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The Structured Observation of Motor Performance in Infants can detect cerebral palsy early in neonatal intensive care recipients

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ABSTRACT

Background: The detection of motor problems in infancy requires a detailed assessment method that measures both the infants' level of motor development and movement quality.
Aims: To evaluate the ability of the Structured Observation of Motor Performance in Infants (SOMP-I) to detect cerebral palsy (CP) in neonatal intensive care recipients.
Study design: Prospective cohort study analyzed retrospectively.
Subjects: 212 (girls: 96) neonatal intensive care recipients (mean gestational age 34 weeks, range: 23–43). Twenty infants were diagnosed with CP.
Outcome measures: The infants were assessed using SOMP-I at 2, 4, 6 and 10 months' corrected age. Accuracy measures were calculated for level of motor development, quality of motor performance and a combination of the two to detect CP at single and repeated assessments.
Results: At 2 months, 17 of 20 infants with CP were detected, giving a sensitivity of 85% (95% CI 62–97%) and a specificity of 48% (95% CI 40–55%), while the negative likelihood ratio was 0.3 (95% CI 0.1–0.9) and the positive likelihood ratio was 1.6 (95% CI 1.3–2.0). At 6 months all infants with CP were detected using SOMP-I, and all infants had repeatedly been assessed outside the cut-offs. Specificity was generally lower for all assessment ages, however, for repeated assessments sensitivity reached 90% (95% CI 68–99%) and specificity 85% (95% CI 79–90%).
Conclusions: SOMP-I is sensitive for detecting CP early, but using the chosen cut-off can lead to false positives for CP. Assessing level and quality in combination and at repeated assessments improved predictive ability.

1. Introduction

Although not entirely conclusive, increasing evidence points to the importance of intensive, goal-oriented and task specific training in infants with cerebral palsy (CP) [1–5]. This training should start during the first months of life when the brain is most plastic [1–9]. It is recommended that the diagnosis of CP should be made at 3–4 years of age [10], however, the definite type can be difficult to discern at this age and milder forms of CP may be missed before the age of 5 [6,11]. This being said, it is important to recognize that the motor anomalies associated with CP are present far earlier [6,7,9], and detection of these infants as soon as possible is crucial to initiate timely intervention [3,5,6].

Several methods are available to assess motor development in infancy [12,13], and quality of movement appears to discriminate better than level of development described as milestone attainment during the first months of life [4,6,10,11]. Many of the existing methods assess either level or quality, or cover an age range that is too narrow to enable repeated assessments throughout the first year of life [12,13]. In addition, quality is not consistently defined. In some methods, quality is intertwined with the level and separate scoring is not possible. In others, it is based on the clinicians' experience and requires an overall subjective measure once the infant has been assessed [14,15] or focuses only on the assessment of the quality of movements [16]. Furthermore, the methods have different purposes ranging from detecting gross motor delay to detecting CP [12,13]. Some have suggested that an optimal method should assess early motor performance according to both level, i.e. progress of motor abilities, and quality, i.e. how movements are performed, to improve the chances of early detection [12,17]. The method should also offer the possibility of repeated

Abbreviations: CP, Cerebral palsy; CPAP, Continuous positive airway pressure; GA, Gestational age; GM, General movements; GMFCS, Gross Motor Function Classification System; NICU, Neonatal intensive care unit; SOMP-I, Structured Observation of Motor Performance in Infants; TIMP, Test of Infant Motor Performance

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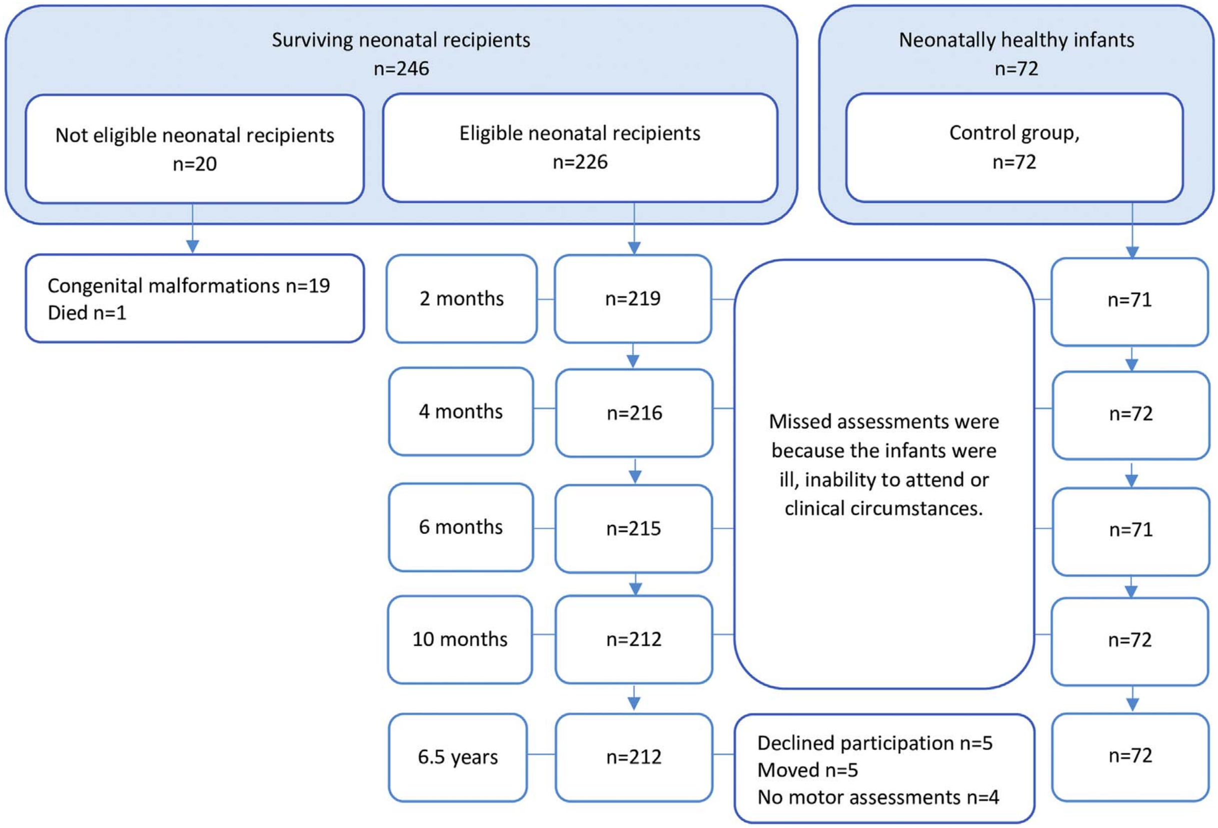

Fig. 1. Flow-chart of recruitment and follow-up assessments.

assessments in infancy to increase predictive ability [13,18,19].

The Structured Observation of Motor Performance in Infants (SOMP-I) is a method that meets these criteria [20,21]. SOMP-I was not developed as a diagnostic method, but rather as a means of detecting a broad range of motor problems that need intervention regardless of etiology [20,22]. However, the method must be able to detect major motor problems such as CP in order to be clinically relevant.

The aim of this study was to evaluate the ability of SOMP-I to detect CP in infants that had received neonatal intensive care, as well as investigate if repeated assessments improved the method's predictive ability.

2. Method

2.1. Participants and procedure

All surviving infants (n = 246) who were treated in the neonatal intensive care unit at Uppsala University Children's Hospital between 1986 and 1989 were enrolled in a longitudinal follow-up study (Fig. 1) [20]. Twenty infants were excluded from this longitudinal study due to congenital malformations (n = 19) or mortality during the first year of life (n = 1), leaving a cohort of 226 infants for follow-up [20]. In addition, 72 neonatally healthy infants were included in the study as a control group, matched to the very preterm infants according to sex, date of birth and birth order (first born/later born) [23]. During the data collection, Uppsala county had 280,000 inhabitants living in either urban Uppsala or its surrounding rural areas. The population was slightly younger and had a slightly higher educational level than the general Swedish population.

The inclusion criteria for neonatal intensive care were: 1) ventilator treatment; 2) treatment with continuous positive airway pressure (CPAP); 3) perinatal asphyxia with an Apgar score ≤ 4 at 5 min; 4) neonatal convulsions treated with continuous intravenous anticonvulsive drugs; 5) need for total parenteral nutrition in the neonatal period; or 6) infants born at a gestational age (GA) of less than 32 completed weeks irrespective of any of the other criteria [24]. Criteria 1–5 were independent of the infant's gestational age at birth. None of the infants received antenatal steroids or surfactant, as these treatments were not in use at the time. Neonatal brain ultrasound examinations were performed when clinically indicated.

The neonatal intensive care recipients were divided into three groups: very preterm infants born at GA 23–31 weeks (n = 68); moderately preterm infants born at GA 32–36 weeks (n = 81); and term infants born at GA ≥ 37 weeks (n = 77) [20,24]. Age was corrected for prematurity for all infants born at GA < 37 weeks. The neonatal characteristics of the participants are given in Table 1.

All infants were assessed using SOMP-I as part of the neonatal follow-up at 2, 4, 6 and 10 months' corrected age (± 1 week) [20]. A

Table 1
Neonatal characteristics.

	n	Sex	Gestational age in weeks		Weight in grams	
		F:M	Mean	Min–max	Mean	Min–max
All NICU patients	226	96:130	34	23–43	2520	639–5210
NICU patients according to gestational age						
Very preterm	68	29:39	29	23–31	1276	639–2278
Moderately preterm	81	30:51	34	32–36	2401	1310–3520
Term born	77	37:40	40	37–43	3727	2065–5210
NICU patients with and without CP						
Without CP	206	87:119	35	23–43	2565	639–5210
With CP	20	9:11	33	27–41	2057	903–3787
Control group	72	30:42	40	37–42	3557	2890–4580

NICU, neonatal intensive care unit; F:M, females:males.