



# The relationship between motor abilities and early social development in a preschool cohort of children with cerebral palsy

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## ABSTRACT

**Aim:** To investigate the relationship between motor ability and early social development in a cohort of preschool children with cerebral palsy (CP).

**Design:** Population-based cohort study.

**Methods:** Participants were 122 children with CP assessed at 18, 24 and 30 months, corrected age (ca). Motor ability was measured by the Gross Motor Function Classification System (GMFCS) with classification assigned by physiotherapists. The sample was representative of a population-based cohort (I = 48, 38.4%, II = 19, 15.2%, III = 17, 13.6%, IV = 22, 17.6% and V = 19, 15.2%). Social development was measured by the Paediatric Evaluation of Disability Inventory (PEDI) and included capabilities in social interaction, social communication, interactive play and household/community tasks.

**Results:** Cross-sectional analyses indicated a significant relationship between motor ability and social development at 18 months,  $F(4, 56) = 11.44, p < .0001, \eta^2 = .45$ , at 24 months,  $F(4, 79) = 15.66, p < .0001, \eta^2 = .44$  and at 30 months,  $F(4, 76) = 16.06, p < .0001, \eta^2 = .49$ . A longitudinal analysis with a subset of children ( $N = 24$ ) indicated a significant interaction between age at assessment and GMFCS,  $F(2, 21) = 7.02, p = .005, \eta^2 = .40$ . Comparison with community norms indicated that at 18 months corrected age, 44.3% of the cohort was greater than two standard deviations below the mean ( $>2SD$ ) for social development and a further 27.9% of the cohort was greater than one standard deviation below the mean ( $>1SD$ ).

**Interpretation:** There is a relationship between motor ability and social development in preschool children with CP. Children with CP may require support for social development in addition to physical interventions, from as early as 18 months.

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## 1. Introduction

Cerebral palsy (CP) is the most common physical disability in childhood (Rosenbaum, 2003) with a total of 2.0–2.5 of every 1000 live born children being diagnosed with CP (Societies, 1995). CP is a clinical descriptive term that refers to a group of disorders of motor development that result from non-progressive disturbances to the developing brain (foetal or infant) (Rosenbaum, 2003). There is also an increased risk of other problems such as intellectual impairment, perceptual impairments and epilepsy as well as secondary musculoskeletal problems and activity limitations (Rosenbaum, 2003).

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The current literature on CP still emphasises the motor impairment (Enkelaar, Ketelaar, & Gorter, 2008), however, recent research has begun to investigate functioning in other areas including social capabilities and social participation (Liptak & Accardo, 2004). It is known that school children with CP are at risk for poorer social outcomes, including decreased social functional capability, smaller friendship networks, poorer quality friendships and reduced social participation (Cunningham, 2009; Forsyth, Alvanides, Woolley, & Lowe, 2007; Law et al., 2006; Morris, Kurinczuk, Fitzpatrick, & Rosenbaum, 2006; Nadeau & Tessier, 2006; Ostensjo, 2003; Voorman, Dallmeijer, Eck, Schuengel, & Becher, 2010). Nadeau and Tessier, 2006 found that females with CP were particularly at risk. They found that girls with CP ( $N = 60$ ; aged 9–12; GMFCS level I only) in mainstream school had fewer reciprocated friendships, exhibited fewer sociable/leadership behaviours and were more isolated and victimised than their peers. Further, Voorman et al. (2010) demonstrated that social functioning limitations extend into adolescence in a longitudinal study of 110 adolescents with CP (mean age = 11 years 3 months; SD 1 years 8 months) in which 45% of participants were found to have restrictions in social functioning as measured by the Vinelands Adaptive Behavior Scales.

The factors underlying social success at school appear to be different for children with CP than for typically developing children (Cunningham, 2009; Thomas, Warschausky, Golin, & Meiners, 2008). In typically developing children, parenting style and direct parent methods such as parental supervision of peer interactions are predictors of social success. In contrast, the same direct parent methods did not predict social network size or friendship quality in schoolchildren with CP (aged 5–12) across different levels of motor functioning as measured by GMFCS (Thomas et al., 2008). Neither did parenting style predict social network size, quality of friendships and social adjustment in children with CP aged between 6 and 12 years ( $M = 8.85$ ,  $SD = 1.75$ ) (Cunningham, 2009). Notably, in children with CP, but not in typically developing children, social network size, quality of friendships and social adjustment were predicted by scores on a vocabulary subset of the Wechsler Intelligence Scale for Children (WISC-III) (Cunningham, 2009). This suggests that the social challenges confronting children with CP in a school setting may be related to associated intellectual impairments.

Ostensjo (2003) conducted a cross-sectional study in Norway with a cohort of 95 children with CP with a mean age of 58 months ( $SD = 18$  months, range 25–87 months) and found that GMFCS level significantly predicted functional capabilities, including social capabilities, as measured by the Paediatric Evaluation of Disability Inventory (PEDI). This suggests that motor ability and social functional capabilities are related in this cohort. It is important to extend this research to investigate the social capabilities of younger preschool children with CP. To our knowledge this has not yet been done, although Enkelaar et al. (2008) has demonstrated a relationship between motor ability and mental ability as measured by the Bayley II in 78 toddlers with CP (mean age 2 years 7 months  $SD = 1$  month). Researching the social capabilities of a preschool aged cohort of children with CP would allow further understanding of how children with CP develop socially before peer interactions in a school context become paramount and at a time when early intervention to prepare for school is possible.

### 1.1. Objectives of the current study

The aim of the current study was to examine the relationship between social functional capability as measured by the PEDI and motor ability classified by GMFCS in a cohort of children diagnosed with CP and aged from 18 to 30 months corrected age.

## 2. Methods

### 2.1. Design

This study involved analysing data collected during a large project, the CP Child Study of Motor and Brain Development (CP Child Study; NHMRC 368400). The CP Child Study is a longitudinal prospective, population-based cohort study with the aim of relating early motor development to the nature, extent and presumed timing of the brain lesion. In the CP Child Study participants are assessed at 6 monthly intervals commencing at 18 months corrected age, continuing until 3 years of age and then on their 4th and 5th birthdays. Early data from the 18 to 30 months corrected age assessments only were analysed in this paper. Assessments were not available at every time point for each child because the age at referral varied.

### 2.2. Participants

A total of 122 children participated in this study. The CP Child Project involves the recruitment of children with CP across the states of Victoria and Queensland in Australia born after the 1st of January 2004 and before the 31st of December 2008. Children with suspected or confirmed CP were referred to the study by their consultant paediatrician, child neurologist, rehabilitation specialist or allied health therapist. In addition, families self-referred following a mail-out to community cerebral palsy organisations. Diagnosis was confirmed by a neurologist, rehabilitation physician or paediatrician and a physiotherapist. As in previous studies, children diagnosed with a progressive or neurodegenerative lesion were excluded from the study (Konman, Paterson Smith, & Shilt, 2004). The assessments completed at 18, 24 and 30 months corrected age only were analysed for this paper. Participants had varying levels of motor functional ability reflected in GMFCS classification at most recent assessment (I = 47, 38.4%, II = 18, 14.8%, III = 16, 13.1%, IV = 22, 18.0% and V = 19, 15.6%) demonstrating a representative sample of a population-based cohort (Howard et al., 2005). Participant characteristics are presented in Table 1.

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