recent meta-analysis, Ritchie et al. (4) reported that social adjustment difficulties in very preterm children tend to manifest as social withdrawal and peer relationship problems. Interestingly, our study found that social skills and group work skills were comparable to the controls and very preterm born children seemed to cope well with the social situations in the classroom.

In this study, we showed that educational abilities in very preterm children with a full-scale IQ ≥ 70 were age appropriate. This is interesting, as we know that their cognitive scores were lower compared to the norm population (18), so one could argue that they performed better than cognitive test scores would lead us to expect. Their better educational abilities could be the result of several mechanisms. These children more often received support at school through full-time special education or by being one grade below, which gave them a one-year advantage in development. On the other hand, one could argue that teacher expectations may be lower for students in one grade below. Consistently with our findings, another study from Finland showed that young adults without NSI born preterm had received more remedial education, but their school grades did not differ from the controls (23). Also, cognitively stimulating and highly sensitive parenting may support the child's educational abilities, especially in the very preterm children (24). In addition, young adults born preterm are more likely to show specific personality traits such as dutifulness and cautiousness (25), which may compensate for their educational abilities. Furthermore, our prospective

Table 4 Gender differences in below average school performance

	Very preterm children (Boys n = 63, Girls n = 60)				Controls (Boys n = 63, Girls n = 70)			
	Boys n (%)	Girls n (%)	OR (95% CI)	p	Boys n (%)	Girls n (%)	OR (95% CI)	p
Academic functioning below average								
Reading	19 (30)	13 (22)	1.7 (0.7–3.8)	0.21	10 (16)	10 (14)	1.2 (0.4–3.0)	0.77
Spelling	23 (37)	20 (33)	1.2 (0.5–2.4)	0.71	20 (32)	16 (23)	1.6 (0.7–3.5)	0.23
Text production	24 (38)	15 (25)	1.8 (0.9–4.0)	0.12	21 (34)	6 (9)	5.4 (2.0–14.7)	<0.001
Reading comprehension	19 (30)	14 (23)	1.5 (0.7–3.4)	0.30	16 (25)	13 (19)	1.7 (0.7–3.8)	0.23
Mathematics	24 (38)	24 (40)	0.9 (0.4–1.9)	0.83	13 (21)	21 (30)	0.6 (0.3–1.3)	0.22
Classroom functioning below average								
Social skills	15 (24)	7 (12)	2.4 (0.9–6.3)	0.08	15 (24)	10 (14)	1.9 (0.8–4.6)	0.16
Group work	20 (32)	6 (10)	4.2 (1.6–11.3)	0.005	14 (22)	6 (9)	3.1 (1.1–8.5)	0.03
Independent work	26 (41)	9 (15)	4.0 (1.7–9.5)	0.002	16 (25)	4 (6)	5.6 (1.8–17.9)	0.004
Persistency	25 (40)	10 (17)	3.3 (1.4–7.7)	0.006	19 (30)	5 (7)	5.6 (2.0–16.2)	0.001
Concentration	30 (48)	10 (17)	4.6 (2.0–10.5)	<0.001	21 (33)	10 (14)	3.0 (1.3–7.0)	0.011
Received support services								
Full-time special education	13 (21)	7 (12)	2.0 (0.7–5.3)	0.18	2 (3)	2 (3)	1.1 (0.2–8.2)	0.91
Part-time special education	9 (14)	14 (23)	0.5 (0.2–1.4)	0.20	13 (21)	9 (13)	1.8 (0.7–4.6)	0.22
Assistant services	22 (35)	13 (22)	1.9 (0.9–4.3)	0.11	13 (21)	7 (10)	2.3 (0.9–6.3)	0.09
One grade below	19 (30)	11 (18)	1.9 (0.8–4.5)	0.13	4 (6)	3 (4)	1.5 (0.3–7.0)	0.60
Receiving at least one support service	35 (56)	22 (37)	2.2 (1.0–4.4)	0.04	19 (31)	15 (21)	1.6 (0.7–3.6)	0.23

The outcomes for the boys and girls are compared with each other within both groups.
Results are presented with odds ratio (OR) and 95% confidence interval (CI).

follow-up protocol itself may have functioned as a significant support for the children, their families and their teachers, as we provided referrals for further support services after early deviant findings. A recent study from the Netherlands demonstrated that between five and six years, 61% of the very preterm born children received healthcare therapies and/or educational support (26). In future studies, it seems important to closely study the efficacy of existing interventions on the children's functioning at school. Additionally, it is recommended that teachers receive information about the preterm status of the pupil to facilitate the use of additional resources to support the educational abilities of the child (5).

Previous literature has consistently reported that children born preterm receive significantly more support services at school compared to their peers (14,15). In the EPIPAGE (Epidemiological study on low gestational age infants) cohort study, more than half (59%) of the eight-year-old children born before 33 weeks of gestation in France in 1997 and 38% of the controls received at least one of the following services: support at school, therapist visit(s) at the age of five to eight years, or grade repetition (14). In our study, 46% of the very preterm children and 26% of the controls received at least one support service. Interestingly, in Finland, the support services received by very preterm children have persisted across decades, because half (49%) of the adults who were born very preterm between 1978 and 1985 and 19% of the controls received remedial education even after excluding individuals with NSI from the preterm group (23).

Children born very preterm are at an increased risk for co-morbid cognitive and academic problems (10,17). An Australian study of preterm children born below 30 weeks of gestation between 1987 and 1994 showed that all children with NSI at 8 years of age received support services at school (16). In this study, all very preterm children who had NSI or extremely low cognitive scores received at least one support service. NSI was less strongly associated with lower ratings of poor educational performance than was low IQ. Explanation for this may be that 60% of the children with NSI had IQ $\geq$ 70. Children with NSI are offered a close follow-up protocol by the Finnish health care system.

There were no gender differences among the preterm children in teacher-rated academic functioning, which is consistent with a growing body of evidence showing a lack of gender differences in the academic abilities of preterm children (10). In the PIPARI study, the lack of gender differences was already shown in language development at two years of age (27). Boys did, however, have more classroom-functioning problems than the girls in both groups. Gender differences in classroom-behaviour may be explained with increased biological vulnerabilities for inattention and hyperactivity-impulsivity symptoms in boys (28) and with environmental factors related to socialisation processes of gender (29). Preterm birth also increases the risk for these symptoms (18,30). However, significant differences between very preterm and control boys were not found.

The major strength of this long-term follow-up study was its high rate of returned teacher-rated questionnaires. We collected data on the comprehensive outcome of educational abilities, including aspects of academic and sociobehavioural functioning, along with information on any

support services the children received. At school age, teachers are key informants when gathering data on these aspects of the daily adaptive functioning of very preterm born children. The limitations of this study included a lack of cognitive test results in the control group. The potential effect of not correcting for prematurity underestimates the performance compared to correcting for prematurity. However, the effect is likely to be small at 11 years of age although can been noteworthy in large populations. Additionally, the five children in the preterm group who were lost from the follow-up process had a lower mean full-scale IQ than those who were followed, which might have biased the educational abilities of the preterm group towards a positive direction. Finally, even if the special education teachers follow the Finnish National Core Curriculum for Basic Education, there is still possibility that some of them have had lower expectations. This could have contributed to the lack of group differences in teacher ratings.

Delayed school entry and grade repetition are frequently reported to be more common in preterm children compared to their peers, but they do not necessarily improve academic performance in the long run when compared with the very preterm children in an age-appropriate grade (3,12). Delayed school entry is considered using chronological age. In future research, it is essential to study which support services are effective in each context in order to provide evidence-based support for preterm children, who seem to benefit from support systems at school. Additionally, using functional measures provides important information about how very preterm children with cognitive vulnerabilities manage to cope in daily situations.

CONCLUSION

A full-scale IQ $\geq$ 70 and age-appropriate educational abilities do not exclude significant need for support services in very preterm children at the age of 11 years. Educational problems were clearly more common in the children who had a severe cognitive delay and, to a lesser degree, in the children who had NSI. Boys had more classroom-functioning problems than girls in both the preterm and control groups. Our results emphasise that the support services received by preterm children should be considered when assessing their educational abilities and performance.

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CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

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