

# Role of Pediatric Physical Therapists in Promoting Sports Participation in Developmental Coordination Disorder

*Imke L. J. Adams, PhD; Wenke Broekkamp, MSc; Peter H. Wilson, PhD; Christine Imms, PhD; Anneloes Overvelde, PhD; Bert Steenbergen, PhD*

Behavioural Science Institute (Dr Adams and Steenbergen), Radboud University Nijmegen, Nijmegen, the Netherlands; Fysiotherapie Kompas (Ms Broekkamp), Hengelo, the Netherlands; School of Psychology (Drs Wilson and Steenbergen) and Centre for Disability and Development Research (Drs Wilson, Imms, and Steenbergen), Australian Catholic University, Melbourne, Australia; Radboud University Medical Center (Dr Overvelde), Scientific Institute for Quality of Healthcare, Nijmegen, the Netherlands.

**Purpose:** To explore the role of pediatric physical therapists (PPT) in promoting sports participation in children with developmental coordination disorder (DCD) and identify associated barriers and facilitators.

**Methods:** Questionnaires were provided to 243 PPTs. Qualitative, semistructured, in-depth interviews were administered with the PPTs, children with DCD, and parents.

**Results:** Approximately 67% of questionnaires were returned. Approximately 46% of PPTs were active in guiding children with DCD to sports clubs. This guidance was facilitated by knowledge of local sports, clubs that include children with DCD, and contact persons. Barriers to sports participation were the motor impairment or coincident disorder, insufficient participants to compose a team, and lack of guidance on how to include children with DCD.

**Conclusions:** PPTs currently guide children with DCD to sports clubs, but this guidance may be improved by connecting them to special exercise programs and mainstream sports clubs and examining children's experiences during sports. (*Pediatr Phys Ther* 2018;30:106-111)

**Key words:** disability, motor control, physical education, physical therapy, sport

Children with developmental coordination disorder (DCD) exhibit motor skills that are below expected levels, given the child's chronological age and previous opportunities for skill learning.<sup>1</sup> The coordination of complex movements, such as

those required in sports activities, is problematic for children with DCD.<sup>2</sup>

Participation in sports is valuable for the well-being and health of children.<sup>3</sup> Because of their motor restrictions, children with DCD have reduced levels of sports participation.<sup>2</sup> Children with motor skill difficulties, as young as 4 to 6 years, engage less in gross and fine motor play than their peers who are developing typically<sup>4</sup> and, over time, generally participate less in free play, individual leisure activities, or organized activities.<sup>5,6</sup> Children with DCD report lower perceived self-efficacy with respect to their physical abilities.<sup>2</sup> This probably influences their levels of participation in physical activity. Studies indicate that children with DCD have reduced self-esteem,<sup>7</sup> lower self-concept perceptions as well as lower life satisfaction.<sup>8</sup> Poulsen et al<sup>8</sup> found that in boys' team sports participation positively mediated the relationship between physical coordination and life satisfaction. Team sports provide an important context for peer socialization, social status, and physical health for boys. However, participating in organized sports is one of the activities that are reported as difficult for children with DCD.<sup>9</sup>

Studies of sports activities in children with DCD suggest important facilitators and barriers to participation,<sup>10</sup> including personal and environmental factors. Facilitators for sports participation included good support from parents, the school, and teachers. Parents are important in keeping their children active in terms of encouragement, motivation, and getting them places.

0898-5669/110/3002-0106

Pediatric Physical Therapy

Copyright © 2018 Academy of Pediatric Physical Therapy of the American Physical Therapy Association.

*Correspondence:* Imke L. J. Adams, PhD, Radboud University Nijmegen, Spinozagebouw A (A.04.23A), PO Box 9104, 6500 HE Nijmegen, the Netherlands (i.adams@pwo.ru.nl).

*Grant Support:* This project was funded by the Dutch Research Council (NWO) for the project "Participation With a Movement Restriction: Towards Tailor-Made Training And Coaching" (project 328-98-004).

*Approval for this study was obtained in 2014 from the local Ethical Committee, Faculty of Social Sciences, Radboud University Nijmegen. All participating pediatric physical therapists and parents signed a written informed consent. Children approved their participation verbally.*

*Supplemental digital content is available for this article. Direct URL citation appears in the printed text and is provided in the HTML and PDF versions of this article on the journal's Web site ([www.pedpt.com](http://www.pedpt.com)).*

*The authors declare no conflicts of interest.*

DOI: 10.1097/PEP.0000000000000485

In the study of Barnett et al,<sup>10</sup> parents stressed the need for activities that were appropriate for both the age and the skill level of their child. Perceived personal constraints to participation included poor motor skills, lack of motivation, poor physical self-concept, low self-confidence, and early fatigue. Perceived environmental constraints included difficulty traveling to activities, negative comments from peers, and teachers' lack of understanding of DCD.<sup>10</sup> Parents report a lack of motivation or time, unfamiliarity with available sporting opportunities and associated costs, and a lack of transport as the greatest barriers.<sup>11</sup>

Health professionals can have an important role in promoting sports participation in children with disabilities. They can provide information about suitable sports and connect families with the appropriate sports trainers in their communities. By working with the children, health providers can develop solutions to some of the barriers associated with integrating physical activity into daily life.<sup>12</sup> Pediatric physical therapists (PPTs) are especially skilled at improving motor skills in children with motor difficulties, and could play a prominent role in promoting sports participation in DCD. In the Netherlands (but also in Canada), parents have direct access to a PPT, and often the PPT is the first to be consulted by parents when a child experiences motor problems. PPTs have an important role in assessing motor difficulties, remediating the impaired motor skills, and—if necessary—referring children to rehabilitation centers and pediatricians. In addition, PPTs educate parents about the physical condition and guide them on how to help their children.

In pediatric rehabilitation, understanding the motivational processes for activity engagement assists therapists in successfully addressing the needs of the child.<sup>13</sup> In the current study, a large survey of PPTs and face-to-face interviews with both PPTs and children with DCD and their parents was employed to (1) examine the current role of PPTs to encourage sports participation in DCD by exploring perceptions and ideas of PPTs and children with DCD and their parents, and (2) identify factors that promote or hinder sports participation in children with DCD. As a follow-up of earlier identified facilitators and barriers for sports participation, we specifically focus on the facilitators that PPTs can enhance and barriers that can be reduced with the help of PPTs. This knowledge will provide important information on the role of PPTs to help children with DCD choose, and participate in, an appropriate sport. This will help PPTs in their goal to improve motor functioning of children, and limiting consequences of impaired motor skills in daily life.

## METHODS

### Study Design

This study used a sequential mixed-methods approach. Questionnaires were administered to PPTs to obtain general knowledge about how PPTs evaluate their role in facilitating sports participation in DCD. Interviews were conducted with both PPTs and children with DCD and their parents. These interviews were intended to deepen the knowledge obtained from the questionnaires. Although we were mainly interested in the child's view, children and parents were interviewed together to support the children's confidence in talking to us and to obtain a full picture of the child's participation in physical activity and

sports. The data analysis and results from the questionnaires and interviews are reported sequentially. Ethical approval was obtained from the local ethical committee. PPTs and parents of all children signed a written informed consent prior to the study, and children approved verbally.

### Questionnaire Participants

Questionnaires were provided to PPTs ( $n = 243$ ) at regional meetings held to support the implementation of the Dutch DCD clinical practice guideline.<sup>14</sup> Five meetings were held across the Netherlands, and participating PPTs were asked to complete the questionnaire during this meeting.

### Development of the Questionnaire

The questionnaire was developed in cooperation with the Dutch Association for Pediatric Physical Therapists (NVFK). The questionnaire consisted of 8 items: 1 open-ended question and 7 multiple-choice questions (Supplemental Digital Content 1, available at: <http://links.lww.com/PPT/A203>).

### Data Analysis

Data from the questionnaires were analyzed using SPSS version 21. Descriptive data were generated and percentages were calculated per answer category of the questionnaire.

### Interviews

**Participants.** Ten PPTs agreed to participate, and they worked in private practices located in the east, middle, and south of the Netherlands (provinces: Overijssel, Gelderland, Brabant, and Limburg). The 10 PPTs asked children with DCD for an interview about sports participation. The PPTs selected children with persistent motor problems. Nine children (male, aged 9–12 years) and their parents were interviewed. Two children attended a mainstream primary school, and 7 attended a primary school for special educational needs.

Children met criteria A (Movement ABC-2 total percentile score  $\leq$ 16th, or component percentile score  $\leq$ 5th) and B (the motor skill deficit significantly interferes with activities of daily living and academic school achievement evidenced by the fact that they were treated or have been treated for their motor problems by a PPT) of the *Diagnostic and Statistical Manual of Mental Disorders*, Fifth Edition (DSM-V) for DCD. Criterion C (onset of the motor difficulties was in the early developmental period) was met because the interviewed children were 9 to 12 years old and were treated for motor problems by a PPT. Criterion D was also considered because the PPTs who treated the children considered that the child's motor difficulties could not be explained by another disorder.<sup>1,15</sup>

### Data Collection

Two separate, structured interview scripts were developed: 1 specific for the PPTs (Supplemental Digital Content 2, available at: <http://links.lww.com/PPT/A204>) and 1 for the children with DCD and their parents (Supplemental Digital Content 3,

available at: <http://links.lww.com/PPT/A205>). Based on the literature and information from the questionnaires, indicators for facilitators and barriers to sports participation in children with DCD were determined and interview questions were based on these indicators. For the PPTs, questions concerned the working environment and experience with treating children with DCD. For the children with DCD and their parents, questions were about their current sports activity, opinion, and wishes regarding sports. Parents were asked what they thought was important with regard to sports participation for their child and what facilitators and barriers they perceived. The second author conducted all interviews and interviews were audiotaped. Interviews with PPTs took place at the PPT's practice or home. Interviews with children and parents took place at the child's school or home.

## Data Analysis

The second author transcribed the interviews verbatim and labeled relevant words and phrases per question.<sup>16</sup> Labeling was checked by 2 authors. The second author summarized the results using the labeling per question, and this was checked by the first author. Subsequently, the first author described the results in the results section. Description of results was checked by all authors.

## RESULTS

### Questionnaires

There were 162 questionnaires returned (response rate: 66.7%). Only the 130 questionnaires completed by PPTs working in private practices were included for further analyses. Questionnaires completed by PPTs working in rehabilitation centers were excluded because in the Netherlands children with DCD treated in rehabilitation centers have more complex disorders and often experience various comorbid disorders (eg, autism or dyslexia). The scores on the questionnaire items are shown in the Table. Approximately 92% of PPTs thought that it would be useful for children with DCD to become a member of a sports club. In response to question 2 of the questionnaire, PPTs added that club membership would only be useful if the chosen sport suited the individual child (32% of PPTs), if it stimulated motor development (26.2% of PPTs), and if it was beneficial for the child's social-emotional development and participation (20.2% of PPTs). Approximately 52% of PPTs thought they could contribute more in the guidance toward sports clubs. In response to question 4, about one-third (30.2%) added that it was important that sports clubs were willing to cooperate with PPTs, and 23.3% added that there should be a request from the family for guidance to select a sports club for the child.

### Interviews

**Pediatric Physical Therapists.** Interviews with PPTs had a mean duration of 34 minutes (range, 26–45 minutes). The 10 PPTs annually treated between 6 and 55 children (5%–80% of their clientele) with DCD. All PPTs reported that they always asked the children about their current sports activities,

including whether they perform sports and, if yes, the type, frequency of involvement, and experience. Children who were not involved in sports activities were asked whether there was a particular reason for this and whether they had performed sports in the past. The PPTs reported that most children stopped being members of a sports club because they could not keep up with their peers. Nine out of 10 therapists reported that it was important for children with DCD to participate in sports activities. Eight PPTs reported that they were currently active in facilitating sports participation in children with DCD. The PPTs thought that their role was mainly to advise and encourage the children and that parents had the final responsibility. Eight PPTs mentioned that children with DCD could participate in FitKids to enhance their motor skills. FitKids is a nationwide program in the Netherlands that enables children to receive a graded exercise program supervised by PPTs.<sup>17</sup> Children can participate in FitKids for 1 year, with the ultimate goal of making a smooth transition into mainstream sports clubs. Three PPTs reported that the transition from FitKids to a regular sports club is still difficult for children with DCD. One PPT stated:

The transition from FitKids to a regular sports club within a year is too difficult and sometimes not realistic at all. For example, a child with DCD can function quite well within FitKids, however functioning at the same level at a regular sports club might never be achieved.

PPTs reported several child-related facilitators for sports participation. Six therapists indicated that it was important that the sport aligns with the child's preferences, which will foster enjoyment in exercise and perseverance. Eight PPTs stressed the importance of a sport that is appropriate for the child, preferably in a mainstream team. One PPT mentioned that athletics is a suitable sport for children with DCD:

Athletics is a nice sport, highly individual, and you can be very good in a particular part. However, children with DCD then shouldn't be in the same team as the highly skilled children.

Extrinsic or environmental facilitators were also identified. Eight PPTs reported that encouragement of parents was very important (eg, paying for the sports club, offering transportation to the club, and showing interest in their child's participation). In addition, 8 PPTs mentioned that encouragement by others, including the PPT or the sports trainer, influenced the sports behavior of children with DCD. The presence of a contact person in the community to provide children, parents, and PPTs with information about the sports on offer in the region was also considered desirable.

The interviewed PPTs described several barriers to sports participation for children with DCD. Eight PPTs identified the motor impairment and the presence of a coincident developmental disorder as child-related barriers to sports participation because these children could not keep up with their peers, in turn reducing motivation to continue. Therapists mentioned that this was especially a problem in team sports. Sometimes children can keep up with their peers in a team sport based on their motor skills, but children with coincidental disorders (attention-deficit hyperactivity disorder [ADHD] and

**TABLE**  
Pediatric Physical Therapists' Responses to the Questionnaire

Question	Topic	Proportion, %
2 <sup>a</sup>	Do you think that it would be useful that children with DCD become a member of a sports club?	
	Yes	91.5
	No	5.4
	Missing	3.1
3	As a pediatric physical therapist, do you play a role in the active guidance of children with DCD toward a sports club in the neighborhood or region?	
	Yes, regularly/often	46.2
	Yes, sometimes/only a couple of times	41.5
	No, but I would be willing to	4.6
	No	3.1
	Missing	4.6
4	Do you think that pediatric physical therapists can contribute more in this guidance toward sports clubs?	
	Yes	56.2
	Maybe	40.0
	No	1.5
	Missing	2.3
5	Pediatric physical therapists could have a valuable contribution to increase participation in children with DCD.	
	What is needed to help pediatric physical therapists with this? (more than 1 answer could be ticked)	
	More insight into the availability of sports clubs in the region	92.3
	More insight into regulations and reimbursements (eg, for transport and materials)	19.2
	Increased range of sports activities to choose from	25.8
	More special needs clubs where children can go to increase their motor skills as a way to join later regular sports clubs	71.5
	A contact person in the region who actively guides children and parents toward a sports club	48.5
	Better quality of the sports trainers/coaches at sports clubs	36.9
	A clear guideline for the way of guidance/referral	26.2
	Something else, for example, more insight into financial compensations, more collaboration between different disciplines and sports clubs, insight in the perceived problems of sports trainers and coaches	14.6
6	Should the focus be on guidance of children with DCD toward regular sports clubs or to special sports clubs for children with a motor impairment?	
	Mainly guidance toward regular groups within regular teams	20.0
	Mainly guidance toward specific groups	22.3
	No preference	55.4
	Missing	2.3
7	Should there be more attention for promoting other kinds of organized sporting in leisure time in children with DCD, such as (independent) sports at fields/squares in the neighborhood, moving games at home etc?	
	There should be a lot more attention to this	72.3
	There should <i>not</i> be more attention to this	20.8
	Missing	6.9

Abbreviation: DCD, developmental coordination disorder.

<sup>a</sup>Question numbers match with the questions in Appendix 1 (see Supplemental Digital Content 1, available at: <http://links.lww.com/PPT/A203>).

autistic spectrum disorder [ASD]) had greater difficulty to participate.

Environmental barriers were reported, with 8 PPTs reporting that parents did not encourage their children with DCD sufficiently to participate in sports, and often did not realize the importance of their children's involvement in sports activities. In addition, 9 therapists reported that sports clubs lack expertise and opportunities to guide children with DCD correctly. As a result, children with DCD often spend more time on the sidelines during training and competition.

**Children and Their Parents.** Interviews with children with DCD and their parents had a mean duration of 29 minutes (range, 17-37 minutes). Seven children reported they liked the gymnastic class at school. Three children were members of a regular sports club, 5 children participated in adapted physical classes such as FitKids, "Club Extra" or gymnastics for children with motor coordination difficulties. Four children indicated that they had been a member of a regular sports club

in the past but stopped because they did not like it anymore, despite liking the sports trainers. Four children and their parents reported that the wishes of the children ensured that they participated in sports. All parents indicated it was important that their children participated in sports. Almost all children and parents ( $n = 8$ ) reported that they considered the motor impairment when choosing a sports activity, and considered both special needs teams for children with motor impairments and mainstream teams. Most parents ( $n = 5$ ) tried to encourage participation by considering the opportunities for sports participation together with their children. Five parents mentioned that the children started a sports activity based on the advice of the PPT; for 3 children, this was a referral to FitKids.

Several barriers to sports participation were reported by children and their parents. Six children did not like playing outside with their peers, according to parents, due to their children's motor impairments. All parents reported that their children were hindered in sports participation due to their motor

impairment. Eight parents reported coincident conditions as an intrinsic barrier to sports participation; most commonly this was a disorder that affected them socially and emotionally (eg, ADHD and ASD). One parent stated:

Also the social aspect is a bit difficult, the connection with the group. My son always hesitates to join a group, due to feelings of insecurity (son is diagnosed with ASD). All the new things are scary.

Parents reported that more guidance was needed for their children not only in regular sports groups but also in special needs teams. Three parents reported that they did not encourage their child's sports participation enough because it took too much of their time or they noticed that their child was not interested in sports. Seven parents reported their child was limited in sports participation in mainstream groups because there was insufficient expertise among trainers and a lack of opportunities at these clubs. One parent mentioned that mainstream groups are often too focused on performance:

Having fun during sports should be most important. A barrier for participation is that many sports clubs are too focused on performance.

Parents indicated that, if trainers do not know how to adapt conditions to the children's level of motor or social impairment, children do not enjoy the sports environment. Parents do not want their children to have a negative experience during sports, and consequently withdraw their involvement. Parents would like to see more opportunities for their children to participate in sports.

## DISCUSSION

This study examined the role of PPTs in facilitating participation for children with DCD using a multi-informant approach. A second goal was to identify factors that promote or hinder sports participation. Although the study was conducted in the Netherlands, there are aspects of this study that can be applied in other countries.

Approximately half of the PPTs who completed the questionnaire reported playing a role in guiding children with DCD toward a sports club. This finding was supported in the interviews, with the majority of PPTs reporting that they encouraged participation in sports. PPTs can have an important role in promoting membership of a sports club, and improve the transition from special needs clubs (adapted for children with motor difficulties) to main stream sports clubs. More than half of the PPTs thought that they could contribute more when guiding sports club participation. In both the questionnaires and interviews, PPTs identified important factors that could provide guidance, such as insight into the availability of sports clubs in the region, and the need for more special needs clubs where children can increase their motor skills. In the interviews with the children with DCD and their parents, 8 of 9 children reported that they participated in sports. Five of these children participated in adapted physical classes such as FitKids, "Club Extra," or gymnastics for children with motor coordination difficulties. Often participation in such adapted physical classes is only temporary.

The ultimate goal is to provide a transition to mainstream sports clubs. Only 3 of the interviewed children with DCD were currently active in a mainstream club. Promoting sports participation for children with DCD may increase their physical activity and fitness.<sup>18</sup> Several facilitators for sports participation were identified by both PPTs and children with DCD in the interviews. Important facilitators were the suitability of the sports for the child's motor abilities, and the alignment with the child's wishes and preferences. Participation in a special needs team or a more individualized sports activity may be appropriate, as these focus less on competition between teams then (eg, athletics and swimming). Several barriers to sports participation were identified and were consistent with previous research,<sup>10,12</sup> suggesting that some barriers may be universal. We showed that the motor impairment experienced by children with DCD leads to problems in team sports, because the children cannot keep up with their peers. Our results further showed that PPTs, children with DCD, and their parents experience sports trainers or coaches who do not have the necessary expertise to specifically coach children with movement impairments. Barnett et al<sup>10</sup> suggested that teachers' lack of understanding of DCD was an external constraint to participation in physical activities for children with DCD.

In the Netherlands, PPTs encourage sports participation in DCD by supervising specialized exercise programs for children with disabilities, such as FitKids. FitKids significantly improves health-related fitness, walking capacity, and health-related quality of life for children and adolescents with chronic conditions or disabilities.<sup>17</sup> In the present study, children and parents reported that they were happy with FitKids, but the transfer from FitKids to a mainstream sports club often failed. Exercise programs, specifically for children with motor impairments, may benefit from a tighter connection to mainstream sports clubs via incorporation of more competitive elements and practicing games in a dynamic situation with several players.

PPTs in the Netherlands currently provide advice about sports participation to children with DCD, and regard it very important to do so. What is currently lacking, however, is regular follow-up of the experiences of children in sports clubs that could be used to learn about which specific elements of a sport are difficult for the child during team play and what exercises might assist. Those exercises can then be used in individual and group sessions with the PPT. In addition, PPTs should have contact with the child's sports trainer or coach to provide the trainer with specific information and advice.

There is a need for information and training for sports trainers and coaches about DCD. Future studies should include the perceptions and ideas of trainers and coaches to promote sports participation of children with impaired motor abilities. Training of sports trainers and coaches must ensure that teachers can appropriately differentiate their teaching to include children of all skill and ability levels.<sup>10</sup> Health providers, including PPTs, can have an important role in promoting physical activity by working with children with disabilities and developing solutions to some of the barriers associated with integrating physical activity into daily life.<sup>12</sup> They can also connect families with the appropriate sports facilities in their region. The PPTs in the current study reported that the presence of a contact person in the

region who actively guides children toward a sports club would be helpful.

This study examined the role of PPTs in the facilitation of sports participation in DCD. As a first exploration of this topic, a closed-question, limited option questionnaire was used. In future studies, the perceptions of PPTs could be examined more thoroughly by using a questionnaire that covers more topics and examines the opinions of PPTs and children with DCD using multiple-response categories (eg, Likert scales) and/or open-ended questions. Further research to identify the specific elements of a sport that are difficult for children with DCD and which elements are currently trained by pediatric physical therapists is needed. In the current study, we determined important facilitators and barriers for sports participation in DCD using the literature and the results of the questionnaire. These indicators for facilitators and barriers were then used to compose interview questions. The interview was conducted to further deepen the knowledge about these facilitators and barriers. Future studies could broaden the knowledge about the role of PPTs in facilitating sports participation in DCD, by conducting more open, semistructured interviews or make use of focus groups. This may require a larger number of participants to ensure data saturation is reached. The current study was conducted in the Netherlands; future studies could focus on the role of PPTs in other countries, especially in countries where health care is organized differently than in the Netherlands to broaden our knowledge about this topic.

## CONCLUSIONS

PPTs are currently involved in guiding children with DCD to sports clubs, but this guidance may be improved by a closer integration between special exercise programs and mainstream sports clubs and following up of the child's experience in a sports club.

## ACKNOWLEDGMENTS

The authors wish to acknowledge all PPTs, children, and parents who participated in this research. The authors would also like to thank the Dutch Association for Pediatric Physical therapists (Dutch abbreviation—NVFK) for their help with composing the questionnaires and interviews, and distributing the questionnaires.

## REFERENCES

1. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders*. 5th ed. Washington, DC: American Psychiatric Association; 2013.
2. Cairney J, Hay JA, Faught BE, Wade TJ, Corna L, Flouris A. Developmental coordination disorder, generalized self-efficacy toward physical activity, and participation in organized and free play activities. *J Pediatr*. 2005; 147: 515-520. doi:10.1016/j.jpeds.2005.05.013.
3. Boreham C, Riddoch C. The physical activity, fitness and health of children. *J Sports Sci*. 2001;19:915-929. doi:10.1080/026404101317108426.
4. Kennedy-Behr A, Rodger S, Mickan S. Physical and social play of preschool children with and without coordination difficulties: preliminary findings. *Br J Occup Ther*. 2011;74:348-354. doi:10.4276/030802211X13099513661199.
5. Cairney J, Hay JA, Veldhuizen S, Missluna C, Faught BE. Developmental coordination disorder, sex, and activity deficit over time: a longitudinal analysis of participation trajectories in children with and without coordination difficulties. *Dev Med Child Neurol*. 2010;52:e67-e72. doi:10.1111/j.1469-8749.2009.03520.x.
6. Oudenampsen C, Holty L, Stuive I, et al. Relationship between participation in leisure time physical activities and aerobic fitness in children with DCD. *Ped Phys Ther*. 2013;25(4):422-429. doi:10.1097/PEP.0b013e3182a6b6ea.
7. Lingam R, Jongmans MJ, Ellis M, Hunt LP, Golding J, Emond A. Mental health difficulties in children with developmental coordination disorder. *Pediatrics*. 2012;129:e882-e891. doi:10.1542/peds.2011-1556.
8. Poulsen AA, Ziviani JM, Cuskelly M. General self-concept and life satisfaction for boys with differing levels of physical coordination: the role of goal orientations and leisure participation. *Hum Mov Sci*. 2006;25:839-860. doi:10.1016/j.humov.2006.05.003.
9. Magalhães LC, Cardoso AA, Missluna C. Activities and participation in children with developmental coordination disorder: a systematic review. *Res Dev Disabil*. 2011;32(4):1309-1316.
10. Barnett AL, Dawes H, Wilmut K. Constraints and facilitators to participation in physical activity in teenagers with developmental coordination disorder: an exploratory interview study. *Child Care Health Dev*. 2013;39:393-403. doi:10.1111/j.1365-2214.2012.01376.x.
11. Heijden AV, Dool RVD, Lindert CV, Breedveld K. *(On)beperkt Sportief 2013. Monitor Sport- en Beweegdeelname Van Mensen Met Een Handicap* [in Dutch]. Nieuwegein, the Netherlands: Utrecht/Arko Sports Media; 2013.
12. Verschuren O, Wiart L, Hermans D, Ketelaar M. Identification of facilitators and barriers to physical activity in children and adolescents with cerebral palsy. *J Pediatr*. 2012;161:488-494. doi:10.1016/j.jpeds.2012.02.042.
13. Ziviani J, Poulsen A, Cuskelly M. *The Art and Science of Motivation: A Therapist's Guide to Working With Children*. London/Philadelphia: Jessica Kingsley Publishers; 2012.
14. Landelijk DCD Netwerk. *Nederlandse Vertaling en Aanpassing van AANBEVELINGEN van de EACD Voor Definitie, Diagnose, Evaluatie en Behandeling van Developmental Coordination Disorder (DCD)* [in Dutch]. Arnhem, the Netherlands: Landelijk DCD Netwerk; 2013;1-15.
15. Blank R, Smits-Engelsman B, Polatajko H, Wilson PH. European Academy for Childhood Disability (EACD): recommendations on the definition, diagnosis and intervention of developmental coordination disorder (long version). *Dev Med Child Neurol*. 2012;54(1):54-93. doi:10.1111/j.1469-8749.2011.04171.x.
16. Baarda DB, de Goede MPM, Teunissen J. *Basisboek Kwalitatief Onderzoek Handboek Voor Het Opzetten en Uitvoeren van Kwalitatief Onderzoek* [in Dutch]. Groningen/Houten, the Netherlands: Noordhoff Uitgevers; 2009.
17. Kotte EM, de Groot JF, Winkler AM, Huijgen BC, Takken T. Effects of the Fitkids exercise therapy program on health-related fitness, walking capacity, and health-related quality of life. *Phys Ther*. 2014;94:1306-1318. doi:10.2522/ptj.20130315.
18. Cermak SA, Katz N, Weintraub N, et al. Participation in physical activity, fitness, and risk for obesity in children with developmental coordination disorder: a cross-cultural study. *Occup Ther Int*. 2015;22(4):163-173. doi:10.1002/oti.1393.