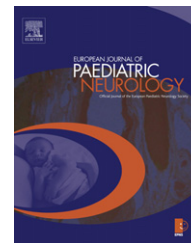




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## Original article

# General movements of preterm infants in relation to their motor competence between 5 and 6 years

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## ABSTRACT

**Background:** The criteria for identification of children with high risk of cerebral palsy are well documented, but the early identification of children at highest risk of minor motor deficits remains less clear.

**Aim:** To analyze the correlation between the quality of general movements (GMs) from term to twenty weeks postterm age and the motor competence between 5 and 6 years of age.

**Methods:** In the group of 45 preterm infants, the quality of GMs was assessed using Precht's method. The Movement Assessment Battery for Children (M-ABC) was used to test motor competence between 5 and 6 years of age. The correlations between GMs and M-ABC results were analyzed.

**Results:** During writhing period, the sensitivity of GMs to identify children with definite motor problem was 0.86 for total impairment, 0.67 for manual dexterity, 0.89 for ball skills and 0.92 for balance. During fidgety period, the sensitivity was higher than during the writhing period: 1.00 for total impairment, 1.00 for manual dexterity, 1.00 for ball skills and 0.83 for balance, respectively. The specificity was low at both ages (total scoring 0.24 at term and 0.21 at 3 months corrected age).

**Conclusion:** The sensitivity of GMs to identify children with definite motor problems is higher at the fidgety than at the writhing period. The specificity of GMs at the term and fidgety age to predict later motor abilities is low.

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## 1. Introduction

A high prevalence of developmental abnormalities presenting with motor deficits occurs in ex-preterm children at school age.<sup>1,2</sup> In addition to cerebral palsy (CP), these include milder motor deficits including poor coordination, poor physical fitness and deficits in postural stability. The motor difficulties

of ex-preterm children do not resolve as the child matures.<sup>3</sup> Previously it was believed that in the absence of major complications these children would catch-up. Recent research suggests that preterm infants remain and often become increasingly disadvantaged in many measures of neuro-integrative functioning. The children experience difficulties in academic achievement or activities in daily living tasks in

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self-care. They show difficulties in behavior regulation, social and emotional adaptation. Risk for learning and behavioral disorders, such as attention problems, is higher.<sup>4</sup> Different terms referring to milder motor deficits have been used since the problem was highlighted for the first time over 40 years ago<sup>5</sup>: clumsy child, minimal cerebral palsy, minimal cerebral dysfunction, developmental apraxia or dyspraxia, minimal brain dysfunction and sensory integrative dysfunction. Recently, a consensus of professionals from various fields suggested the term “developmental coordination disorder (DCD)”, taken from the Diagnostic and Statistical Manual of Mental Disorders, 4th edition, Text Revision (DSM- IV-TR), to be used for this group of children.<sup>6,7</sup> DCD is defined as a neurodevelopmental condition that has an impact on child’s ability to perform everyday tasks in self-care and academic areas. Children with DCD are a heterogeneous group who has a marked impairment in the performance of functional motor skills. The diagnosis of DCD should be made within a diagnostic setting and may require a multidisciplinary approach. To identify children that meet the motor impairment diagnostic criterion for DCD, the Movement Assessment Battery for Children (M-ABC) test and the Bruininks–Oseretsky Test of Motor Proficiency are the most popular tools used.

While the criteria for identification of children with high risk of cerebral palsy have already been documented by many authors, the early identification of children at highest risk of minor motor deficits remains less clear. In the last two decades, the qualitative assessment of general movements (GMs) proved to be a highly sensitive and specific diagnostic tool for the assessment of the integrity of the young nervous system. General movements are part of the spontaneous movement repertoire observed in fetus from 9 weeks postmenstrual age onwards until the end of the first half year of life. If the nervous system is impaired, GMs lose their complex and variable character and become monotonous and poor.<sup>8,9</sup> A persistent abnormal pattern of cramped-synchronized GMs during the writhing period and the absence of GMs of fidgety character during the fidgety period reliably predict later cerebral palsy.<sup>10</sup> However, it is still uncertain whether the GMs assessment can be used to predict mild neurologic deficits.

In order to determine the predictive value of GMs to identify children with definite or borderline motor difficulties consistent with DCD, the present study aimed to analyze the correlations between GMs and motor competence as tested by M-ABC between 5 and 6 years of age.

## 2. Participants and methods

### 2.1. Participants

Forty-five infants (23 boys, 22 girls), were included in our study. All were referred after discharge from the maternity hospital for close follow up to the regional outpatient Developmental Centre because of known risk factors for impaired neurologic function. Apart from prematurity (gestational age of 36 weeks or less), the criteria for inclusion in the study were (i) the existence of one or more neonatal complications (Apgar score 7 or less at 5 min, mechanical ventilation for more than

one week, documented sepsis or central nervous system infection, convulsions, exchange transfusion due to hyperbilirubinemia, documented central nervous system hemorrhage, surgical intervention) and, (ii) first examination at the corrected gestational age of 40 weeks (plus/minus 5 days). Children with dysmorphic syndromes and chromosomal abnormalities were excluded from the study.

All except 3 children were born at the Ljubljana Maternity Hospital. They were born preterm, with gestational ages from 23 to 36 weeks (mean 31.6 weeks, SD 3.3 weeks) and birth weights from 525–3240 gm (mean 1788 gm, SD 718 gm). 7 children had very low birth weights and in 15 children the birth weight was below 1500 gm. Six infants were small, 2 were large and the others were appropriate for gestational age. There were 8 pairs of twins. Twenty-six children experienced one additional neonatal complication, while 19 children experienced 2 or more. Characteristics of the studied population are presented in Table 1.

This group of preterm infants was first assessed at the corrected term age.<sup>11</sup> Their developmental and neurological condition was periodically assessed with psychodiagnostic and neurologic follow up.<sup>12,13</sup> They were regularly followed later on with the intention to study the developmental and neurologic outcome at school age. In this paper the relation between GMs and motor competence measured by M-ABC is presented.

### 2.2. Methods

#### 2.2.1. Observation of spontaneous movements

The quality of spontaneous movements was blindly assessed by a developmental pediatrician experienced in this technique (B. Š.) according to the standard Prechtl method, from term to 20 weeks postterm age. Serial videotape recordings, each lasting about 15 min, were made and collected on a separate tape for each infant, documenting the developmental course of GMs from term to 20 weeks postterm. Two assessments were performed (1) a global judgment of the

**Table 1 – Summary of characteristics in the studied group.**

Number of patients	45	
Male/female	23/22	
Gestational age		
23–27 weeks	8	18%
28–32 weeks	15	33%
33–36 weeks	22	49%
Birth weight		
<1000 g	7	16%
1000–1500 g	10	22%
>1500 g	28	62%
Apgar score <7 at 5 min	12	27%
Mechanical ventilation >1 week	28	62%
Sepsis	18	40%
CNS infection	3	7%
Convulsions	6	13%
Hyperbilirubinemia-exchange transfusion	4	9%
Surgical intervention	2	4%
CNS hemorrhage	6	13%

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