



## Developmental Coordination Disorder in children with specific language impairment: Co-morbidity and impact on quality of life

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### ABSTRACT

Co-morbidity of Developmental Coordination Disorder (DCD) in children with specific language impairment (SLI) and the impact of DCD on quality-of-life (QOL) was investigated in 65 5–8 year old children with SLI (43 boys, age  $6.8 \pm 0.8$ ; 22 girls, age  $6.6 \pm 0.8$ ). The prevalence of DCD was assessed using DSM-IV-TR criteria (American Psychiatric Association (APA), 2000) operationally defined in the clinical practice guideline (CPG): movement ABC scores below 15th percentile, scores on DCDQ and/or MOQ-T below 15th percentile, absence of medical condition according to paediatric-neurological exam. Quality of life (QOL) was measured with the TNO-AZL-Child-Quality-Of-Life (TACQOL) Questionnaire filled out by parents for the SLI group with and without DCD, and compared to a reference group ( $N = 572$ ; age  $6.9 \pm 0.9$ ). The TACQOL covers 7 QOL domains: physical, motor, cognitive and social functioning, autonomy, positive and negative moods. Prevalence of DCD in children with SLI was 32.3%. In children with SLI, mean QOL scores were significantly lower in the autonomy, cognitive, social and positive moods domains compared to the reference group. Children with SLI and DCD differed from children with SLI without DCD by significantly lower mean overall-, motor-, autonomy-, and cognitive domain-QOL scores. Clinicians should be aware that about one third of children with SLI can also be diagnosed with DCD. Assessment of QOL is warranted in order to assess which domains are affected in children with SLI with or without DCD.

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### 1. Introduction

Specific language impairment (SLI) is diagnosed if a marked impairment in language development interferes with communication at home and in school (American Psychiatric Association (APA), 2000; Webster, Erdos, & Evans, 2006). SLI affects 1.3–7.4% of children (Webster et al., 2006) and causes restrictions in communicative and social activities of daily living (such as expression and understanding) and/or in academic achievement (such as poor reading and understanding of information). In research on SLI, the debate is whether the disorder is restricted to the language domain, or rather one aspect of a broader profile of developmental delay covering multiple domains, including the motor domain (Dyck, Piek, & Patrick, 2011).

A developmental disorder affecting the motor domain is Developmental Coordination Disorder (DCD). DCD is diagnosed if a marked impairment in motor coordination interferes with motor performance at home and in school (APA, 2000). DCD

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causes restrictions in motor activities of daily living (such as sports, play and self-care skills) and/or in academic achievement (such as poor handwriting). The prevalence of DCD is 5–6% in the general population, but in children with SLI prevalence figures of motor difficulties vary between 20 and 75% (Cheng, Chen, Tsai, Chen, & Cherng, 2009; Hill, 2001; Visscher, Houwen, Scherder, Moolenaar, & Hartman, 2007; Webster, Majnemer, Platt, & Shevell, 2005; Webster et al., 2006).

The large variation in prevalence of DCD found in the different studies may be due to differences in diagnostic criteria applied in these studies. First, in some studies children with SLI were diagnosed with DCD when they failed on a motor test (Criterion I of the diagnostic criteria). However, a formal diagnosis of DCD can only be made if four diagnostic criteria are met (APA, 2000). Second, until recently operational criteria for DCD were not well defined causing variation in inclusion criteria for DCD between studies. Recently a clinical practice guideline (CPG) was published with recommendations on the definition, diagnosis and intervention of DCD agreed upon by an expert panel initiated by the European Academy of Childhood Disability (EACD; Blank, Smits-Engelsman, Polatajko, & Wilson, 2012). According to the recommendations in this guideline, DCD should only be diagnosed if children perform below the 15th percentile on a standardized motor test, preferably the Movement ABC (MABC) (Criterion I), and if the motor problems interfere with activities of daily living or academic performance (Criterion II). The use of validated motor questionnaires is recommended to operationalize Criterion II. Other medical and neurological conditions should be excluded by clinical examination (Criterion III). Criterion IV, usually operationally defined as an IQ score exceeding 70, was not adopted as inclusion criterion in the CPG. To the best of our knowledge, co-morbidity of DCD in children with SLI has never been determined when all diagnostic criteria for DCD are applied. Gaines and Missiuna (2006) reported a DCD prevalence of 30% in a sample of 4–6 year old children with SLI who met three out of four diagnostic criteria for DCD.

Although SLI affects 1–7% of the children, little is known about its impact on the child's health-related quality of life (QOL). According to the definition of the World Health Organization (WHO), health is 'a state of complete physical, mental and social well-being and not merely the absence of disease' (WHO, 1948). Health-related QOL is a multidimensional construct. To measure QOL, questionnaires can be applied that measure health (problems) in the areas physical, social and psychological functioning (Eiser, 2004). One of the questionnaires used to measure QOL is the TNO-AZL-Child-Quality-Of-Life (TACQOL) Questionnaire that has the advantage of including several developmental domains such as physical, motor, social, cognitive and autonomic functioning (daily living), as well as positive and negative moods. Proxy ratings by parents are used when self-report measures are not feasible in children who are too young or who lack the necessary language skills, as is the case in children with SLI. Previous studies using the TACQOL in children with chronic conditions revealed lower scores on the different domains of the TACQOL related to the health status of the child (Verrips et al., 1999).

According to a recent review, studies regarding QOL in SLI are rare, as only three studies regarding QOL in SLI were found in the literature (Arkkila et al., 2009, 2011; Feeney, Desha, Ziviani, & Nicholson, 2012; van Agt, Essink-Bot, van der Stege, de Ridder-Sluijter, & de Koning, 2005). Two of these report lower QOL in the social and academic/cognitive domains (Arkkila et al., 2009; van Agt et al., 2005), while the results regarding the physical domain are less conclusive. Reductions in physical functioning were found in some of the reviewed studies, but not in others (Feeney et al., 2012). According to the authors, lower functioning in the physical domain might be related to the presence of co-morbid conditions, such as motor difficulties. Consequently, the authors recommend examination of the effects of co-morbid conditions, including DCD, on QOL of children with SLI (Feeney et al., 2012).

Comparable to SLI, little is known about QOL in children with DCD. According to a recent review, only one study addressed QOL in children with DCD and comorbid Attention Deficit Hyperactivity Disorder (ADHD) (Flapper & Schoemaker, 2008; Zwicker, Harris, & Klassen, 2012). All QOL domains were affected in these children. To the best of our knowledge, the impact of associated DCD on QOL has never been investigated in 5–8 year old children with SLI.

The purpose of the study was twofold: first, to explore the co-morbidity of DCD in 4–8 year old children with SLI applying all diagnostic criteria according to the recommendations in the CPG and to assess which motor skills are most affected and second, to investigate the impact of SLI in 5–8 year old children on QOL and the additional impact of comorbid DCD.

## 2. Materials and methods

### 2.1. Participants

Children with SLI were recruited from four schools for special education in the Northern part of the Netherlands. The original sample consisted of 137 respondents with SLI (response rate 60%); non-respondents did not differ in speech-language and cognitive scores.

Children included in the study were only those who met the formal criteria for SLI of the Diagnostic and Statistical Manual of Mental Disorders, operationally defined by Leonard (1998). A child was diagnosed with SLI if language test scores for auditory processing, grammar or lexical-semantic skills were larger than 1.25 standard deviations (SDs) below the norm, for at least 2 of the mentioned skills.

A "receptive language impairment" was defined as a discrepancy for age (reference standard) between the measures of receptive language and non-verbal intelligence of 1.25 SD. An "expressive language impairment" was defined as a discrepancy of 1.25 SD for age (reference standard) between the measures of expressive and receptive language or non-verbal intelligence. Combined "receptive and expressive language impairment" was diagnosed, if both expressive and receptive language impairments were found. Exclusion criteria were IQ-scores below 85 on the SON Nonverbal Intelligence

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