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Original article

Aspects of activities and participation of 7–8 year-old children with an obstetric brachial plexus injury

Els Spaargaren [a], *Jasmyn Ahmed* [b], *Willem J.R. van Ouwerkerk* [c], *Vincent de Groot* [a,d], *Heleen Beckerman* [a,d,*]

[a] *Department of Rehabilitation Medicine, VU University Medical Center, Amsterdam, The Netherlands*
[b] *Faculty of Medicine, VU University Medical Center, Amsterdam, The Netherlands*
[c] *Department of Neurosurgery, VU University Medical Center, Amsterdam, The Netherlands*
[d] *EMGO Institute for Health and Care Research, VU University and VU University Medical Center, Amsterdam, The Netherlands*

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ABSTRACT

Background: Children with an obstetric brachial plexus injury (OBPI) can experience problems in the performance of meaningful activities such as writing, bimanual activities, and participation in sports and leisure activities.
Aims: To quantify the everyday functioning and participation of 7–8 year-old children with an OBPI, with special emphasis on writing, and to investigate associated characteristics.
Methods: Parents of children with an OBPI were sent a self-report questionnaire regarding the school performance, writing abilities, bimanual hand use, and participation in sports and leisure activities of their child, assessed with the Vineland Adaptive Behavior Scales (VABS sub-scale writing), the ABILHAND-kids, and the Children's Assessment of Participation and Enjoyment (CAPE). Furthermore, questions were asked about socio-demographic variables, medical history, pain, and the use of assistive devices.
Results: Fifty three questionnaires were filled in (response 61%). According to the parents, 66% of their children were almost completely recovered, and 58% had a near normal arm function. Most of the children preferred to use their non-involved hand. More than 45% of the children complained about pain, and 39.6% had difficulties with writing, which resulted in a mean developmental delay of 8 months on the VABS sub-scale. Children with writing problems significantly more often had neurosurgery, were living with a single parent, more often received assistance at school, and had a significantly lower ABILHAND-kids score, compared to children with no writing problems.
Conclusions: Large percentages of 7–8 year-old children with an OBPI experience difficulties with writing and have musculoskeletal pain. Restrictions in participation were less pronounced.

* *Corresponding author*. Department of Rehabilitation Medicine, VU University Medical Center, PO Box 7057, 1007 MB Amsterdam, The Netherlands. Tel.: +31 20 4440762; fax: +31 20 4440787.
E-mail address: h.beckerman@vumc.nl (H. Beckerman).
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1. Introduction

Obstetric brachial plexus injury (OBPI) is typically caused by traction to the brachial plexus during labor. A recent study of the incidence of OBPI showed a decrease over time in hospitals in the USA from 1.7 per 1000 live births in 1997 to 1.3 per 1000 live births in 2003.[1] A higher, and somewhat increasing incidence has been found in various European studies, ranging from 3 per 1000 live births in Norway and 3.3 per 1000 live births in Sweden to 4.6 per 1000 live births in a Dutch university hospital.[2–4] Explanations for the difference in these trends are probably related to the percentage of Caesarean sections that are performed, the incidence of infants with a high birth weight, the multiple birth rates, the rates of preterm labor induction, and the difference in systems for reporting OBPI.

The neonatal injury is clinically classified according to the nerve roots involved. Injuries affecting the upper plexus (C5–C7 roots) or so-called Erb's injuries are dominant, compared to injuries in which the C8–T1 nerve roots are also affected. The decision to perform neurosurgical repair of the brachial plexus depends on the severity of the plexus injury, the resulting muscle palsies, and the tendency of spontaneous recovery during the first three months. Microsurgical repair is performed when the infant is between 3 and 9 months old. The time-range is a consequence of non-conforming evidence supporting the predictive value of the antigravity function of the biceps brachii muscle.

Conservative management starts during the first weeks of life, and the main aim of the treatment is to prevent contractures and joint deformities. At an older age, the aim of exercise and occupational therapy is to improve bimanual use, school performance, and daily self-care activities. Several reviews have focused on the outcome of conservative treatment or neurosurgical procedures in children with an OBPI.[5–8] However, there is a scarcity of long-term follow-up data pertaining to the children's performance of everyday activities and perspective on participation.[9–16]

In addition to the neuromusculoskeletal problems caused by the plexus injury, an OBPI might also cause developmental and behavioral problems, because of a delay in the development of mid-line orientation, and eye–hand and hand–hand co-ordination.[17] A lack of support function of the involved arm/hand, trunk- and head-extension, and diminished weight bearing are also common problems in the early stages of development. At a later stage, this might also result in anxiety and limited self-confidence in gross motor activities such as climbing, running, going up stairs or playing outdoors. Children with an OBPI have different ways of performing activities within different contexts, and they set different conditions for specific activities. In most cases, the plexus injury does not preclude the child from active participation, but slightly more effort may be needed to compete with their non-disabled peers.[18]

Krumlinde et al.[9] carried out a study combining aspects of activity performance and hand function in 105 5-year old children with an OBPI. Restricted range of motion in the shoulder and grip strength seemed to be the key factors related to problems in the performance of bimanual activities. Kirjavainen et al.[11,12] studied the long-term functional outcome after neurosurgery in 124 Finnish children, and found that 37% of the children still needed help with everyday activities such as washing, cutting up food, and doing up buttons. Furthermore, one third of the children had pain in the involved arm. The strongest factor predicting outcome in this study appeared to be the extent of the primary plexus injury.[11]

In the general population, 85–90% of the people are right-handed. However, due to the diminished function in the involved arm and hand, many children with an OBPI prefer to use their non-involved hand, assisted by their involved hand.[19,20] In 37 children with a right-sided OBPI, only 17% preferred to write with their right hand, whereas the others preferred their non-involved hand.[19] These children tend to use the involved arm less frequently because it is less efficient. In bimanual activities, the child might use the affected arm and hand for stabilizing or holding purposes, but will often use other body parts or other things to stabilize objects, for example their legs, trunk, mouth, or the table.

Writing is an activity that is of great value in society, not only for personal growth and development of self-esteem, but also in building professional relationships. For children who are beginning to write, the physical demands of the task are substantial. It is a bimanual activity, in which the dominant hand performs the fine motor activity (writing) and the assisting hand stabilizes and moves the paper. It has been found that 10–30% of school-going children have difficulties with writing.[21] Fine motor skills in wrist and fingers, dynamic grasp, dissociated movement, stabilized sitting position, eye–hand co-ordination, and converting spoken or read information into written language are important aspects in this complex activity.[22,23] In addition to their preference to write with the non-involved hand, children with a total brachial plexus injury or with a more severely affected and less well recovered lower plexus function, are also expected to experience problems in stabilizing and moving paper when they are writing. This might eventually reduce writing capacity and/or delay performance time. Clinical experience shows that compensation in writing strategy or sitting position can, in the long run, cause serious back and neck problems. When children write with the involved arm/hand, this often causes increased fatigue or pain.

In order to develop rehabilitation perspectives on activities and participation for children with an OBPI, the aims of this study are to describe the level of activities and participation of 7–8 year-old children with an OBPI, to specify how many of these children do have writing problems, and to investigate the associations between writing problems and child- and injury-related characteristics.

2. Methods

2.1. Study group

Each year, approximately 50 children with an OBPI are referred to the specialized plexus team at the VU University Medical Center in Amsterdam. This multidisciplinary team consists of a neurosurgeon, a rehabilitation physician, a physiotherapist,