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The relationship between multiple developmental difficulties in very low birth weight children at 3½ years of age and the need for learning support at 5 years of age

Gijs Verkerk [a,*], Martine Jeukens-Visser [a], Aleid van Wassenaer-Leemhuis [b], Joke Kok [b], Frans Nollet [a]

[a] Department of Rehabilitation, Academic Medical Centre, University of Amsterdam, Amsterdam, The Netherlands
[b] Department of Neonatology, Academic Medical Centre, University of Amsterdam, Amsterdam, The Netherlands

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ABSTRACT

This study investigated whether multiple developmental difficulties are more frequent in very low birth weight (VLBW) children than in those born full term. The association between multiple developmental difficulties assessed at 3½ years of age and educational provision for the child at 5½ years was also investigated, with 'educational provision' referring to the curriculum, school placement and the level of learning support. There were 143 VLBW children without cerebral palsy (CP) and 41 term-born peers assessed at 3½ years of age. The assessment included 6 measures of development: word comprehension, visual motor integration, visual perception, motor coordination, executive functioning and behaviour. Educational provision was determined at age 5½ years. A mildly abnormal score (score <1 standard deviation) was considered to indicate developmental difficulty. Scores from the six measures of development were analysed to determine the difficulty frequency and the presence of multiple difficulties (>1 difficulty score) in each child. This study showed that at 3½ years of age, the VLBW children had significantly more difficulty with motor coordination than their term-born peers. In addition, 27% of the VLBW children had multiple difficulties compared to 10% in the term-born group. Multiple logistic regression analyses showed that of the difficulties, impaired motor coordination was most strongly associated with the requirement for learning support two years later. Regression analyses showed that having multiple difficulties was significantly associated with the need for learning support (Odds Ratio of 3.4 (95% CI: 1.5–7.8). These results show that the presence of multiple difficulties in a VLBW child of preschool age, can impact the child's educational provision two years later.

1. Introduction

The number of very low birth weight (VLBW) children with severe neonatal morbidities is decreasing worldwide (Horbar et al., 2012). However, VLBW children are at risk of neurodevelopmental problems. Meta-analyses and reviews show that VLBW children, mainly those ≥4 years of age, do not perform as well as their term-born peers in domains such as word comprehension (Barre, Morgan, Doyle, & Anderson, 2011), visual motor integration (Geldof, van Wassenaer, de Kieviet,

* Corresponding author at: Department of Rehabilitation, A-01-414, Academic Medical Centre, Meibergdreef 9, 1105 AZ Amsterdam, The Netherlands. Tel.: +31 20 5667610; fax: +31 20 5669154.
E-mail addresses: g.j.verkerk@amc.uva.nl (G. Verkerk), m.jeukens-visser@amc.uva.nl (M. Jeukens-Visser), a.vanwassenaer@amc.uva.nl (A. van Wassenaer-Leemhuis), j.h.kok@amc.uva.nl (J. Kok), f.nollet@amc.uva.nl (F. Nollet).

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Kok, & Oosterlaan, 2012), visual perception (Geldof et al., 2012), motor coordination (De Kieviet, Piek, Aarnoudse-Moens, & Oosterlaan, 2009) and executive functioning (Aarnoudse-Moens, Weisglas-Kuperus, van Goudoever, & Oosterlaan, 2009). VLBW children also have more behavioural difficulties (Hayes & Sharif, 2009). Further, a number of studies show that VLBW children older than 4 years of age are at increased risk of difficulty in multiple developmental domains, with 'difficulty' defined as a score <1 standard deviation (SD) (Potharst et al., 2011; Roberts, Lim, Doyle, & Anderson, 2011; van Baar, van Wassenaer, Briët, Dekker, & Kok, 2005; Woodward et al., 2009).

Impaired development becomes more apparent in VLBW children as they get older (Walther, den Ouden, & Verloove-Vanhorick, 2000), and having multiple difficulties can significantly impact a child's educational achievement (Hornby & Woodward, 2009; van Baar et al., 2005). Therefore, early detection of difficulties in multiple developmental domains, together with the identification of appropriate interventions, are important steps for helping ensure that a child is able to reach his or her learning potential.

This study compared VLBW children with their term-born peers with respect to the frequency of difficulties (scores <1 SD), the presence of multiple difficulties (difficulty score >1) and the cumulative level of difficulty across several developmental domains at 3½ years corrected age (CA). It also investigated the association between difficulties at 3½ years CA and educational provision at 5½ years CA in VLBW children. In this paper, 'educational provision' is used as a general term that encompasses school curriculum, school placement and/or the provided levels of learning support.

2. Methods

This study utilised data from an earlier follow-up study of a multicentre randomised controlled trial (RCT) evaluating the effectiveness of an early neurobehavioural intervention program, the Infant Assessment and Intervention Program (IBAIP)© (Hedlund, 2013; Verkerk et al., 2012).

2.1. Participants

VLBW children, together with a comparison group of term-born children, were assessed at 44 months CA. This age was chosen in order to investigate the performance of the VLBW children across several developmental domains just before they started school. In the Netherlands, VLBW children enter school when they are 48 months old (uncorrected age). For readability, we use the term '3½ years CA' instead of '44 months CA'. The RCT included 176 VLBW infants with a birth weight <1500 g and/or a gestational age <32 weeks. The VLBW infants were recruited at 7 hospitals in Amsterdam, the Netherlands. In the RCT, 86 VLBW children received the IBAIP (Koldewijn et al., 2009) while 90 VLBW children received standard care. Briefly, the neurobehavioural intervention consisted of 6–8 interventions at home that were performed after hospital discharge up to 6 months CA. The infant's neurobehavioural organisation and self-regulatory competence were assessed within the context of their home environment. The parents were shown how to adjust the environment to meet their infant's needs and how to support the capacity for self-regulation. The VLBW children were assessed at 6, 12 and 24 months CA (Koldewijn et al., 2009, 2010; van Hus et al., 2013b). Children with cerebral palsy (CP) often have multiple impairments and require special educational provisions (Bax et al., 2005); accordingly, children diagnosed with CP by a paediatrician or neurologist were excluded from this study.

The term-born children were recruited via Amsterdam's Public Health Service. Invitation letters were sent to 200 parents a few months before their child would be 3½ years old. The inclusion criteria for the term group were as follows: born at 37 weeks of gestation or later; birth weight of at least 2500 g; and no referral to a psychologist, a paediatrician or another physician because of developmental or health problems. By a process of consecutive selection, the comparison group of term-born children and their parents were matched to the distribution of the VLBW group with respect to the following characteristics: male gender, maternal education ≤10 years and mother born abroad. The Medical Ethics Committee of the Academic Medical Centre in the Netherlands approved the follow-up study design.

2.2. Procedure

Parents who agreed to participate in the study were asked to complete questionnaires pertaining to their child's behaviour and executive functioning. Home visits were organised, and the parents provided written informed consent for participation in the study. The child's performance was assessed in the home environment by an occupational therapist who knew whether the child was a VLBW child. The children were assessed between August 2007 and February 2010 at 3½ years CA. The study aimed to assess the children approximately a few months before school entry, which in the Netherlands is at 4 years of (uncorrected) age.

The assessments were chosen for two reasons. First, they covered aspects of neurodevelopment in which VLBW children tend not to perform as well as their term-born peers; and second, the assessments included preschool activities that parents often do with their children. The activities included talking about the images in picture books, detecting differences in comparable pictures and drawing tasks. In the follow-up at 5½ years CA, information was collected about educational provisions for the VLBW children (van Hus et al., 2013a).