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Does early communication mediate the relationship between motor ability and social function in children with cerebral palsy?



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ABSTRACT

Background: Children diagnosed with neurodevelopmental conditions such as cerebral palsy (CP) are at risk of experiencing restrictions in social activities negatively impacting their subsequent social functioning. Research has identified motor and communication ability as being unique determinants of social function capabilities in children with CP, to date, no research has investigated whether communication is a mediator of the relationship between motor ability and social functioning.

Aims: To investigate whether early communication ability at 24 months corrected age (ca.) mediates the relationship between early motor ability at 24 months ca. and later social development at 60 months ca. in a cohort of children diagnosed with cerebral palsy (CP).

Method: A cohort of 71 children (43 male) diagnosed with CP (GMFCS I = 24, 33.8%, II = 9, 12.7%, III = 12, 16.9%, IV = 10, 14.1%, V = 16, 22.5%) were assessed at 24 and 60 months ca. Assessments included the Gross Motor Function Measure (GMFM), the Communication and Symbolic Behaviour Scales-Developmental Profile (CSBS-DP) Infant-Toddler Checklist and the Paediatric Evaluation of Disability Inventory (PEDI). A mediation model was examined using bootstrapping.

Results: Early communication skills mediated the relationship between early motor abilities and later social functioning, $b = 0.24$ (95% CI = 0.08–0.43) and the mediation model was significant, $F(2, 68) = 32.77$, $p < 0.001$, $R^2 = 0.49$.

Conclusions and implication: Early communication ability partially mediates the relationship between early motor ability and later social function in children with CP. This demonstrates the important role of early communication in ongoing social development. Early identification of communication delay and enriched language exposure is crucial in this population.

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Abbreviations: CP, cerebral palsy.

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What this paper adds?

Early communication ability partially mediates the relationship between early motor ability and later social functioning in children with CP. In particular, early speech and expressive language is a partial mediator of the relationship between early motor ability and later social functioning. This demonstrates the key role that speech and expressive language plays in early social development. Early identification and intervention for speech and language delays are crucial in the CP population.

1. Introduction

Cerebral palsy (CP) is a neurodevelopmental condition involving disorders of the development of movement and posture (Rosenbaum, 2003). It is the most common cause of physical disability in childhood with a prevalence of approximately 2 per 1000 live births (ACPR Group, 2009). In addition to motor disorders, disturbances of sensation, cognition, communication, perception, and behaviour, as well as secondary musculoskeletal problems and epilepsy often accompany CP (Bax et al., 2005; Rosenbaum, 2003).

Children diagnosed with CP are at risk of experiencing restrictions in social activities and participation as well as difficulties with social development when compared to typically developing peers (Cunningham, Warschawsky, & Thomas, 2009; Voorman, Dallmeijer, Van Eck, Schuengel, & Becher, 2010). Seven in 10 preschool children with CP show significant delay in social milestones relative to community norms (Whittingham, Fahey, Rawicki, & Boyd, 2010) and this is predicted by motor abilities (Whittingham et al., 2010). Although the relationship between motor ability and social functioning has been demonstrated, the factors mediating this relationship have yet to be explored.

Social functioning is a global construct that encompasses social cognition, including perceiving and interpreting the intentions and behaviours of others, and social skills, the cognitive, and verbal and nonverbal behaviours necessary to engage in positive interpersonal interactions (Adolphs, 2009; Voorman et al., 2010). Deficits in social functioning can increase the risk of a variety of negative social outcomes including behavioural problems, peer rejection and neglect (Badenes, Clemente Estevan, & García Bacete, 2000), social withdrawal (Rubin, Coplan, & Bowker, 2009), academic failure and school withdrawal (Malik & Furman, 1993) and adult adjustment problems (Englund, Kuo, Puig, & Collins, 2011).

The motor impairments of CP can impact on the controlled, coordinated and rapid movements that are required for speech and nonverbal communication, limiting communication opportunities (Pennington, 2012). Regular communication, including communication about intentions, mental states and emotions, is necessary for the development of social cognition (Dunn, Brown, Slomkowski, Tesla, & Youngblade, 1991). A prior study focused on children who are deaf with normal intelligence who grew up in hearing families demonstrated that the absence of early rich communication can impact on social development including delayed understanding of mental states, perspectives, and emotions (Garfield, Peterson, & Perry, 2001). Despite a productive area of research identifying that motor abilities and communication predict social function capabilities in children with CP (Voorman et al., 2010; Whittingham et al., 2010), to date, no research has investigated the mechanism of this effect. In particular, whether the link between motor ability and social functioning is mediated by communication. This is necessary to inform early intervention for social functioning.

The primary aim of this study was to explore the underlying mechanisms that mediate the relationship between motor ability and social functioning capabilities in children diagnosed with CP. It was hypothesised that the relationship between early motor ability at 24 months and later social function capabilities at 60 months would be mediated by communication ability at 24 months.

2. Method

2.1. Participants

A total of 71 children (male = 43 [60.6%] female = 28 [39.4%]) diagnosed with CP participated in this study out of a current total of 295 children within the broader CP Child Study (Boyd et al., 2013). Children living in Victoria and Queensland who were born after the 1st of January 2004 and before the 31st of December 2009 with suspected or confirmed CP were referred to the CP Child Study by their health professional ($n = 65$) or families self-referred in response to mail-outs to community CP organisations ($n = 6$). The diagnosis of CP was confirmed upon entry to the study by a neurologist, paediatrician or rehabilitation specialist. All children diagnosed with CP were eligible to participate in the CP Child Study and children diagnosed with a progressive or neurodegenerative lesion were excluded. Participants in this project had varying levels of motor functional ability identified in their Gross Motor Function Classification System (GMFCS) classification at their 24 months ca. assessment (I = 24, 33.8%, II = 9, 12.7%, III = 12, 16.9%, IV = 10, 14.1%, V = 16, 22.5%) which is a similar distribution to the Australian population of children with CP (ACPR Group, 2009).

2.2. Design and procedure

This study analysed a subset of longitudinal data collected for a larger prospective, population-based cohort study of Australian children diagnosed with cerebral palsy; the Cerebral Palsy Child Study of Motor and Brain Development (CP Child Study; NHMRC 368400) (Boyd et al., 2013). Eligible children were entered into the CP Child Study from the age of 18 month

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