Early Human Development 117 (2018) 39–43

Contents lists available at ScienceDirect

Early Human Development

journal homepage: www.elsevier.com/locate/earlhumdev

Very preterm born children at early school age: Healthcare therapies and educational provisions☆,☆☆

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ARTICLE INFO

Keywords:
Prematurity
Follow-up studies
Motor outcome
Cognitive outcome
Preschool

ABSTRACT

Aim: To explore changes in motor and cognitive outcomes in very preterm (VP; gestational age < 30 weeks) born children between ages five and six years, and to determine whether changes in these outcomes were associated with the use of healthcare therapies and educational provisions.

Study design: Single-center observational cohort study. Five-year-old VP born children of a one-year-cohort of our neonatal follow-up program ($N = 90$) were invited for re-assessments at age six. Use of healthcare therapies and educational provisions was registered at ages five and six years. Motor function (Movement Assessment Battery for Children-2 [M-ABC-2]; higher scores indicate better functioning) and IQ (Wechsler Preschool and Primary Scale for Intelligence [WPPSI-III-NL]) were assessed at both ages.

Results: Sixty-four VP born children were seen at ages five and at six years. In this year, 61% received healthcare therapies and/or educational provisions. M-ABC-2 scores of VP born children who received healthcare therapy and/or educational provisions were significantly higher ($M = 8.9$ [$SD = 3.2$]) at age six years than at age five years ($M = 7.5$ [$SD = 3.3$]); $p < 0.00$). M-ABC-2 scores remained stable in the average range in VP born children without any support. IQ scores remained stable irrespective of received support.

Conclusions: Improvements in motor outcomes are associated with the use of healthcare therapies and/or educational support between ages five and six years in VP born children. Future studies need to determine the efficacy of existing interventions, and to develop tailored interventions to support VP born children in the transfer period from preschool to primary education.

1. Introduction

Due to improved neonatal intensive care, the gestational age [GA] at which preterm born infants are considered viable has rapidly decreased over the last decades [1], leading to an increasing proportion of surviving very preterm (VP; GA < 30 weeks) born infants [2]. These VP born infants are at great risk for disabilities in motor and cognitive areas of functioning [3–14]. To support VP born infants' development, early post-hospital discharge interventions are often provided, with positive influence on motor and cognitive outcomes in infancy [15]. Though cognitive benefits are reported to persist [15], at early preschool age, 50% to 75% of the VP born children still experience motor and/or cognitive disabilities [3–14], and little is known about the use and effect of healthcare support beyond infancy [16].

The transition period from preschool to primary school, usually between ages five and six years, is challenging for many VP born children, due to increasing cognitive, motor, and educational demands in primary school [5,17]. The few studies addressing healthcare use in these early (pre)school years, show that VP born children are significantly more often referred to healthcare therapies, such as physical therapy, occupational therapy, or speech therapy, than same-aged term-born peers [18,19]. In addition, studies also show that already at

☆ Financial support. This work was supported by the Emma Foundation (grant number 2015.168); and the Janivo Foundation (grant number 2015-002).
☆☆ Conflict of interests None.
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https://doi.org/10.1016/j.earlhumdev.2017.12.010
Received 8 November 2017; Received in revised form 18 December 2017; Accepted 18 December 2017

this young age, VP born children are more frequently than peers reported to repeat a grade and to have special educational needs [6,14].

Though clearly reported as an important and vulnerable period for VP born children, to date, no study has explored the naturalistic course of VP born children's motor and cognitive development during this transition period from ages five to six years. Also, no study has determined whether healthcare therapies and educational provisions in this short timeframe are related to the course of motor and cognitive development. More knowledge on this matter would help justify future randomized controlled trials on the efficacy of therapeutic interventions and their effective elements.

In this observational cohort study, we, therefore, aimed to explore the naturalistic course of motor and cognitive outcomes in the early (pre)school years, and to determine whether changes in these outcomes were associated with the use of healthcare therapies and educational provisions.

2. Methods

2.1. Study design and participants

This study is a single-center, observational cohort study conducted at the Emma Children's Hospital, Academic Medical Center, Amsterdam. The institutional review board approved the study protocol. Included were VP born children (GA < 30 weeks and/or birth weight [BW] < 1000 g) who were invited between January 2013 and February 2014 for the neonatal follow-up program at five years corrected age and whose parents consented to repeat assessments at six years corrected age.

2.2. Procedure

At the end of the five years' follow-up visit as part of the neonatal follow-up program, parents were invited to return to our clinic one year later for similar assessments of their child. Parents received verbal and written information on the study, and written consent was obtained from all parents. Assessments were scheduled within three months after the child had reached the corrected age of five and six years (M = 5.1, SD = 0.1; M = 6.1, SD = 0.2, respectively).

Motor development was assessed by a pediatrician and cognitive development was assessed by a child psychologist. Standardized tests and instructions were used for the assessments. The pediatrician and child psychologist were not blinded for the degree of prematurity, neonatal history, previous test results, and therapies or educational support of the VP born children. Standard scores of all tests were calculated according to the manualized instructions of the tests, and were corrected for prematurity.

2.3. Measures at both ages five and six years

2.3.1. Motor development

Motor development was assessed using the Movement Assessment Battery for Children – 2 (M-ABC-2), a standardized test designed to identify motor impairments in children aged 3 to 16 years [20]. The test comprises eight tasks yielding a Total score, and three component scores: Manual Skills score, Ball Skills score, and Balance Skills score. The standardized Total score and component scores have a mean of 10 (SD = 3) [20]. Higher scores on the M-ABC-2 Total score and component scores indicate better motor functioning.

2.3.2. Cognitive development

Cognitive development was assessed using the Dutch version of the third edition of the Wechsler Preschool and Primary Scale of Intelligence (WPPSI-III-NL) [21]. The test comprises ten tasks yielding a Full Scale IQ (FSIQ), Verbal IQ (VIQ), Performance IQ (PIQ), Processing Speed Quotient (PSQ), and General Language Component (GLC) [21]. WPPSI-III-NL scaled scores have a mean of 100 (SD = 15) [22].

2.3.3. Educational provisions

In The Netherlands, children enter school at age four years. Educational provisions are initiated and provided by the schools and include in-school educational support, grade repetition, and/or enrollment in special education. Grade repetition in preschool was defined as being in preschool for more than two years and eight months at the six-years' assessment.

2.3.4. Healthcare therapies

Healthcare therapies, including physical, occupational, and speech therapy, and behavioral support, were either prescribed by the local pediatrician and registered at the follow-up visit, or prescribed by the pediatrician who performed the neonatal follow-up assessment.

2.4. Statistics

Percentages of children that received healthcare therapies and educational support between ages five and six years were calculated. To explore the naturalistic course of motor and cognitive outcomes between ages five and six years, we conducted paired sample t-tests, and McNemar's tests where appropriate. To determine associations between healthcare therapies and educational provisions, and changes over time of motor and cognitive outcomes, paired sample t-tests were conducted separately for the VP born children who received support and the VP born children who did not. p-values of < 0.05 (two-tailed) were considered statistically significant. All analyses were performed using IBM SPSS Statistics 24.0.

3. Results

3.1. Participants

At age five years, 90 of the 97 VP born children invited for participation in the neonatal follow-up program were assessed. Parents of 68 children provided informed consent for the six years' re-assessment. At age six years, four children were lost to follow-up. The final study sample of VP born children assessed at both five and six years consisted of 64 children. These 64 children did not differ significantly from the 33 non-participating children with respect to GA, BW, and gender (all p's > 0.05). Mothers of the 33 non-participating children more often had a low education than mothers of the 64 participating children (χ^2 = 9.78, p < 0.01). The 64 participating children did not differ significantly from the 26 children not seen at age six years, with respect FSIQ, and M-ABC-2 Total score, at age five years (all p's > 0.05).

The study cohort of 64 VP born children had a mean GA of 28.1 weeks (range 25.0 to 31.4), and a mean BW of 1048 g (range 550 g to 1590 g) (Table 1). None of these children had disabling cerebral palsy with a Gross Motor Function Classification System [23] (GMFCS) score > 1, nor a visual handicap or hearing aids.

3.2. Healthcare therapies and educational provisions between ages five and six years

Table 2 depicts the rates of healthcare therapies and educational provisions. Between ages five and six years, 24 children (38%) received educational provisions, and 26 children (41%) received healthcare therapies. In total, 39 children (61%) received healthcare therapies and/or educational support. Of these 39 children, 11 children (28%) received both healthcare therapies and educational support.

3.3. Motor and cognitive outcomes at ages five and six years

Table 3 depicts the cognitive and motor outcomes at ages five and six years and the results of the statistical comparisons between the two