

# **Paper V**

ORIGINAL ARTICLE

## Intervention for 6-year-old children with motor coordination difficulties: Parental perspectives at follow-up in middle childhood

SYNNØVE IVERSEN<sup>1</sup>, BJØRN ELLERTSEN<sup>2</sup>, ASTRID TYTLANDSVIK<sup>3</sup> & MAGNE NØDLAND<sup>4</sup>

<sup>1</sup>Section of Physiotherapy Science, Department of Public Health and Primary Health Care, University of Bergen, Norway, <sup>2</sup>The Reading Centre, University of Stavanger, Norway, <sup>3</sup>Madla Physio- and Occupational Therapy Section, Stavanger, Norway, <sup>4</sup>Madlavoll School, Stavanger, Norway

### Abstract

The aim of the study was to evaluate motor function in middle childhood for two groups of children with motor coordination difficulties who had received intervention at the age of 6 years. For group A ( $n = 15$ ) a high-dosage, targeted motor skills approach with a high degree of parental involvement had been applied, whereas group B ( $n = 15$ ) had received a low-dosage, basic motor skills approach with limited parental involvement. Parental follow-up descriptions of the children's situation at home and at school 1–4 years after intervention, with primary focus on motor function at the levels of activity and participation, were compared with motor function as assessed with the Movement Assessment Battery for Children (M-ABC). No significant differences were found with regard to M-ABC sum-scores, but the parents from group A reported an overall more favourable situation at the levels of activity and participation. The children in group A were physically active, with frequent use of targeted motor skills learned during intervention. The majority of children from both groups displayed comorbid learning difficulties and attention deficits at follow-up. Parents considered their children vulnerable and worried about future social functioning.

**Key words:** Comorbid difficulties, Developmental Coordination Disorder, intensity of training, intervention approaches, motor learning, Movement Assessment Battery for Children, parental involvement

### Introduction

A variety of terms have been used in order to describe children with motor coordination difficulties (1,2). At a consensus conference in 1994, researchers agreed to use the term “Developmental Coordination Disorder” (DCD) from the 4th edition of the *Diagnostic and Statistical Manual of the American Psychiatric Association* (DSM-IV) (3). According to the DSM-IV criteria, children must present with motor function significantly below chronological age and the motor impairment must interfere significantly with activities of daily living and not be related to a medical condition. The label DCD may be used in cases of mental retardation when the motor problems are in excess of those usually associated with this condition (4).

The International Classification of Functioning, Disability and Health (ICF) (5) has been suggested as a meaningful framework in order to describe characteristics of children with DCD. Reviews have showed a wide variety of difficulties for this group of children at the level of body function and structure (6–8). However, some primary impairments seem to be quite common, such as a general slowness of movement (9–11), and information processing difficulties (see Wilson & McKenzie (12) for a review). Decreased power and strength has also been reported as possible secondary impairment (13,14). At an activity level, the children often find activities such as running, jumping, climbing, riding a bike, swimming and ball games difficult, as well as activities such as dressing, writing and using various tools (6,7). At a participation level, anxiety, lack of

motivation and withdrawal from school activities and play has been reported (15–17).

The group of children meeting the DSM-IV criteria for DCD is diverse and heterogeneous (18–20). Several studies have shown that motor control problems are comorbid with Attention Deficit Hyperactivity Disorder (ADHD), as well as speech-language deficits, specific learning disorders, perceptual abnormalities and behavioural and psychiatric disorders (21–25). There is evidence that motor problems persist into adolescence for a large group of persons with DCD (15,24–26) and also into adulthood (27,28).

Several researchers have pointed out the importance of early identification and intervention for children with motor problems (27,29,30). Recent research on motor control and learning lends support to intervention approaches that focus directly on learning meaningful activities in natural environments (31–36). A review of the literature on intervention for children with DCD supports task specific approaches to motor learning as well as teaching. The choice of motivating and goal-directed activities is considered important (30,37–44). As highlighted by Pless and Carlson (45) and Sigmundsson et al. (46) in their reviews of intervention studies, intensity of training also seems to be a crucial variable for success. However, research on intervention effects is still limited, with research on long-term effects so far lacking (7,29).

The purpose of the present study was to evaluate motor function in middle childhood for two groups of children with DCD who had received intervention at the age of 6 year. For group A ( $n = 15$ ) a high-dosage, targeted motor skills approach, with a high degree of parental involvement, had been applied. Group B ( $n = 15$ ) had received a low-dosage, basic motor skills approach with limited parental involvement. At follow-up, parental perspectives were of particular interest. Their descriptions of the children's situation and functioning at home and at school, with a primary focus on motor function at the levels of activity and participation, were compared with motor function as assessed with the Movement Assessment Battery for Children (M-ABC) (47). Based on recent research advocating high-dosage targeted motor skills approaches to children with DCD (30,45,46), we hypothesized a more favourable situation for the group who had received this type of intervention.

## Methods

### *Participants*

Thirty children participated in the study. Group A consisted of 15 children (two girls, 13 boys) with a

mean age of 8 years 4 months (range 7–11 years), whereas group B consisted of 15 children (two girls, 13 boys) with a mean age of 8 years 8 months (range 7–12 years). All children in both groups were reported by their parents to be in good health, without medical diagnoses. One child in group A had recently obtained an ADHD diagnosis.

The children in group A had been enrolled in a high-risk programme at the age of 6 years. Eight out of approximately 1200 6-year-olds in the community were selected by the school psychology service each year, for 4 years, for participation in the programme ( $n = 32$ ). Intervention took place at a city school in Norway, and the programme consisted of daily intensive training of cognitive, social and motor skills. The children took part in the programme for the duration of one school year. The main criterion for inclusion was attention deficits and/or behavioural and social problems. All children were assessed with the Wechsler Intelligence Scale for Children-Revised (48) and the M-ABC (47) at the start of intervention. It was found that 17/32 children displayed M-ABC scores at or below the 5th centile, indicating clinical motor problems. Thus they were possible candidates for the follow-up study. Fifteen families were traced and contacted, and agreed to participate. At the start of the intervention programme group A displayed a mean ( $\pm$  standard deviation, SD) full-scale IQ of  $89.60 \pm 16.10$ , and a mean total M-ABC score of  $21.13 \pm 4.69$ , corresponding to the 1st centile. As a standard part of programme evaluation, the children were re-assessed with M-ABC at the end of the intervention period. An experienced physiotherapist did both pre- and post-training assessment with the M-ABC. Post-training results showed a mean total M-ABC score of  $11.60 \pm 5.04$ , corresponding to the 8th centile. The change in M-ABC total score was statistically significant, indicating an effect of training (see the Results section for statistical analyses).

The source sample for group B was 6-year old children from the same city and the same years as group A, who had been referred by the school nurse to the municipality physiotherapy service based on a motor screening test (49). Thirty random families representing the same four year-groups as the children in the high-risk programme were contacted by letter based on the children's results on the motor screening test. Twenty families responded positively, and physiotherapy journals for 15 of these children confirmed motor problems at the physiotherapy assessment that had been undertaken after the screening. These children were included in the study. All participants had received motor intervention from the municipal physiother-

apy service at the age of 6 years, which consisted of advice and information to parents and teachers, and for 13/15 also weekly basic motor skills group training led by physiotherapists. One of the remaining children had received advice and supervision only, whereas the other had received a combination of group and individual training. On the average, the group training had lasted a little less than one school year.

For group B, IQ measures at the age of 6 years were not available, but only children who attended mainstream classes were included. At the time of onset of the intervention for the children in group B, the M-ABC was not a standard assessment tool within the municipal physiotherapy service. Pre-training M-ABC results at or below the 5th centile, indicating severe motor problems, was available for six children in group B. Post-training group M-ABC results were not available for the children in group B, whereas M-ABC data at follow-up was obtained and compared with data from group A.

#### *Materials*

*The Movement Assessment Battery for Children (M-ABC).* The M-ABC (47), a broad norm-based standardized measure, was chosen for evaluation of motor coordination difficulties at follow up. The M-ABC is used widely in Europe for research purposes as well as a clinical tool. It is a comprehensive assessment battery consisting of the M-ABC Checklist, the M-ABC Test and guidelines for remediation. The M-ABC test yields an overall motor impairment score indicating increasingly pronounced motor difficulties with increasing scores. There are sub-scores for the areas manual dexterity, ball skills and balance as well as sub-test scores within these areas. The test consists of eight different test items, yielding ordinal data on a scale from 0–5, with 5 indicating severe motor difficulties on the particular item and 0 indicating no problems. The M-ABC is designed in order to detect difficulties, not to differentiate between average and superior motor performance (47). The M-ABC has been standardized in the USA, but Mæland (50) concluded that the norms were appropriate for Norwegian children as well. As in the original normative data, Mæland (50) reported small, non-significant differences between boys and girls. According to the manual, overall reliability is good, ranging from 97% agreement in 5-year-old children to 73% in 9-year-olds.

*Structured parental interviews.* The parents of the children in both groups were interviewed based on

a structured thematic interview guide. The main themes were: description of their children's situation today with regard to coping and social functioning at home and at school; their motivation for and enjoyment of physical activity; their choice and mastery of motor skills; and participation in organized spare-time activities. Retrospective evaluations of the children's motor intervention at the age of 6 years were also obtained. The parents were asked open-ended questions, with sub-questions according to the main themes.

#### *Description of the intervention programmes*

Information on the high-risk programme (hereafter programme A) was collected through interviews with the teachers involved and by video-observations from the intervention programme. Information on the municipal physiotherapy intervention (hereafter programme B) was obtained from physiotherapy journals of the children, and supplemented by informal interviews with the physiotherapists who conducted the intervention.

*Programme A.* The children in group A participated for about a third of their time in various physical activities in- and outdoors, and motor training was an integrated part of the cognitive and social parts of the programme. The target skills of programme A were bicycling (daily), swimming (once a week), playing land-hockey (2–3 times a week), playing soccer (2–3 times a week), skiing (during the winter daily if possible), and doing obstacle courses including basic motor skills such as jumping, climbing and running (daily). Ball-skills and basic motor skills were practised both in- and outdoors. In addition, a particular gymnastic activity was chosen: somersaults from a trampoline. Additional fine motor skills were practised as an integrated part of the cognitive part of the programme. An experienced teacher was in charge of the programme, and a pre-school teacher assisted him. The teachers administered the daily motor practice while a physiotherapist from the municipality physiotherapy service monitored the group at regular intervals. The parents were actively involved in the programme. The teachers kept in close contact, with an "open door" at school, inviting the parents to visit whenever they wanted to. The teachers emphasized that they made a point of continually informing the parents about the learning progress of the children.

*Programme B.* The weekly basic motor skills group training took part indoors, led by physiotherapists and sometimes assisted by educational staff. The children mainly practised a variety of basic motor skills such as climbing, crawling, jumping, running, hopping and basic ball-skills (throwing, catching), but more complex skills such as various tag-and-tail games were also reported. Group participation was considered important, with a focus on learning basic rules, as well as being able to interact with other children. Information and advice to the parents usually occurred as a one-time follow-up of the initial assessment, and took place at the municipal physiotherapy department. Supervision of educational staff took place at the local kindergarten/school, or during the group sessions, if/when the teacher attended. The amount of supervision to educational staff for the children in group B had been variable, ranging from one-time visits to weekly supervision either in kindergarten/school or during group sessions.

#### Procedures

The study was administered in accordance with the guidelines of the Declaration of Helsinki and ethical approval was obtained from the regional ethics committee. Participation was based on written informed consent. Follow-up testing and interviews of parents took place at the same time for both groups. Because children in both groups were recruited from four different year-groups, follow-up took place 1–4 years after intervention, with a mean of 2.5 years. Two trained and experienced paediatric physiotherapists, with no former knowledge about previous motor assessment of the children, or about the children and families involved, conducted the M-ABC assessment. Owing to time and resource constraints, the assessors were not blinded to what programme the children had been a part of, as the physiotherapists also conducted the parental interviews. The interviews were conducted at the end of the assessment session, or for some families, in a separate session. In order to enhance reliability, the two testers made joint preparatory video-analyses of testing procedures and scoring. All children were assessed with the same test kit, in quiet surroundings after school hours.

#### Analyses

Because M-ABC data are nominal and not normally distributed, both parametric and non-parametric statistics were obtained. Descriptive statistics, *t*-test and Mann–Whitney *U*-test were

calculated for independent group comparisons using the SPSS 11.5.1 package. ANOVA was used for analysis of M-ABC changes in group A (before and after intervention and at follow-up). Pairwise comparisons were performed using Bonferroni adjustment for multiple comparisons. These data were also analysed using the Friedman test for related measures and Wilcoxon test for pairwise comparisons of these. Written transcripts of the interviews of the parents were summarized and categorized according to the main themes of the study, addressing motor and social function at the ICF levels of activity and participation.

## Results

#### *Severity and types of motor coordination difficulties as assessed with the M-ABC*

Group A obtained a mean ( $\pm$ SD) total score of  $13.83 \pm 6.66$  on the M-ABC at follow-up, or just below the 5th centile. The individual results varied from 3, indicating normal motor skills, to 23, indicating severe difficulties. The pre-training, post-training and follow-up sub-scale scores of the individual M-ABC test items for group A are presented in Figure 1.

As illustrated by the figure, the progress obtained during the intervention period remained stable at follow-up, as measured by the M-ABC, with the exception of test item 6, measuring static balance, showing a seemingly relapse to baseline level. One-way ANOVA for repeated measures, including pre-training, post-training and follow-up scores, showed that the change over time was statistically significant ( $F(2, 13) = 21.21$ ,

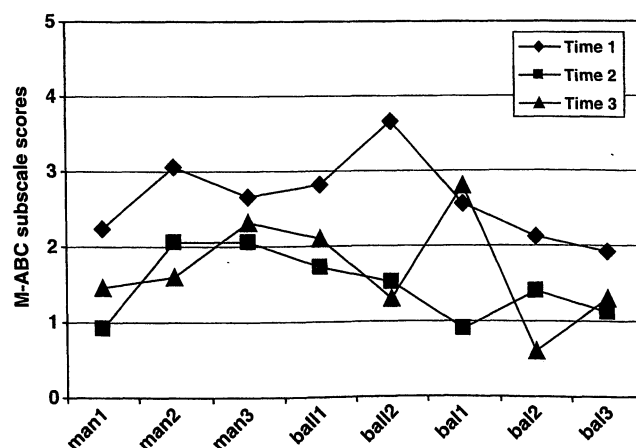


Figure 1. Mean sub-scale scores at the Movement Assessment Battery for Children (M-ABC) for the individual eight test items for group A at time 1 (pre-training), time 2 (post-training) and time 3 (follow-up).

$p < 0.001$ ). Bonferroni-adjusted comparisons showed that there were significant differences between pre-training and both post-training and follow-up, but not between post-training and follow-up. These findings were confirmed using Friedman test and Wilcoxon tests.

For group B the mean total M-ABC score was  $16.03 \pm 6.97$ , corresponding to the 2nd centile. Individual results varied from 3 to 29, or from normal motor function to severe difficulties. A comparison between group A and B on the three sub-area scores of the M-ABC did not yield statistical significances. However, as can be seen in Figure 2, there was a tendency for better performance in the sub-area of balance for group A ( $t(28) = 1.55$ ,  $p = 0.13$ ). A Mann-Whitney  $U$ -test confirmed this finding.

Regarding individual test results, the number and percentage of children showing normal motor function (total score  $> 15$ th centile), borderline function ( $> 5$ th to  $\leq 15$ th centile), and definite motor problems ( $\leq 5$ th centile) are presented in Table I.

As can be seen from the table, more children from group B obtained a total motor impairment score at a clinical level ( $\leq 5$ th centile).

#### Parental reported motor function at the levels of activity and participation

At an activity level, the parents in group A reported bicycling as an important activity for all 15 children. The children used their bikes a lot, as a means of transportation to and from friends, as a shared activity with friends, or just going for

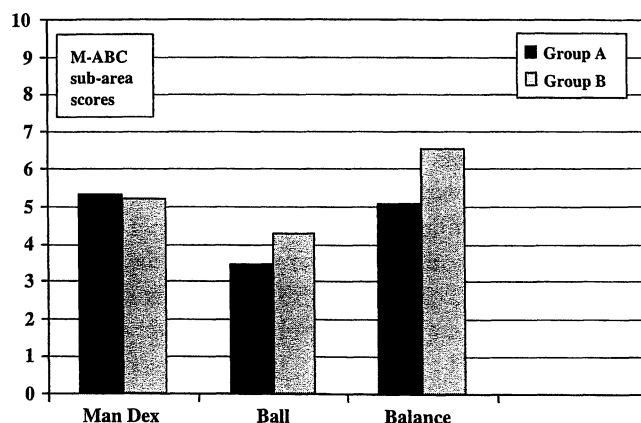


Figure 2. Mean sub-area scores at the Movement Assessment Battery for Children (M-ABC) for group A and group B at follow-up. Man Dex comprises the sum-score of three items in the sub-area of manual dexterity; Ball comprises the sum-score of two items in the sub-area of ball-skills; Balance comprises the sum-score of three items in the sub-area of balance.

Table I. Number and percentage of children in group A ( $n = 15$ ) and group B ( $n = 15$ ) who obtained total Movement Assessment Battery for Children (M-ABC) scores at a clinical level ( $\leq 5$ th centile), borderline level ( $> 5$ th to  $\leq 15$ th centile) or at a normal level ( $> 15$ th centile).

	Group A	Group B
Clinical scores	6 (40.0%)	11 (73.3%)
Borderline scores	5 (33.3%)	2 (13.3%)
Normal scores	4 (26.7%)	2 (13.3%)

rides on their own. Thirteen children could swim in a coordinated way and did so regularly during their spare time. All 15 mastered basic skiing skills, and 13 children were also reported to master and enjoy skating. All children could perform somersaults from a trampoline; some also did this from a diving board. The parent reports on ballgames showed a more variable picture, with the parents of six children pointing to ballgames (mostly soccer) as negative and difficult. Ten children took part in organized spare-time activities. Fourteen children were reported to be generally physically active and to enjoy gross-motor activities; one child preferred to be at home and indoors.

Thirteen children from group B were able to ride a bike, even though some did it rarely. Ten children could swim in a coordinated way, and skiing and skating were mastered by about half the group. In accordance with group A, the parents in group B pointed to ballgames as the most demanding activity, with participation reported as difficult for 10 children. At the time of follow-up, 4/15 children took part in organized activities during their spare time. Compared to group A, the parents in group B reported a lower general physical activity level, with seven parents mentioning that they had to push and organize in order for their children to be physically active outdoors.

#### Additional motor training and physiotherapy services after intervention

A clear majority from both groups (12 from group A and 11 from group B) had received no additional motor training or just a yearly physiotherapy consultation after intervention. The remaining children had attended weekly motor training group sessions periodically at their local schools. Whereas none of the parents from group A asked for additional motor training at follow-up, the parents of five children in group B did.

Table II. Number and percentage of children with parental reported attention deficits, learning problems and social problems at follow-up for groups A and B.

	Group A	Group B
Attention deficits		
Definite and borderline	12 (80.0%)	9 (60.0%)
None	3 (20.0%)	6 (30.0%)
Learning problems		
Definite and borderline	12 (80.0%)	10 (66.7%)
None	3 (20.0%)	5 (33.3%)
Social problems		
Definite and borderline	8 (53.3%)	11 (73.3%)
None	7 (46.7%)	4 (26.7%)

The parents graded problems into one of three categories: definite, borderline and no problems. In the table, definite and borderline problems have been summarized.

#### *Parental reported comorbidity and social function*

The parents graded the most common comorbid problems into one of three possible categories (definite, borderline and no problems), and the results are shown in Table II. As can be seen from the table, with respect to definite attention deficits and learning problems, group A and B were comparable at follow-up, with children from both groups showing a high rate of both. The table shows that social problems were slightly more frequently reported by group B compared to group A. No clear connection was found between the total M-ABC scores and reported social problems. Both children with high and low M-ABC scores were characterized as being with and without social problems in group A as well as group B. When asked about future expectations, the parents from both groups considered their children vulnerable, and they were particularly worried about social functioning.

#### *Retrospective parental evaluation of the intervention programmes*

With the exception of one father, all the parents in group A judged the outcome of programme A favourably with regard to motor learning and general coping. Most parents specifically appreciated learning new motor skills, such as riding a bike, swimming and skiing, as well as pointing to an enhanced general level of fitness and motor proficiency. They also commented on psychological aspects, and many parents mentioned increased self-esteem and decreased vulnerability as effects of the intervention. All parents expressed satisfaction with regard to information about the programme, and how their child was doing throughout the school year. Many parents also described how the information and support from the teachers had helped them in their

everyday coping, increasing their own understanding and insight regarding their child's resources and problems.

The parents of nine children in group B evaluated the early motor intervention of their children positively. In their opinion, their children had improved in motor performance and/or motor confidence during intervention. The remaining six reported that they had not noticed any particular improvement, and the parents of four specifically mentioned that their children did not like to attend the group sessions. The parents from group B did not mention any particular skills learned during intervention. With regard to information during the intervention period, all parents had received a written report from their respective physiotherapist at the end of the school year. About half of the group had received some information during the school year, by phone or by talking to the physiotherapist when they transported their children to group sessions.

#### **Discussion**

At follow-up 1–4 years after intervention, both groups displayed mean M-ABC scores that still indicated definite motor problems. For group A, comparable pre- and post-training results were available. The findings of significant differences between pre- and post-training M-ABC scores, and stability of scores from post-training to follow-up, support that the children in group A improved as a consequence of intervention, and with long-term effects. However, due to a limited number of subjects and lack of comparable research, the results must be interpreted with care, and validating studies that address long-term intervention effects need to be undertaken. For group B, comparable pre- and post-training M-ABC scores were unavailable, and improvement as a consequence of programme B can therefore not be ascertained. At follow-up, both groups displayed a high rate of parental reported attention deficits and learning problems, which supports other studies on comorbidities in DCD (51,52). The children from both groups presented themselves as socially vulnerable and, in line with the findings of Cohn et al. (53) and Pless et al. (54), the parents from both groups worried about the future.

As hypothesized, the parents from group A reported motor function at the levels of activity and participation more favourably compared to group B, thus supporting recommendations of intensive targeted motor skills practice for children with DCD (30,45,46). Important target skills from programme A, such as riding a bike and skiing,

were mastered by all the children in group A at follow-up, regardless of M-ABC score, whereas these activities were described as difficult for several children in group B. Frequency and motivation for physical activity were also more positively reported for group A, with bicycling and swimming practised at a regular basis by almost all the children at follow-up.

The motor assessment at follow-up as well as pre- and post-training assessment for group A was conducted with a recommended standardized norm-based instrument, by trained and experienced physiotherapists. It must, however, be emphasized that assessment of young children with comorbid difficulties is a challenge, and results must be interpreted bearing this in mind. The fact that a limited sample size was available for the study further underscores the importance of validating studies. However, group A and B were comparable with respect to gender, mean age and age range at follow-up, and parental descriptions of their children's here and now situations holds the possibility of highlighting important aspects that should be considered when future intervention programmes are being designed, implemented and evaluated. The parental evaluation of programme A and B must be interpreted with care due to possible recall bias, but should not favour any of the two groups.

Programme A and B differed with respect to intensity of motor training, the types of motor skills practised and environment for practice, and degree of parental inclusion. The results will be further discussed within the framework of these main differences.

#### *Intensity of motor training*

In order for motor learning to occur, a certain number of repetitions are required (34). Earlier research has emphasized the importance of intensity of training, and training periods consisting of three to five weekly sessions have been recommended for children with DCD (45,46). The findings of more positive long-term outcomes for group A compared to group B support that intensity of training is a crucial variable for success. The importance of intensity is further highlighted by research showing that children with DCD tend to avoid and withdraw from physical activities (15,17,55). Possible secondary impairments such as reduced strength and power have also been reported (13,14). In a long-term perspective, this may lead to a reduced general level of physical fitness with negative implications for health and quality of life. Promotion and inclusion of an active lifestyle as a part of intervention programmes have been recommended (30,56). The

design and intensity of programme A ensured a substantial degree of cardiorespiratory training, as well as the building of strength and power. The design and intensity of programme B did not offer the same opportunities. It is likely that programme A gave the children an early start to learn and incorporate targeted motor skills as a natural part of their daily life. In a long-term perspective, the establishment of physical activity as a habit increases the possibilities of preventing negative health implications of DCD.

#### *Types of motor skills practised and choice of motor learning environments*

During intervention, soccer and land-hockey were practised several times a week for group A, whereas programme B contained some basic ball-skills practice. At follow-up, the parents from both groups reported ball games as the most difficult area for participation. In their discussion of choice of intervention strategies for children with DCD, Missiuna et al. (30) recommended activities such as swimming, skiing and bicycling which contain sequences of repetitive movements, and argued that once learned, children with DCD can become successful. In contrast, activities such as ballgames contain a high degree of unpredictability, which in turn requires constant monitoring and adaptations in response to environmental feedback. The findings of this study give support to Missiuna et al.'s (30) recommendations, as motor skills containing repetitive elements were mastered and actively used by almost all children in group A, whereas ballgames still were reported as difficult for many.

The motor skills chosen in programme A and B required different motor learning environments. Whereas the basic motor skills approach in programme B took place in a gym, the learning of cycling, swimming and skiing had to take part in other types of environments. In programme A, ball skills and basic motor skills were practised in- and outdoors, making learning of these types of activities more comparable to real-life situations. In a dynamic systems perspective, motor learning is viewed as the result of interaction between cognitive, perceptual, mechanical and neurological internal mechanisms, as well as interaction of the individual with the task and the environment (31–33). Within this framework, variable practice of externally focused goal-directed motor skills is promoted in order to enhance motor learning (32,34–36). Programme A provided the children with the opportunity actively to explore the activities under variable conditions in- and outdoors, thus promoting understanding as well as automatization and generalization of the



various skills (32–34). In contrast, the children in programme B were not given the same opportunity to actively explore under variable learning conditions.

#### *Parental inclusion*

Parents of children with developmental disabilities often point to insufficient information about services and the condition and prognosis of their child (57). Parental information and inclusion differed between the two intervention approaches. In programme A, the parents were continually informed about the learning progress of their children, and they were active participants, with targeted motor skills to focus on. In programme B, the parents received limited advice and information on a few occasions only, and more general skills were taught to the children. During the interviews, the parents from group A particularly mentioned increased insight and support as positive implications of the intervention. Within the framework of Antonovsky's (58) salutogenic model, the learning during the high-risk programme may have enhanced and widened the repertoire of coping strategies for both children and parents, thus increasing their "sense of coherence" and making both children and parents less vulnerable.

Based on the worries expressed by both groups with regard to their children's future possibilities, as well as research highlighting comorbidity as well as individual diversity and heterogeneity of children with DCD (18–20), it must be emphasized that intervention for children with DCD should be undertaken within a broad, dynamic developmental framework.

#### **Conclusion**

The study shows that children with motor difficulties, who had learned targeted motor skills in natural environments during a high-intensity one school-year programme at the age of 6 years, still practised and enjoyed these activities 1–4 years later, with positive health and social implications. Ball skills tended to be an exception, and were reported as difficult for many at follow-up. Parents of children who had received a low-dosage basic motor skills approach reported an overall less favourable situation. As measured by the M-ABC, both groups showed significant motor problems at follow-up. The parents from both groups reported a high rate of comorbid attention and learning difficulties; they considered their children vulnerable and worried

about social function in particular. In this study, extensive support to, and inclusion of the parents during intervention, seemed to enhance general coping for the families involved, with possible long-lasting effects.

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