

The effectiveness of occupational therapy for children with developmental coordination disorder: a review of the qualitative literature

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Key words:

Developmental coordination disorder, therapy, motor.

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Reference: Morgan R, Long T (2012) The effectiveness of occupational therapy for children with developmental coordination disorder: a review of the qualitative literature. *British Journal of Occupational Therapy*, 75(1), 10-18.

DOI: 10.4276/030802212X13261082051337

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Submitted: 15 January 2010.
Accepted: 1 September 2011.

Introduction: This review investigates qualitative evidence regarding the effectiveness of motor interventions for children with developmental coordination disorder (DCD).

Method: Six databases were searched for qualitative studies conducted with school-age children with DCD and their parents to understand better which occupational therapy interventions are most effective for decreasing core symptoms and improving occupational outcomes. The Model of Human Occupation was used as a guide to structure the discussion and to illustrate how a model can be used to guide the therapeutic reasoning process regarding future intervention decisions.

Findings: The findings suggest that, for many families, intervention that addressed everyday occupations and the social consequences for children with DCD was of the utmost importance. Most parents' greatest hope for intervention was to maximise their child's social participation and motivation. Parents described successful interventions that enabled their child to participate regularly in his or her chosen motor activities within the community and that created social participation opportunities. Although children reported similar concerns to parents, they also valued their ability to engage in self-care and play activities.

Conclusion: The qualitative evidence supports the need for practitioners to incorporate the priorities of parents and children in order to optimise the outcomes of intervention. Parental and teacher education was highly valued by parents to help manage their uncertainty and worry associated with raising a child with DCD.

Introduction

The aim of the review was to support evidence-based practice by identifying and describing interventions that were perceived to be effective by children with developmental coordination disorder (DCD) and their parents. DCD is a common diagnostic term used internationally to describe children who have a motor skills disorder that interferes significantly with their successful participation in everyday activities at home and school (American Psychiatric Association [APA] 1994). It is estimated that up to 6% of children aged 5-12 years, mostly boys, are affected (Sutton Hamilton 2002). Children with DCD are a heterogeneous group, frequently presenting with symptoms that differ in range and severity or coexist with other learning, emotional and behavioural disorders (Sutton Hamilton 2002). This multifactorial condition has gained public recognition because longitudinal studies suggest that the long-term prospects for adolescents and adults with a lack of coordination are poor (Wilson 2005). There is growing evidence that motor deficits persist and are commonly associated with social and emotional problems, which is contradictory to a common assumption that has been long held that over time children outgrow their difficulties (Sutton Hamilton 2002).

The aim of reviewing the literature is to provide guidance for practitioners to ensure that interventions for this heterogeneous group are effective and evidence based, reflecting the needs of service users. It is important that

Table 1. PICO: concepts, synonyms and related terms

'In children diagnosed with DCD, what is the most effective occupational therapy for decreasing core symptoms of the condition and improving occupational outcomes?'

Patient	Intervention	Comparison	Outcome
1996 onwards	Treatment	No treatment	Motor/functional measures
Development\$	Intervention	Alternative treatment	
Coordination Disorder\$	Therapy		
DCD	Motor/sensory/cognitive		
Clumsy			
Dyspraxia			
Local population			
Child\$			
Pa?diatric\$			

PICO = Patient Intervention Comparison Outcome; DCD = Developmental coordination disorder.

Table 2. Limits applied to the search

Limits
Remove duplicates
English language
Human
Peer reviewed journals 1996-2009
Treatment and prevention 5-14 years
Remove review articles
Relevance from title
Relevance from abstract
Exclusion criteria

findings from qualitative literature are considered in order that therapists acquire a better understanding of how children and parents make sense of therapeutic experiences. Their unique perspective on contextual and environmental issues, which support family-centred care and partnership working, is vital to a rounded understanding. Additionally, this paper focuses on increasing awareness of the outcomes of occupational therapy and illustrates an occupation-based approach to intervention, which achieves outcomes that are valued by children and parents. This guidance, considered in conjunction with evidence from quantitative literature reviews, could assist clinicians to meet the needs of children with DCD and their parents more comprehensively.

Method

The Patient Intervention Comparison Outcome (PICO) method was used to refine the search question for the literature review more clearly and concisely: 'In children diagnosed with DCD, what is the most effective occupational therapy for decreasing core symptoms of the condition and improving occupational outcomes?' (University Library, University of Illinois at Chicago 2011). Selected search terms, shown in Table 1, reflected the most commonly used terminology in studies post-1994 (Stephenson 2004). Core symptoms of DCD were defined as two inclusion criteria: criterion A, performance in daily activities that require motor coordination is substantially below that expected given the person's chronological age and measured intelligence, and criterion B, the disturbance in criterion A significantly interferes with academic achievement or activities of daily living (APA 1994).

Inclusion and exclusion criteria

Published professional knowledge in journals was targeted. Studies outside the scope of 'therapy' were excluded, as defined by the International Classification of Functioning, Disability and Health (World Health Organisation 2001). By employing this definition, interventions that decreased activity limitation, increased participation in occupation or were remedial in nature were included. An age range of

5-14 years (inclusive) was selected. Children with coexisting conditions were excluded to minimise confounding factors, such as poor attention. Terminology was limited to DCD criteria in recognition of the historical change in the use of terminology and to allow for comparison of samples (APA 1994, Polatajko et al 1995). Studies after 1996 were reviewed, which coincided with the standardisation terminology for children with DCD. Articles in English were selected because no translation service was available. Articles from health and education disciplines focused on delivering interventions for children with DCD were included.

Sources of material

Initially, the Cochrane Collaboration was accessed. A profession-specific electronic database, OTseeker, was selected because it contains abstracts of systematic reviews relevant to occupational therapy. The occupational therapy literature search services, OTBASE and OT Search, were also used. Worldwide medical databases MEDLINE and EMBASE were searched from a topic and intervention perspective. Two databases focusing specifically on allied health literature, AMED and the Cumulative Index to Nursing and Allied Health Literature (CINAHL), were included. PsycINFO and the Education Resources Information Centre (ERIC) were included to capture psychological and educational perspectives. DCD studies were identified via the National Research register. In an attempt to capture some ongoing, unpublished or impending research, a search was executed through the College of Occupational Therapists and the British Library. Scanning reference lists and citation searching from existing review articles supplemented electronic searching.

Search findings

Initial searching that used broad concepts yielded a high number of hits; therefore, concepts were combined to achieve a balance between sensitivity and specificity (Brettell and Grant 2004). Applying limiting factors yielded a more manageable number of six qualitative studies in total.

Appraisal method

Initially, two screening questions from the Critical Appraisal

Table 3. Overview of studies included in the review

Author	Country	Profession	Approach	Method	Aim	Sample
Missiuna et al (2006)	Canada	Occupational therapy	Phenomenology	In-depth interviews and questionnaires.	Parents' insights and early experiences of their child with DCD.	Thirteen parents of children 6-14 years, with DCD diagnosis.
Iversen et al (2005)	Norway	Physiotherapy	Combined quantitative and qualitative study	Structured thematic interview guide.	Parents' perspectives of child's performance in different contexts. Retrospective evaluation of treatment.	Two groups of 15 parents (children 7-12 years, with DCD diagnosis, different treatment levels, 1-4 years post-intervention).
Dunford et al (2005)	United Kingdom	Occupational therapy	Child-focused	Validated pictorial scale. Parent/teacher questionnaire.	Children's perceptions of the impact of DCD on everyday activities.	Thirty-five children 5-10 years, with DCD diagnosis.
Mandich et al (2003)	Canada	Occupational therapy	Grounded theory	In-depth interviews.	Parents' perception of the impact of DCD on child and the value of participation in childhood activities.	Twelve parents of children 7-12 years, with DCD diagnosis, attending Cognitive Orientation to daily Occupational Performance (CO-OP) clinic.
Segal et al (2002)	Canada	Occupational therapy	Grounded theory	Interviews.	Parents' perceptions of the social consequences of DCD.	Eight parents of six children, 9-11 years, with DCD diagnosis, who had received occupational therapy.
Pless et al (2001)	Sweden	Physiotherapy	Combined quantitative and qualitative study	Semi-structured interviews. Open questions.	Parents' observations, feelings and actions. Comparisons between different severity levels.	Thirty-seven parents (two groups) of DCD children 5-6 years.

DCD = Developmental coordination disorder.

Skills Programme were applied to the six qualitative studies (Public Health Resource Unit 2006). A judgement was made regarding the clarity of the research aims and their relevance to the review topic and the appropriateness of the methodology used. The papers were then reviewed using an occupational therapy-specific critical appraisal tool for qualitative studies to ensure that adequate rigour was applied to the process (Law et al 1998). Table 3 shows, in chronological order, a summary of the six qualitative research studies included in the review.

Results

The phenomenon of interest was the intervention experiences of children with DCD and their parents. Their thoughts, feelings and perceptions were considered to provide important information that complemented the conclusions drawn from quantitative evidence regarding treatment effectiveness. The qualitative information provides a human context within which the established empirical research findings could be interpreted, adding depth and understanding to knowledge in this area. The review results demonstrated that most of the qualitative research on this topic has been carried out within the last decade, perhaps reflecting a growing concern

of the importance of capturing children's and parents' experiences. Although research in this area is sparse, studies have been carried out on an international basis.

Most studies aimed to explore issues from the parents' perspective, a stance that may assume that parents are able to provide this perspective of the child's experience objectively but which risks obscuring the child's first-hand account with the proxy version (Green et al 2009). One study sought opinions directly from children with DCD and compared their concerns with those of their parents and teachers (Dunford et al 2005). Reliance on parental reports may reflect challenges associated with using children as key informants, such as developmental readiness and different communication styles (Curtin 2000). However, it could be argued that only children can report accurately on the lived experience of DCD. Most studies focused on exploring parents' perceptions of DCD symptoms, the effects of these on their child's participation in everyday activities, and the experiences of parents when trying to access services for their child.

Quality of the literature

Research approaches

In one study (Missiuna et al 2006), researchers used a phenomenological approach, which was an appropriate choice

Table 4. Approach taken and inclusion of families

Author	Intensity and context	Activities	Approach	Inclusion of child and parents
Missiuna et al (2006)	Individual. Once weekly. Parent-led. Outside home.	Individual physical activities: karate and swimming. Alternative roles in team sport not dependent on proficiency – score keeper.	Family-centred service. Focus on functional self-care tasks and physical activities chosen by child. Structured motor activities and environment to challenge child.	Child leads session and is encouraged to select own goals based on his or her activity preference. Professional-parent partnership. Parent/professional education regarding expectations of therapy and identifying strategies that maximise movement opportunities for child.
Iversen et al (2005)	Individual/group. Several activities practised daily for one school year. Indoor and outdoor, similar to real life settings. Optimum: several times a week.	Frequent practice of motor skills: cycling and swimming.	Increase child's activity and participation. Targeted motor skills. Goal-directed. Motivating activities. Challenging, structured environment.	Choices of activities given that were meaningful to child. High degree of parental advice and information. Extensive support during intervention. Promotion of a healthy lifestyle and frequent use of new motor skills.
Dunford et al (2005)	Not specified.	Specific self-care, productivity and leisure activities.	Child-focused assessment approach. Goal orientated.	Child's view gathered by pictorial tool. Child selected and prioritised his or her goals for therapy. Child's perceptions of his or her competence performing everyday activities gathered. Parents'/teachers' concerns gathered by questionnaire.
Mandich et al (2003)	Group. Therapy clinic and natural environments with friends.	Mastery of everyday functional activities of childhood with friends.	Cognitive Orientation to daily Occupational Performance (CO-OP) approach. Enabled activity and participation. Skill based, achieving mastery of new skills/social participation.	Focused on child identifying own functional goals and choosing physical activities. Supports child to develop a positive attitude towards physical activity.
Segal et al (2002)	Individual/group. Safe contexts: therapy clinic and natural environments with supportive peers.	Use of activities relevant to child's life: cycling, ball skills and fire pole.	Child sets own goals. Child takes advantage of opportunities of therapy sessions. Special enabling conditions.	Child-centred occupations/activities. Interventions that enhance child's social inclusion in peer groups and build self-confidence. Parent supported child to ensure challenge is at just right level.
Pless et al (2001)	Individual/group. Low intensity, parent-led. Naturally occurring situations.	Activities: swimming, cycling and skating.	Training designed to encourage motor learning. Structured environment that challenged child. Motor skill training groups.	Parent important as 'expert' on child. High level of parental education/support if child unwilling to participate. Parent observed organised training sessions so could act as co-therapist.

because the focus was on parents' subjective experiences and their interpretations of their child's experience of DCD. Two studies reported grounded theory as their research approach, with a justification that their findings potentially related to theory construction and verification (Segal et al 2002, Mandich et al 2003). Two studies, both by physiotherapy researchers, used a mixed methods approach, where qualitative methods were used to supplement quantitative findings (Pless et al 2001, Iversen et al 2005). Dunford et al (2005) described their design type as child-focused research, using theory underpinning this approach as a framework for analysis.

Sampling

One study reported that sampling continued until redundancy in data was reached (Missiuna et al 2006), a concept similar

to data saturation which, while difficult to define convincingly, is commonly recommended. Some researchers discussed potential bias where representation was geographically unequal or participants were predominantly white, middle-income, educated families (Mandich et al 2003, Missiuna et al 2006). Only one paper reported that participants came from a wide range of socioeconomic backgrounds (Dunford et al 2005).

Data collection

Details of specific interventions are highlighted in Table 4. All researchers used in-depth interviewing, open questioning and follow-up probes to generate rich information from parents. Mothers were the most common respondents in most studies. In one study, the child was present while the parent was being interviewed, which might have restricted

the parent's level of openness (Pless et al 2001), although Eggenberger and Nelms (2007) offered a contrary view, suggesting that interviewing family members together added value by demonstrating how family members interacted with each other and articulated shared concerns. Several parents had children who were actively receiving treatment during the study by Mandich et al (2003), and this may have influenced their responses in relation to treatment effects, as suggested by Seale and Barnard (1999). One study sought children's perspectives of DCD in the presence of their parents (Dunford et al 2005). Other authors discussed how questions had been formulated and considered their potential personal bias in their role as therapist and parent (Missiuna et al 2006). Children were able to share perceptions of their strengths and weaknesses using a pictorial tool (Dunford et al 2005). They were also able to prioritise these, in terms of goal setting.

Data analysis

Numerous methods for organising and managing the raw data were used. Some studies attempted to determine generalisable themes or categories, a dubious endeavour in a qualitative study, whereas others focused on recording in-depth descriptions. Decision trails evidencing the development of categories or patterns were clearly reported in some instances, which gave confidence to the reader that the findings were grounded validly in the data (Pless et al 2001, Segal et al 2002, Mandich et al 2003, Missiuna et al 2006). With the exception of Iversen et al (2005), all studies used verbatim data extracts from participants in the research papers to support their findings.

Rigour and utility of findings

Some authors prefer to use alternative terms in considering the rigour of qualitative research, but Long and Johnson (2000) argued that these relate directly to the traditional concepts of validity and reliability. A number of studies used triangulation techniques (theory, source, researcher or method triangulation) to confirm preliminary findings and explore emerging areas of tension (Pless et al 2001, Missiuna et al 2006). Although care is needed to avoid confusion of the question effectively being posed in triangulated studies, in these instances the data were enhanced by this strategy. Some studies took measures to enhance the validity of data by keeping a field journal or recording reflective or analytical memos (Mandich et al 2003, Iversen et al 2005, Missiuna et al 2006). This helped to reduce researcher impact or, at least, to distinguish it from original data.

The usefulness of findings for other situations was enhanced in some studies by the researcher providing a full description of the research context, the participants involved and the philosophy underpinning the study (Pless et al 2001, Mandich et al 2003, Dunford et al 2005, Iversen et al 2005, Missiuna et al 2006). This allowed the reader to make an informed decision as to whether the results were relevant and applicable to their setting.

Findings in the literature

The strengths and weaknesses of individual study designs are shown in Table 5, alongside a summary of main outcomes and implications for practice declared by the researchers. In general, parents' descriptions of intervention focused on the outcomes of intervention rather than the specific content of the support that their child had received. Parental experiences of intervention varied, suggesting that intervention was tailored to their child's unique needs. The findings from all six studies confirmed that parents valued child-centred and parent-centred interventions highly.

Parents' perceptions

Across the qualitative studies, common themes emerged regarding parents' and children's perceptions of DCD and interventions. The findings addressed five main areas: experience, participation, motivation, environment and effective treatment.

Experience

Many parents described past, present and future worries and uncertainties for their child with DCD (Pless et al 2001, Mandich et al 2003, Dunford et al 2005, Iversen et al 2005, Missiuna et al 2006). Most parents reported that their child with DCD experienced various degrees of distress as a result of motor difficulties. There were descriptions of peers rejecting, excluding or teasing children with DCD on the basis of their physical impairments (Segal et al 2002, Mandich et al 2003, Missiuna et al 2006). Parental reports of reduced self-worth or embarrassment in children with DCD were recurring themes when the child's motor difficulties interfered with a group activity (Segal et al 2002, Dunford et al 2005, Iversen et al 2005).

Participation

Parents reported that limited social participation and engagement in everyday activities were recurring problems for children with DCD (Segal et al 2002, Mandich et al 2003, Dunford et al 2005, Iversen et al 2005). Parents in all six studies emphasised the negative impact of DCD on children's physical abilities. The consequences of what appeared to be minor difficulties had major implications for many children in their everyday lives, in particular during their school years (Segal et al 2002, Mandich et al 2003, Dunford et al 2005, Missiuna et al 2006). Parents' descriptions of their children's difficulties that caused most concern related primarily to gross motor movements (Pless et al 2001, Segal et al 2002, Mandich et al 2003, Dunford et al 2005, Missiuna et al 2006). Larger movements, such as balance and ball skills, were essential prerequisites for children's free play activities and team games, which often determined whether a child was accepted or rejected by peers (Segal et al 2002, Mandich et al 2003, Iversen et al 2005, Missiuna et al 2006). Parents also detailed how their children struggled to keep up with peers academically (Dunford et al 2005).

Table 5. Strengths and weaknesses of study designs, conclusions and implications for practice

Author	Strengths	Weaknesses	Conclusions	Practice implications
Missiuna et al (2006)	Sample obtained from different services.	Limited cultural and socioeconomic groups represented.	Parental challenge of understanding DCD and obtaining help. Social participation and self-worth of more concern than motor difficulties.	Importance of education of parents/teachers and maintaining focus on occupational performance. Outcome measures need to relate to child's/parents' priorities. Need for early intervention.
Iversen et al (2005)	Addressed length of treatment effects. Compared intensity of treatments, context and degree of parental inclusion.	Limited information regarding analysis of information from interviews. Parental verbatim data extracts not included.	Parents whose children received targeted, intensive intervention reported increased participation and activity levels for their children. Parents judged positive outcomes of treatment for children as increased skills, self-esteem and inclusion in activities with peers and education/support for themselves. Increased child's coping strategies. Children were confident and competent with activities 1-4 years later, except for ball skills.	Collaborative, intense intervention is perceived favourably at long-term follow-up by parents. Some skills acquired were maintained after 1-4 years but motor difficulties persisted. Importance of establishing physical activity within children's routines. Functional outcomes need to be captured in different contexts.
Dunford et al (2005)	Included child, parent and teacher perceptions. Identified tool to establish child-centred goals.	Parents present. Questionnaire for parents and teachers did not match the children's scale.	Children, parents and teachers share common concerns relating to physical and academic activities. Children identified self-care and leisure activities as concerns.	Child, parent and teacher perception of concern varies in important areas. Outcome measures useful to inform DSM-IV DCD diagnostic criterion B (APA 1994), important for early diagnosis.
Mandich et al (2003)	ICF framework useful tool to inform theory and practice for children with DCD.	Some children receiving treatment.	Incompetence in everyday activities had negative effects for children with DCD. Main themes of small difficulties causing large consequences and strategies leading to mastery of skills. Achieving mastery promotes activity participation, social inclusion and increased self-esteem.	Intervention that increases activity and participation has a positive impact on quality of life. Stresses importance of child choosing his or her own functional goals and building social networks.
Segal et al (2002)	Stigmatisation needs to be considered in theory and practice.		Parents believed that DCD primarily restricted their child's social participation and led to avoidance techniques. Parents commented that their children selected physical activities as goals with therapy support.	Importance of occupational therapists using activities relevant to a child's life in order to enhance his or her social participation. Motor activities plus special enabling conditions resulted in skill enhancement.
Pless et al (2001)	Large sample.	Children present during interviews with parents.	Parents of children with severe DCD had multiple concerns and physically supported their child.	Highlights gathering information on how child performs in comparison to others to identify parental concerns. Importance of providing information for carer and teaching co-therapist facilitation skills.

ICF = International Classification of Functioning, Disability and Health; DCD = Developmental coordination disorder.

Motivation

Parents recounted their children's coping strategies; in particular, the use of avoidance of tasks requiring motor abilities, both at school and in free-time activities (Pless et al 2001, Segal et al 2002, Mandich et al 2003, Missiuna et al 2006). Where possible, children with DCD avoided situations where their deficits were noticed by peers because this could result in rejection. Some children managed their

social relationships with peers through either choosing or accepting roles within group activities that did not impact directly on others or expose their lack of motor competence (Segal et al 2002, Missiuna et al 2006). Parents valued therapy that improved their child's self-confidence and competence over those that addressed motor abilities (Segal et al 2002, Mandich et al 2003, Missiuna et al 2006). Some children needed a higher level of parental support in order

to sustain their motivation and help to establish patterns of interests that promoted their participation in physical activities (Pless et al 2001, Iversen et al 2005, Missiuna et al 2006). Achieving competence and participating successfully in motor activities motivated children and helped them to interpret their experience more positively, which influenced their future activity choices (Segal et al 2002, Mandich et al 2003).

Environment

Resources available to children with DCD were perceived by parents as being limited (Pless et al 2001, Segal et al 2002, Mandich et al 2003, Missiuna et al 2006). Difficulty accessing health and education services was a problem commonly reported, and this contributed to parental self-doubt, frustration and increased stress levels (Pless et al 2001, Segal et al 2002, Mandich et al 2003, Missiuna et al 2006). Parents attributed the difficulty in accessing services to the often subtle effects of motor in-coordination and its less obvious impact on everyday life and function (Pless et al 2001, Mandich et al 2003, Missiuna et al 2006). Most studies confirmed that difficulties experienced by children with DCD were exacerbated within the school context (Segal et al 2002, Mandich et al 2003, Dunford et al 2005, Missiuna et al 2006). Several parents suggested a need for further teacher education, which supports an issue raised by Dunford and Richards (2003) that DCD continues to be widely unrecognised or misunderstood by professionals (Missiuna et al 2006). Parents often needed to structure the child's natural physical and social environment to ensure that their child chose activities that were sufficiently challenging (Pless et al 2001, Iversen et al 2005, Missiuna et al 2006).

Effective interventions

(i) Child-focused interventions

Parents prioritised occupation-based interventions that enabled their child in terms of mastering skills and increasing their activity choices and participation levels (Segal et al 2002, Mandich et al 2003, Dunford et al 2005, Missiuna et al 2006). Parental expectation of effective intervention was focused not on the remediation of motor impairments, but rather on the broader issue of developing their child's self-worth and social participation. Parents, however, reported that by achieving motor competency through mastering skills, many children acquired a more positive attitude towards participation, with increased levels of motivation, perseverance and self-confidence (Mandich et al 2003). The importance of children with DCD being able to participate in organised, physical activity groups as part of their school or leisure time was noted by parents. Success depended on multiple factors, such as carers providing the appropriate level of support to the child, the goal being challenging but also achievable and meaningful to the child, and the intervention being delivered within an environment in which the child felt secure (Segal et al 2002).

Many parents recounted positive effects on their child's quality of life as they acquired new skills, such as developing friendships, taking pride in their achievements and increased motivation to build on their successes (Segal et al 2002, Mandich et al 2003, Missiuna et al 2006). For example, learning to ride a bicycle opened up multiple social opportunities for many children (Segal et al 2002, Mandich et al 2003, Iversen et al 2005, Missiuna et al 2006).

Parents' feedback indicated that within a therapeutic context the goals that children chose often related to the areas that challenged them the most physically. This suggested that many children with DCD had a desire for peer acceptance and to participate in a normal repertoire of childhood activities (Segal et al 2002, Mandich et al 2003). Within supportive contexts, children with DCD were often motivated to develop strategies and skills to enhance their occupational performance.

(ii) Parent-focused interventions

Many parents stressed the provision of DCD information or strategy training as being crucially important in helping them to readjust their expectations of their child, their parent role and the intervention (Pless et al 2001, Iversen et al 2005, Missiuna et al 2006). Parent education in many cases helped to shift expectations from wanting their child's motor problems to be cured to better management of symptoms associated with DCD. Some parents perceived that effective intervention had empowered them to employ more successful parenting techniques, thereby minimising the impact of DCD symptoms on their child's life (Pless et al 2001, Iversen et al 2005, Missiuna et al 2006). Knowing what action to take to help their child also helped parents to reduce the anxiety and stress associated with their child's condition, and this was emphasised as being an important landmark for many parents (Pless et al 2001, Mandich et al 2003, Iversen et al 2005, Missiuna et al 2006).

Children's perceptions

Children reported similar concerns to their parents and teachers regarding the impact of DCD on their physical capabilities and school performance. However, they also identified the negative impact of DCD on their ability to engage in self-care and play activities, and considered these areas to be important to them. Children were specific in their descriptions regarding sports that they found challenging, whereas parents spoke in more general terms about gross motor skills. Parents, teachers and children tended to agree on the severity of the motor problems, but not necessarily on treatment goals or priorities (Mandich et al 2003, Dunford et al 2005).

Discussion

Enabling occupational therapists to integrate research evidence with practice techniques through considering practice models that complement one another is important

(Nixon and Creek 2006). Many of the findings emerging from the studies aligned with Model of Human Occupation (MOHO) concepts, recognising the importance of client-centredness, occupation, volition (motivation for occupation), habits and underlying motor ability (Kielhofner 2008). MOHO concepts are, therefore, incorporated within this discussion to help to interpret the findings of the literature review and to illustrate how models can be used to guide the therapeutic reasoning process regarding intervention decisions.

Occupational adaptation

From a MOHO perspective, the development of positive self-perception of motor ability and control is important for children with DCD and this is dependent on their successful participation in a range of motor activities and everyday functional tasks. Parents' descriptions of successful factors regarding the nature of the intervention that their child had received echoed these themes (Segal et al 2002, Mandich et al 2003). Children rely on competent motor skills to fulfil their main occupational roles at home and school as they carry out play, self-care and educational activities. In order for children with DCD to achieve a positive self-identity regarding their motor abilities and mastery of motor skills, intervention must be meaningful and related directly to their individual roles and personal values. The choices of activities that a child makes, and how the child engages in these, reflects his or her values, interests and personal capacity. Parents spoke positively about their experiences of interventions that adopted such principles (Segal et al 2002, Mandich et al 2003, Dunford et al 2005). It is important within practice, then, to ensure that goals are set by the child and that these define the motor skills that he or she wishes to accomplish.

Occupational participation

In most of the qualitative studies, the importance was highlighted of the relationship between interventions that taught motor skills and a child's perceived self-confidence and motivation to participate in physical activities (Segal et al 2002, Mandich et al 2003, Dunford et al 2005, Iversen et al 2005). This aligns with MOHO theory that a child's occupational roles, volition and perceived self-competence are important considerations in addition to his or her actual motor capacity. Therefore, outcome measures used within research studies may need to incorporate tools that measure changes in self-efficacy and perceived competence for activities. The implication for practice is that occupational therapists should use a broad range of occupation-based assessment and intervention tools, which address a child's motivation for occupation and optimise participation in meaningful motor activities.

In the mixed methods study, parents described how their children, following intense intervention and with enhanced parental involvement, participated more frequently and in a broader range of activities in comparison to peers who had received less intense motor treatment with minimal parental support (Iversen et al 2005). However, it was noted

that motor difficulties persisted for both groups of children. Other studies have recommended that the timing and duration of intervention for children with DCD requires consideration to account for the differing perceptions of family members and professionals (Green and Wilson 2008).

Parents expect intervention to facilitate their child's participation in everyday activities in addition to improving their motor skills (Segal et al 2002, Mandich et al 2003). Occupational therapists, therefore, need to consider the impact of the child's motor difficulties on participation at home and school, and to use this information to guide their practice.

Some studies illustrate how children are more motivated to achieve their own goals, rather than those set by others (Segal et al 2002, Mandich et al 2003, Dunford et al 2005). Parents and children confirmed that self-directed goals facilitated engagement in motor activities and social participation with peers (Segal et al 2002, Mandich et al 2003, Dunford et al 2005). Dunford et al (2005) reported that, although there were some shared areas of concerns between the child, parent and teacher, children also place great value on self-care and play activities. These additional factors may be overlooked if the child's perspective is not sought.

Over the last decade, a range of assessment tools for children with an occupational focus has been developed, which could be incorporated into clinical practice to supplement motor assessments by demonstrating the impact of motor difficulties on the child's participation in everyday activities (Missiuna et al 2004, Bowyer et al 2005, Keller et al 2005). Dunford et al (2005) identified the importance of using instruments that specifically measure DCD diagnostic criterion B with respect to activities of daily living to assist with diagnosis and management of preschool children (APA 1994). Several researchers concluded that the measurement of motor ability should be extended to include functional outcomes and measures of occupational performance (Pless et al 2001, Dunford et al 2005, Iversen et al 2005).

Conclusion

Qualitative research evidence suggests that, for many families, intervention that addresses the everyday occupations and social consequences for children with DCD is more important than the remediation of motor disabilities. Therefore, assessment and intervention pathways that actively involve children and parents in partnership with professionals are recommended. Occupational therapists should work collaboratively with the child and his or her parents to agree goals and to monitor intervention outcomes.

Education of parents and professionals is an important aspect of care. Education could be extended to include children where developmentally appropriate, so that the child learns better coping strategies for participation in community-based leisure and social activities (Stephenson 2004). This means that future study designs need to measure the success of education programmes provided to families and professionals.

Parents perceived successful interventions as being those that focused on enabling their child to participate in meaningful occupations in everyday contexts and which created social participation opportunities in addition to developing their motor skills. Generating a better understanding of the child and the occupational goals that are most important to him or her is a vital aspect of child-centred practice. Occupational therapists should be familiar with using paediatric, occupation-based assessment tools and outcome measures that facilitate this process. Children with DCD need to be supported by occupational therapists in developing a positive attitude towards an active lifestyle to maximise their general health and social wellbeing in the long term.

Conflict of interest: None declared.

Key findings

- Both child-centred and parent-centred interventions for DCD were valued by families, but allowing children to be active in goal setting was vital to this.
- Parents tended to aspire to intervention that would maximise the child's social participation whereas children were more concerned about their ability to engage in self-care and play activities.

What the study has added

This review of qualitative evidence will help practitioners to understand better how children with DCD and parents make sense of therapeutic experiences, and will promote harmonisation of therapist and family priorities. The focus on outcomes of therapy through an occupation-based approach lends support to the adoption of this approach by practitioners.

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