Early motor repertoire is related to level of self-mobility in children with cerebral palsy at school age

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LIST OF ABBREVIATIONS
LR Likelihood ratio
NPV Negative predictive values
PPV Positive predictive values

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AIM To determine the predictive value of the early motor repertoire for the level of self-mobility in children with cerebral palsy (CP) at school age.

METHOD Video recordings were made at 11 to 17 weeks post-term of 37 preterm infants (20 males, 17 females) who later developed CP. The early motor repertoire was assessed by obtaining a motor optimality score. At 6 to 12 years, children were classified according to the Gross Motor Function Classification System (GMFCS).

RESULTS Of 37 children (mean gestational age 29.1wks, SD 1.9; mean birthweight 1273g, SD 324), nine had unilateral and 28 had bilateral spastic CP. Twelve children were in GMFCS level I, three level II, 10 level III, four level IV, and eight level V. The absence of the age-adequate motor repertoire, a cramped motor repertoire, an abnormal kicking pattern, and a non-flat supine posture were associated with lower levels of self-mobility ($\chi^2$ for trend test, $p<0.05$). Predictive for a low level of self-mobility was a cramped repertoire⁄non-flat supine posture (PPV 100%, NPV 54%). Predictive for a high level of self-mobility was a non-cramped repertoire⁄flat supine posture (PPV 80%, NPV 74%).

INTERPRETATION Several aspects of the motor repertoire at 11 to 17 weeks post-term predicted the degree of functional limitations in children with CP at school age.

Neurological and developmental impairment is common in preterm infants. Several studies have shown that approximately 10% of infants born before 32 weeks’ gestational age develop cerebral palsy (CP).1 There are several indicators for the early identification of infants at highest risk. Gestational age and birthweight are two rather imprecise early indicators. Neuroimaging (brain ultrasound and magnetic resonance imaging)2,3 and specific clinical risk scores4 are more accurate. The quality of spontaneous general movements, assessed in the individual infant using Prechtl’s method, has emerged as a reliable and valid predictor of CP.5–8 This method is based on visual Gestalt perception of the quality of general movements in preterm infants and infants from term up to the age of 5 months post-term. Normal general movements are characterized by complexity, variability, and fluency, whereas abnormal general movements are characterized by reduced complexity, variability, and fluency. At 6 to 9 weeks post-term age, the character of the general movements gradually changes into so-called fidgety movements. In particular, the presence of these fidgety movements, which can be observed until 20 weeks post-term, is an accurate marker for neurological outcome. Most infants (96%) with normal fidgety movements have a normal neurological outcome, whereas most infants (95%) in whom fidgety movements are absent during this particular period develop CP.9 However, the
absence of fidgety movements does not predict the level of self-mobility in the children who develop CP.

The motor repertoire between 6 and 20 weeks post-term consists not only of fidgety movements but also of other movement and postural patterns. Previous studies have shown that several qualitative and quantitative aspects of these movement and postural patterns are predictive of the development of minor neurological dysfunction at school age.\textsuperscript{10,11} This raised the question whether these aspects of the early motor repertoire might also have predictive value for the severity of the functional limitations in children with CP at school age.

Therefore, the aim of the study was to investigate the predictive value of the motor repertoire at 11 to 17 weeks post-term, in relation to clinical data, for the level of self-mobility in children with CP at 6 to 12 years of age.

**METHOD**

**Participants**

After informed consent, a total of 347 children were prospectively included in studies investigating the relationship between the early motor repertoire and neurological and developmental data at follow-up. The inclusion criterion was birth before 34 weeks gestational age; exclusion criteria were congenital malformations and chromosomal abnormalities. Previously, several studies have reported on parts of the study population.\textsuperscript{6,10,12} For this study, data analysis was performed in those children who had developed CP by the age of 6 years (n=37). Twenty infants were born and treated at the tertiary neonatal intensive care unit of the University Medical Center, Groningen between 1992 and 2000. Seventeen infants were treated at the Stella Maris Institute, Pisa between 1988 and 2001. The ethical review boards of the University Medical Center and the Stella Maris Institute approved the study design. Patient characteristics are presented in Table I.

**Recording and evaluation of spontaneous motor repertoire**

Video recordings, approximately 5 to 10 minutes long, were made of the infants between 11 and 17 weeks post-term. The recordings were made either at the outpatient clinic or at home, during periods of active wakefulness between feeds, with the partially dressed infants lying in the supine position. All recordings of those infants who developed CP were later evaluated offline by JLMB and AFB and partly by CE, according to the method of Einspieler et al.\textsuperscript{7} The observers were unaware of the children’s clinical history and the degree of functional impairment.

The motor optimality score was used to judge the motor repertoire.\textsuperscript{7,11} The score is the sum of five components: (1) the quality of the fidgety movements; (2) the presence and normality of movement patterns; (3) the presence and normality of postural patterns; (4) the age adequacy of the concurrent motor repertoire; and (5) the quality of the concurrent motor repertoire.\textsuperscript{7,11} Together these components provide the basis for calculating a motor optimality score, with a minimum of 3 points and a maximum (optimal) score of 28 points.\textsuperscript{11} Previous studies of this method have reported the interobserver reliability: a Cohen’s kappa of 0.87 was found for the quality of fidgety movements, 0.91 for the quality of the concurrent motor repertoire, and 0.89 for the age adequacy of the concurrent motor repertoire.\textsuperscript{10,11}

Fidgety movements are movements of small amplitude, moderate speed, and variable acceleration of the neck, trunk, and limbs in all directions.\textsuperscript{7} They are continually or intermittently present in the awake infant, except during periods of fussing or crying. Fidgety movements may be seen as early as 6 weeks post-term but usually appear around the 9th week and persist until 15 to 20 weeks post-term.\textsuperscript{7} We assessed the quality of fidgety movements as normal, abnormal (amplitude, speed, and jerkiness were exaggerated), or absent (i.e., fidgety movements were not observed during the entire recording).

The movement repertoire at this age consists of a large variety of movement patterns. The number and variety of these movements increase with age.\textsuperscript{15} A score for the presence and normality of movement patterns was derived

| Table I: Clinical characteristics and risk factors of the study group according to neurological findings at 6 to 12 years of age. Data are expressed as median (25–75 centiles), or number (%) |
|---------------------------------|-----------------|-----------------|-----------------|-----------------|
| Characteristics                | GMFCS I, II     | GMFCS III, IV   |
| Number                         | 15              | 22              |
| Age at GMFCS, y                | 9 (7–11)        | 8.5 (6–11.3)    |
| Unilateral/bilateral           | 9/6             | 0/22            |
| Gestational ages, wks          | 28.8 (27.1–31)  | 29.4 (27.9–30.3)|
| Birthweight, g                 | 1225 (870–1485) | 1306 (1063–1453)|
| Male/female                    | 10/5            | 10/12           |
| ICH\textsuperscript{a} grade, n (%) | 1–2 (2 (13))   | 7 (32)          |
|                               | 3–4 (8 (53))    | 1 (45)          |
| PVL\textsuperscript{b} grade, n (%) | 1 (11 (73))   | 8 (36)          |
|                               | 2–3 (1 (7))     | 12 (55)         |

\textsuperscript{a}Intracranial haemorrhage (ICH) graded according to Papile et al.\textsuperscript{13}

\textsuperscript{b}Periventricular leukomalacia (PVL) graded according to de Vries et al.\textsuperscript{14} PVL grade 1 is also called prolonged flaring. \textsuperscript{p}<0.05, compared with children at Gross Motor Function Classification System (GMFCS) levels I and II, \textsuperscript{2} test for trend.

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from the relative frequency of their occurrence, normality being defined by the preponderance of normal patterns during the observation period and abnormality by the preponderance of abnormal patterns. The presence and normality of several postural patterns were also scored. Normality was again defined by the preponderance of normal postural patterns during the observation period and abnormality by the preponderance of abnormal patterns.

The occurrence of all specific movement and postural patterns provided the basis for scoring the age adequacy of the concurrent motor repertoire (all movement and postural patterns besides fidgety movements) as age-adapted, reduced, or absent. The age adequacy of the concurrent motor repertoire was scored absent when fewer than five normal movement and postural patterns were observed, reduced when five or six observed movement and postural patterns were observed, and age-adapted when seven or more movement and postural patterns were observed.

The last item to be judged was the quality of the concurrent motor repertoire. The quality of the concurrent motor repertoire was considered normal if it was smooth, variable, fluent, and complex. Reduced complexity (monotony), jerkiness, and/or a cramped character were considered to be signs of abnormality and were scored separately. Differences in the degree of monotony, jerkiness, and cramped character were not scored.

**Functional assessment of the neurological and motor findings**

The diagnosis of CP was based on a recently proposed definition. Between 6 and 12 years of age a functional assessment was obtained in all children who had developed CP. They were scored and classified by a physiatrist according to the Gross Motor Function Classification System (GMFCS). The GMFCS provides a standardized method of classifying the gross motor function of children with CP. The GMFCS is based on a 5-level classification system: the higher the level, the more severe the CP. The distinction between the levels of motor function is based on functional limitations and the need for assistive technology, including mobility devices and wheeled mobility.

**Statistical analysis**

Statistical analysis was performed using the SPSS package for Windows (version 14.0). The \( \chi^2 \) test for trend was applied to evaluate the association between the GMFCS and the motor optimality score and its various components. Univariate analysis was performed to evaluate the association of several components of the motor optimality score with the degree of functional limitation in children with CP. Next, multiple logistic regression analysis was performed to evaluate the independent predictors of the degree of functional limitation in children with CP. Logistic regression analysis (whether univariate or multiple) was performed in two groups of children: those who did not need a wheelchair to mobilize (GMFCS levels I and II, high level of self-mobility) versus those who did need a wheelchair to mobilize (GMFCS levels III to V, low level of self-mobility). The predictive value of several components of the early motor repertoire for a low level of self-mobility was assessed by calculating sensitivity, specificity, positive predictive values (PPV), and negative predictive values (NPV), including 95% confidence intervals (CI).

**RESULTS**

Of the thirty-seven children who developed CP, nine developed spastic CP with unilateral involvement, whereas 28 showed bilateral involvement. Twelve children were in GMFCS level I, three children GMFCS level II, 10 children GMFCS level III, four children GMFCS level IV, and eight children GMFCS level V.

<table>
<thead>
<tr>
<th>Motor optimality score ≤9</th>
<th>Cramped movement character</th>
<th>Non-flat supine posture</th>
<th>Combined: cramped, non-flat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitivity (95% CI)</td>
<td>86 (72–100)</td>
<td>64 (44–84)</td>
<td>68 (49–87)</td>
</tr>
<tr>
<td>Specificity (95% CI)</td>
<td>47 (22–72)</td>
<td>80 (60–100)</td>
<td>73 (51–95)</td>
</tr>
<tr>
<td>Positive predictive value (95% CI)</td>
<td>70 (53–87)</td>
<td>82 (64–100)</td>
<td>79 (61–97)</td>
</tr>
<tr>
<td>Negative predictive value (95% CI)</td>
<td>70 (42–98)</td>
<td>60 (39–81)</td>
<td>61 (38–84)</td>
</tr>
</tbody>
</table>

GMFCS, Gross Motor Function Classification System; CI, confidence interval.
Relationship between motor repertoire and neurological findings

The higher the motor optimality score of the infants the better was the GMFCS level ($\chi^2$ test for trend = 4.9; $p=0.027$). The median motor optimality score was 9 (range 7–15) in the group with a low level of self-mobility (GMFCS levels III–V) and 12 (range 9–22) in the group with a high level of self-mobility (GMFCS levels I and II). The optimal cut-off point of the motor optimality score for distinguishing between these two groups, determined by the receiver operating characteristics curve, was 9. Using this cut-off point, the PPV for limited self-mobility was 70% (95% CI 53–87) and the NPV was 70% (95% CI 42–98; Table IIa).

The associations between each of the components of the motor optimality score and the neurological findings at school age were further analysed to identify which of these components differentiated between children in a lower versus a higher GMFCS level.

Thirty-three infants (89%) showed an absence of fidgety movements at the age of 11 to 17 weeks post-term; one infant (3%) had abnormal fidgety movements, and three infants (8%) had normal fidgety movements. The infants with normal fidgety movements were in GMFCS level I ($n=2$) or II ($n=1$) at school age; the one infant with abnormal fidgety movements was in GMFCS level III. No association existed between the quality of fidgety movements in infants and GMFCS levels at school age.

Analysis of the age adequacy of the motor repertoire showed an association between age adequacy and GMFCS levels at school age (Fig. 1a). The concurrent motor repertoire was age-adequate in only two children (5%). Infants in whom the age-adequate repertoire had been absent were more often in a higher GMFCS level at school age than those with normal or reduced age adequacy ($\chi^2$ test for trend = 5.3; $p=0.021$). Univariate analysis by logistic regression (high vs low level of self-mobility) revealed a likelihood ratio (LR) of 10.5 (95% CI 1.1–102; $p=0.043$).

The analysis of the presence and normality of movement patterns showed that no association existed between

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**Figure 1**: Association between several aspects of the early motor repertoire at the age of 11 to 17 weeks post-term and Gross Motor Function Classification System (GMFCS) level at school age. Each dot represents an individual child. These associations were significant: (a) the age adequacy of the motor repertoire ($\chi^2$ test for trend = 5.3; $p=0.021$); (b) the quality of the kicking pattern (quadratic model, $\chi^2$ test for trend = 6.2; $p=0.012$); (c) the presence or absence of a flat posture ($\chi^2$ test for trend = 6.1; $p=0.017$); and (d) the presence or absence of a cramped movement character ($\chi^2$ test for trend = 8.0; $p=0.005$).
the number of normal and abnormal movement patterns in infants and the GMFCS level at school age. More detailed analysis of particular movement patterns revealed that monotonous, repetitive kicking was common in our study group. The quality of the kicking pattern showed a trend towards being more often observed in children in higher GMFCS levels, but this association was not significant with any GMFCS levels separately. The raw data revealed that abnormal kicking was frequently observed in GMFCS levels II to IV, but less frequently in GMFCS levels I and V (Fig 1b). We therefore applied a quadratic transformation. For that purpose, we substituted the number −2 for GMFCS level I, −1 for GMFCS level II, 0 for GMFCS level III, 1 for GMFCS level IV, and 2 for GMFCS level V. Next, we squared these numbers and analysed the relationship between the result and the quality of the kicking pattern with the \( \chi^2 \) test for trend. It showed a significant relationship (\( \chi^2 \) test for trend = 6.2; \( p=0.012 \)).

No difference was observed between the number of normal and abnormal postural patterns in relation to GMFCS level. However, more detailed analysis of the postural patterns showed that a predominantly flat supine posture differentiated between infants classified in lower and in higher GMFCS levels at school age (\( \chi^2 \) for trend = 6.1; \( p=0.013 \); Fig. 1c). A predominantly flat posture was scored when the infant, lying supine, had all four limbs mainly lying on the surface, antigravity movements and flexion in hips and knees were rare, and arms and legs hardly came above the level of the trunk. A normal, predominantly non-flat supine posture was scored when the infant had antigravity movements, with arms or legs moving above the level of the trunk, and flexion in hips and knees was frequently observed. Infants with a predominantly flat posture more often had a higher level of self-mobility than those without a predominantly flat posture (LR 5.9; 95% CI 1.4–25.2; \( p=0.017 \)), with PPV of 79% (95% CI 61–97) and NPV of 61% (95% CI 38–84; Table IIa).

At 11 to 17 weeks post-term, none of the infants had normal-quality concurrent motor repertoire. The abnormal quality noted in all infants was monotony, 17 were also jerky and 17 were also cramped. Six infants showed cramped synchronized movements. Jerkiness of the concurrent motor repertoire did not differentiate between children classified in lower and higher GMFCS levels. A cramped character of the concurrent motor repertoire, however, was associated with a higher GMFCS level (\( \chi^2 \) test for trend = 8.0; \( p=0.005 \); Fig. 1d). Fourteen infants with a cramped movement character were in GMFCS level III or more (LR 7.0; 95% CI 1.5–32.5; \( p=0.013 \)), with PPV of 82% (95% CI 64–100) and NPV of 60% (95% CI 39–81; Table IIa).

**Prognostic value of combining several qualitative characteristics of motor repertoire for level of self-mobility in CP**

At 11 to 17 weeks post-term, five aspects of the motor repertoire had a particularly high prognostic value for the degree of functional limitations in infants with CP. These were the motor optimality score, the age adequacy of the concurrent motor repertoire, the quality of the kicking pattern, the presence of a flat posture, and the presence of a cramped movement character. The different qualitative aspects of the motor repertoire were likely to be interdependent. Therefore, we performed a multiple logistic regression analysis to investigate which aspects contributed independently to the degree of functional limitations in infants with CP. When entering these aspects as predictors in a multiple logistic regression model we found that the presence of a non-flat posture (LR 15.1; 95% CI 1.9–119; \( p=0.010 \)) and a cramped movement repertoire (LR 18.2; 95% CI 2.1–155; \( p=0.008 \)) remained in the model as predictors of more severe functional limitations. The presence of an abnormal kicking pattern showed a trend towards more severe functional limitations (LR 7.0; 95% CI 1.0–51; \( p=0.056 \)).

Combining these aspects further differentiated between the degrees of functional limitation in infants with CP (Fig. 2). Infants with a non-flat posture combined with a cramped movement character more often had a low level of self-mobility at school age, with PPV of 100% (95% CI 82% (95% CI 64–100) and NPV of 60% (95% CI 39–81; Table IIa).

[Figure 2: Association between the combination of the presence or absence of a flat posture and the presence or absence of a cramped movement character at the age of 11 to 17 weeks post-term and Gross Motor Function Classification System (GMFCS) level at school age. Each dot represents an individual child. These associations were significant (likelihood ratio 10.4; 95% confidence interval 2.2–49; \( p=0.003 \)).]
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**Table III: Sensitivity, specificity, positive predictive value, and negative predictive value of the combination of a non-cramped movement character, and flat supine posture, for a high level of self-mobility (GMFCS levels I, II) at school age**

<table>
<thead>
<tr>
<th></th>
<th>Sensitivity (95% CI)</th>
<th>Specificity (95% CI)</th>
<th>Positive predictive value (95% CI)</th>
<th>Negative predictive value (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Combined:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>non-cramped, flat</td>
<td>53 (28–78)</td>
<td>91 (79–100)</td>
<td>80 (55–100)</td>
<td>74 (57–91)</td>
</tr>
</tbody>
</table>

GMFCS, Gross Motor Function Classification System; CI, confidence interval.

90–100) and NPV of 54% (95% CI 36–72; Table IIa). In contrast, infants with a flat posture combined with a non-cramped movement character more often had a high level of self-mobility, with PPV of 80% (95% CI 55–100) and NPV of 74% (95% CI 57–91; Table IIb).

**Relationship between clinical data at birth and neurological findings at school age**

The associations between the clinical data and the neurological findings at 6 to 12 years of age are shown in Table I. Hardly any difference in clinical data existed between children with a lower GMFCS level and those with a higher GMFCS level. Only the presence of an intraventricular haemorrhage and periventricular leukomalacia differed between the groups.

In order to investigate which aspects contributed independently to the development of more severe functional limitations, again a multiple logistic regression analysis was performed, now also including clinical data. Possible predictors were the presence and grading of intraventricular haemorrhages, the presence of cystic periventricular leukomalacia, the quality of the kicking pattern, the presence of a non-flat posture, and the presence of a cramped movement character. Only the presence of an intraventricular haemorrhage grade 3 or 4 (associated with a lower GMFCS level, LR 0.32; 95% CI 0.12–0.84, \( p = 0.020 \)), the presence of a non-flat posture (LR 9.7; 95% CI 1.18–80, \( p = 0.034 \)), and the presence of a cramped movement character (LR 19.7; 95% CI 1.7–225, \( p = 0.016 \)) remained in the model. When the various aspects of the motor repertoire (presence of cramped character and non-flat posture) were combined as a single measure, LR for a low level of self-mobility was 13.2 (95% CI 2.2–79, \( p = 0.005 \)).

**DISCUSSION**

The present study demonstrates that in children with CP the motor repertoire between the age of 11 and 17 weeks post-term is associated with the level of self-mobility at school age. A lower motor optimality score that is representative of the early motor repertoire is indicative of a lower level of self-mobility. Previous studies have already shown that the absence of fidgety movements is predictive of the development of CP, but this feature cannot predict the degree of later functional limitations. To the best of our knowledge, this is the first report on the predictive value of the qualitative and quantitative aspects of the motor repertoire at the age of the fidgety movements, condensed into the motor optimality score, for the level of self-mobility in children with CP.

Several components of the motor optimality score were associated with functional limitations at 6 to 12 years of age. First, the quality of the concurrent motor repertoire, if scored as cramped at 11 to 17 weeks post-term, was associated with more severe functional limitations than a non-cramped motor repertoire. Previously, the predominant presence of cramped synchronized movements (an abnormal type of general movement) during the preterm to early post-term period was also found to be predictive of the development and severity of CP. The earlier the onset of these cramped synchronized movements, the more severe was the CP. In the present study only six infants had cramped synchronized movements at 11 to 17 weeks of age. An association was now also found with the cramped (and non-synchronized) character of the concurrent motor repertoire and the degree of functional limitation in children with CP. Apparently, a cramped character of the concurrent motor repertoire in combination with the absence of fidgety movements has some predictive value for children developing CP. This association is not seen in infants with normal or abnormal fidgety movements who do not develop CP.

Second, the age adequacy of the motor repertoire scored as absent at 11 to 17 weeks post-term was associated with more severe functional limitations than reduced or normal age adequacy. This finding underscores the importance of the presence and normality of movement and postural patterns as predictors of the level of self-mobility in children with CP. Of all the observed movement and postural patterns, only a monotonous kicking pattern at 11 to 17 weeks post-term was associated with more severe functional limitations at school age, whereas a predominantly flat supine posture was associated with less severe functional limitations.

Third, a flat posture was associated with less severe functional limitations in children with CP, especially in the case of a non-cramped movement character. In general, a flat posture can be considered as an abnormal sign. It seems that, in children without fidgety movements at risk for developing CP, a flat posture is a favourable sign for later.
functional limitations. Previously, Touwen and Hadders-Algra stated that shoulder retraction and hyperextension of neck and trunk in the first months of life (mimicking a flat posture) were not predictive of later neurological impairment.27 We now add that a predominantly flat posture accompanied by a non-cramped movement character is an independent predictor of less severe functional limitations in infants with CP.

The spontaneous kicking pattern in young infants has also been investigated previously,23-26 but these studies only reported on the differences between low-risk and high-risk infants. They showed no difference when looking at either the quantity of the kicking patterns or the presence of a monotonous and repetitive kicking pattern at the age of 6 and 12 weeks post-term between low-risk and neurologically impaired infants.23-25 However, at 3 to 5 months post-term, abnormal kicking patterns were more often observed in neurologically impaired infants.28,26 The findings of the present study indicated that in the group of children who developed CP, the persistence of monotonous and repetitive kicking at the age of 11 to 17 weeks post-term was associated with more severe functional limitations. The persistence of a monotonous, repetitive kicking pattern could be because of delayed maturation in those infants, or it could be the result of more severe neurological impairment at this particular age. Our study also showed that the absence of a kicking pattern combined with a cramped movement character was associated with more severe functional limitations in children with CP. This is probably caused by the inability of cramped infants to make kicking movements because their movements are too cramped.

Previous studies showed that infants with higher-grade intracranial haemorrhage or periventricular leukomalacia are prone to develop adverse neurological outcome.2 In the present study, children with higher-grade leukomalacia were mostly represented in the group with higher GMFCS levels whereas children with higher-grade haemorrhages were represented more in the group with lower GMFCS levels. We cannot fully explain these findings: they might be due to selection. Unilateral grade 3 and 4 haemorrhages result more often in unilateral spastic CP in comparison with grade 2 and 3 periventricular leukomalacia.2 Unilateral CP is, in general, associated with a higher level of self-mobility than bilateral spastic CP. However, these findings might also be just by chance, as the numbers of children in both categories of ultrasound abnormalities are very small.

There are some limitations to our study. One was the distribution of the children with CP over the different GMFCS levels. First, this was because we included only those infants born before 34 weeks’ gestational age. Therefore, the distribution of our study group may not be representative of the general CP population.27-29 Second, the consequence of combining two different follow-up groups, a follow-up programme from a neonatal intensive care unit (Groningen) and a rehabilitation follow-up programme (Pisa), in which possibly more infants with severe functional limitations were included, could have caused bias. It should further be noted that the confidence intervals around LRs, sensitivity, specificity, PPV, and NPV are very wide, because of the relatively small sample size. Estimates for the individual child may be imprecise. Although it is very tempting, one should also keep in mind that 11 to 17 weeks post-term age is very early to predict and talk to parents about severity of CP at the age of 6 years and older. When talking to the individual family, one should realise that variation in development is very wide. It, therefore, seems prudent to counsel parents thoughtfully and observe children carefully without labelling them too soon.

CONCLUSION

Our study demonstrates that the motor repertoire of infants at the age of 11 to 17 weeks post-term is, to a considerable extent, associated with the level of self-mobility in children with CP. Most predictive for the development of CP with a low level of self-mobility was a non-flat posture combined with the presence of a cramped movement character, with PPV 100% (95% CI 90–100) and NPV 54% (95% CI 36–72). Most predictive for the development of CP with a high level of self-mobility was a flat posture combined with a non-cramped movement character, with PPV 80% (95% CI 55–100) and NPV 74% (95% CI 57–91).

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