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# Reprint of “Co-occurring motor, language and emotional–behavioral problems in children 3–6 years of age”<sup>☆</sup>

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### ABSTRACT

**Purpose:** Developmental Coordination Disorder (DCD) has been shown to co-occur with behavioral and language problems in school-aged children, but little is known as to when these problems begin to emerge, or if they are inherent in children with DCD. The purpose of this study was to determine if deficits in language and emotional–behavioral problems are apparent in preschool-aged children with movement difficulties.

**Method:** Two hundred and fourteen children (mean age 4 years 11 months, *SD* 9.8 months, 103 male) performed the Movement Assessment Battery for Children 2nd Edition (MABC-2). Children falling at or below the 16th percentile were classified as being at risk for movement difficulties (MD risk). Auditory comprehension and expressive communication were examined using the Preschool Language Scales 4th Edition (PLS-4). Parent-reported emotional and behavioral problems were assessed using the Child Behavior Checklist (CBCL).

**Results:** Preschool children with diminished motor coordination ( $n = 37$ ) were found to have lower language scores, higher

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externalizing behaviors in the form of increased aggression, as well as increased withdrawn and other behavior symptoms compared with their typically developing peers.

*Conclusions:* Motor coordination, language and emotional–behavioral difficulties tend to co-occur in young children aged 3–6 years. These results highlight the need for early intervention.

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## 1. Introduction

Developmental Coordination Disorder (DCD) is a neuro-developmental disorder characterized by diminished fine and/or gross motor coordination that affects approximately 5–6% of children (*American Psychiatric Association, 2013*). In addition to difficulties with motor skills, many of these children display other developmental and behavioral difficulties. Notably, DCD has been shown to co-occur with language difficulties (i.e. reading disability, specific language impairment) and emotional/behavioral problems, such as ADHD (*Cairney, Veldhuizen, & Szatmari, 2010; Dewey & Wilson, 2001; Flapper & Schoemaker, 2013; Zwicker, Harris, & Klassen, 2012*). Most research on concurrent disorders in DCD has involved school age children, mainly because DCD is not typically diagnosed until middle childhood (*Barnhart, Davenport, Epps, & Nordquist, 2003*).

*Schoemaker and Kalverboer (1994)* were among the first to examine the relationship between movement problems and social and affective problems in young children (aged 6–7 years). They found that children who had motor coordination difficulties were more anxious than their typically developing peers. Since then, several studies have found similar associations between motor ability and internalizing behaviors (*Green, Baird, & Sugden, 2006; Tseng, Howe, Chuang, & Hsieh, 2007*) only one of which focused solely on children of kindergarten age (*Piek, Bradbury, Elsley, & Tate, 2008*). Longitudinal research has implicated variable early motor development (from 4 months to 4 years) to be predictive of higher anxious/depressive symptomatology at age 6–12 and that childhood motor skills may be a risk factor for adolescent anxiety levels (*Piek, Barrett, Smith, Rigoli, & Gasson, 2010; Sigurdsson, Van Os, & Fombonne, 2002*).

In addition to internalizing disorders, such as depression and anxiety, motor coordination has also been linked to externalizing behaviors. Co-occurrence rates with DCD and attention deficit/hyperactivity disorder (ADHD) have been found to be as high as 50% (*Kadesjo & Gillberg, 1999; Pitcher, Piek, & Hay, 2003*); however, these co-morbidities are typically studied in children who are already in mid- to late childhood. Only a couple of studies have examined the relationship between motor competence and externalizing behaviors in children under 6 years old. Better motor performance in 5–6-year-old children has been shown to relate to lower externalizing behaviors (*Livesey, Keen, Rouse, & White, 2006*), and increased aggression has been observed in preschool children with DCD during free-play (*Kennedy-Behr, Rodger, & Mickan, 2013*). In contrast, one study on children with DCD aged 6–10 reported lower levels of aggression (*Chen, Tseng, Hu, & Cermak, 2009*) and therefore this relationship needs further examination.

Language difficulties have also been reported to co-occur with motor difficulties. *Flapper and Schoemaker (2013)* found the prevalence of DCD in 5–8 year old children with specific language impairment was approximately 33%, significantly above the population prevalence of DCD. Early language delay, in toddlers and preschoolers, has also been reported to relate to later motor impairment in kindergarten and school-age children, respectively (*Gaines & Missiuna, 2007; Webster, Majnemer, Platt, & Shevell, 2005*). Language concerns in the DCD population are particularly important because some children with language impairments tend to struggle with social skills and may be at increased risk of developing behavioral and social problems (*Horowitz, Jansson, Ljungberg, & Hedenbro, 2005; Ketelaars, Cuperus, Jansonius, & Verhoeven, 2010; Lindsay & Dockrell, 2000; Willinger et al., 2003*).

Collectively, this body of research suggests that motor development is related to various aspects of child development. However due to the limited research on emotional–behavioral and language

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