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KINDERKINETICS MOTOR INTERVENTION FRAMEWORK FOR CHILDREN WITH DEVELOPMENTAL COORDINATION DISORDER: AN E-DELPHI PERSPECTIVE

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ABSTRACT

Developmental coordination disorder (DCD) is a motor coordination disorder that persists if intervention is not provided. Local guidelines are unavailable for intervention in children with probable DCD (p-DCD), and the aim of this study was to develop a motor intervention framework focusing specifically on the South African population within the scope of kinderkinetics, based on expert information, as a guideline for children with DCD or p-DCD. Twenty-nine kinderkinetics experts from South Africa participated in a three-round e-Delphi process. Round one obtained consensus and opinions from the experts by reviewing literature findings on intervention for children with DCD or p-DCD. Rounds two and three were based on answers and opinions provided in round one to determine an 80% agreement to accept the statement. Ten main elements formed the foundation for the motor intervention framework. The main focus areas of the framework were intervention planning, goal setting, intervention approaches, intervention apparatus, intervention delivery mode, additional role players, settings, dosage (time, duration, frequency and number of sessions), and evaluation. Understanding that the causes of DCD are heterogeneous was essential in finalising the framework. The research provided unique and collated feedback from kinderkinetics experts to develop a motor intervention framework for children with DCD or p-DCD within the scope of kinderkinetics in South Africa.

Keywords: Developmental coordination disorder; DCD; e-Delphi survey; Framework Kinderkinetics; Motor intervention; Paediatric exercise science

INTRODUCTION

Developmental coordination disorder (DCD) refers to a motor coordination disorder influencing academic performance and daily physical activity participation (American Psychiatric Association [APA], 2013; Caçola, 2014; Ferguson *et al.*, 2015). Numerous children with DCD or probable DCD (p-DCD) do not receive the necessary supportive intervention and,

therefore continue to experience low motor abilities (Smits-Engelsman *et al.*, 2018; Blank *et al.*, 2019). A motor intervention has been recommended for children with DCD as it enhances social abilities, cognitive factors, emotional well-being, motor skills, healthy lifestyles and fitness levels (Cermak *et al.*, 2015; Amador-Ruiz *et al.*, 2018; Yu *et al.*, 2018).

Interventions are usually implemented by health professionals, such as occupational therapists and physiotherapists, where occupational therapists develop interventions and solutions regarding problems around the child's performance and physiotherapists help children to optimise their mobility and improve movement (Smits-Engelsman *et al.*, 2012). Both occupational therapists and physiotherapists play an essential yet distinct role in intervention for children with DCD in a clinical setting (Smits-Engelsman *et al.*, 2012). However, kinderkinetics (paediatric exercise science), a profession developed in South Africa, also plays a role in the management of children with DCD and p-DCD, especially in a field-based setting. Kinderkinetics is a professional field in South Africa that provides scientifically based motor developmental programmes with specialised knowledge in movement and physical activity for children 0–13 years of age (South African Professional Institute of Kinderkinetics, 2020). Kinderkinetics was developed subsequent to the work of Pienaar (1994), who reported that movement difficulties improved after children received the correct intervention and therefore recommended that people should be trained with specific knowledge (neurological aspects) to assist children with motor difficulties in South Africa (Pienaar, 1994; Coetzee & Pienaar, 2015).

South Africa is an upper-middle-income country with various socioeconomic environments and cultural differences (Statistics SA, 2018). The country has a 40% poverty rate, and clinically based interventions provided by occupational therapists and physiotherapists are expensive (Ferguson *et al.*, 2013; Pienaar *et al.*, 2014; Statistics SA, 2018). Relatively high incidences (13.2%–25%) of p-DCD, which refers to moderate to severe motor difficulties, occur in various provinces of South Africa (Wessels *et al.*, 2008; de Milander *et al.*, 2014; Denysschen *et al.*, 2021). Therefore, intervention for children with p-DCD in South Africa is crucial and kinderkineticists can play a vital role. Yu *et al*. (2018) were of the opinion that cost-effective intervention approaches for children with DCD should be implemented. Although findings on a motor intervention in kinderkinetics exist (Ernst, 2003; Peens, 2005; Pienaar & Lennox, 2006; Peens & Pienaar, 2007; Coetzee & Pienaar, 2013; de Milander *et al.*, 2014; de Milander *et al.*, 2015), contradictions have been raised and research is limited. Various intervention approaches for DCD are available and the literature mostly refers to task -oriented approaches, process-oriented approaches and combined approaches (Smits-Engelsman *et al.*, 2012; Smits-Engelsman *et al.*, 2018; Blank *et al.*, 2019; Pienaar, 2020). The task-oriented approach, also recently referred to as the activity-oriented approach (improves the task) and participation-oriented approach (improves participation) (Smits-Engelsman *et al.*, 2018), involves an intervention in which the task that should be learnt is addressed (Smits-Engelsman *et al.*, 2012). Furthermore, the process-oriented approach, also known as the body-function-oriented approach, addresses the underlying processes involved in executing a task and improving body functions and structure such as strength and core stability (Smits-Engelsman *et al.*, 2012; Smits-Engelsman *et al.*, 2018; Blank *et al.*, 2019).

In North West Province, South Africa, combined intervention approaches have been conducted with DCD and p-DCD children. Pienaar and Lennox (2006) reported that an overall

improvement occurred, although it was not significant, and further highlighted that the task-specific approach provided statistically significant improvement in the experimental group. In addition, a study on 7- to 9-year-old children (n=413) found that the motor intervention integrated approach was the most successful intervention method (Peens & Pienaar, 2007). Pienaar and Ernst (2007) agreed that an integrated motor intervention could be successful, with slight adaptions in their study of children 4 to 12 years old. An additional intervention approach by Coetzee and Pienaar (2013) on children between 7 and 8 years of age, who participated in a visual therapy intervention programme focusing on the improvement of ocular motor control problems in children with DCD, reported improved ocular motor control following the intervention. In other provinces, a study of 6- to 8-year-old children in KwaZulu Natal, South Africa demonstrated improvement in motor proficiency of children, but no mention was made of the type of intervention approach (Gouws, 2015). However, a study in Free State Province involving 5- to 8-year-old children with p-DCD reported that although there was no improvement as a whole in motor proficiency, improvement was observed in balance skills when conducting a perceptual-motor intervention presented by kinderkineticists (de Milander *et al.*, 2015). Contradicting de Milander *et al.* (2015), a study not explicitly conducted on children with p-DCD or DCD has highlighted that a perceptual-motor development programme developed by kinderkineticists improved the motor abilities of children 4 to 6 years old (Pienaar *et al.*, 2011) and van Biljon and Longhurst (2011) proved that a kinderkinetics intervention on 4.5- to 6-year-old children improved their motor skills. Lastly, Pienaar and Kemp (2014) indicated that it is important to appoint kinderkineticists in the school environment to provide intervention programmes for children with impaired motor abilities, especially in the lower grades.

Considering the various intervention studies, a drawback is that limited information is available on the durations and frequencies to apply with the various intervention programmes (Preston *et al.*, 2017; Smits-Engelsman *et al.*, 2018). Ernst (2003) and Pienaar and Lennox (2006) reported that an 8-week intervention twice a week for 45 minutes is too short to observe effective improvement, whereas Peens and Pienaar (2007) indicated that an 8 -week intervention for 30 minutes twice a week is sufficient. The training principles provided for kinderkineticists-in-training indicate that an effective intervention should be longer than 10 weeks and include once-a-week treatment and more frequent practice sessions (Pienaar, 2020). Another focus point is individual versus group intervention. It seems that researchers have questioned the validity and reliability when group interventions are conducted, especially in environments where affordability is problematic or resources limited (Ferguson *et al.*, 2013; Smits-Engelsman *et al.*, 2018). The literature recommends one-on-one intervention with a focus on each individual's problems (Ernst, 2003; Pienaar & Lennox, 2006; Coetzee & Pienaar, 2013). In addition, group motor interventions have been reported to yield successful results in children with DCD (Peens & Pienaar, 2007; Pienaar, 2020). Lastly, various suggestions have been made regarding the different intervention approaches.

When conducting a motor intervention, it is important to choose the correct intervention approach, plan correctly, identify goals and determine the frequencies and durations for children with DCD (Blank *et al.*, 2019). An intervention framework can guide practitioners in planning, presenting, and progressing in the intervention process (Schen kman *et al.*, 2006). Recently, the international clinical practice recommendations (CPR) on the definition, diagnosis, assessment, intervention, and psychosocial aspects of DCD (CPR-DCD) were

developed and provided various guidelines to follow during interventions (Blank *et al.*, 2019). However, the guidelines focused on clinically based recommendations, with limited focus on treatment service barriers, resources and field-based intervention, in upper middle-income countries (Blank *et al.*, 2019). According to Blank *et al.* (2019), due to country- and culture-specific service provision and professionals available for individuals with DCD in different countries, the international CPR-DCD standards should be adapted to national guidelines according to the country's specific needs (available services, resources and circumstances). Taking that into consideration and with the availability of kinderkineticists in South Africa, a proposed framework is suggested in this article by linking the larger guidelines to the scope of kinderkinetics. The CPR-DCD guidelines that can be related to the scope are briefly pointed out in Table 1.

***Table 1*. INTERNATIONAL CLINICAL PRACTICE RECOMMENDATIONS ON INTERVENTION FOR DCD (BLANK *ET AL.*, 2019)**

Recommendation description
A child diagnosed with DCD must receive an intervention.
During the planning of the intervention the strengths and weaknesses in the child's environment must be considered, to improve motor performance, activity and participation; the evidence of effective dose should be considered; and priorities should be set according to the severity if a co-occurring disorder is present. Priorities should further be established using motor and non-motor factors in functioning.
The focus should be on individual goals during planning, and the goals should address activities and participation. The viewpoints of the child, the family and relevant others should be considered.
Psychosocial factors should be considered during planning, and self-concept should be accommodated.
Activity- and participation-oriented approaches should be used for improving general, fundamental and specific motor skills.
Active video games can be useful in supervised settings and physical fitness should be considered in the intervention.
Small group intervention should be considered carefully if and when a group setting is appropriate.
Children should be provided with sufficient opportunity to practise movement skills.
Professionals should provide parents and relevant others with advice on abilities and problems that the child with DCD experiences and how they can assist at home, school, leisure and sport.
Formal standardised assessment should be repeated at the end of the intervention, and at least every 3 months if intervention is longer, to determine the effectiveness, if goals are met and if further extended intervention is required.

Suggestions have been proposed on whether activity- and body-oriented interventions should not be combined with functional tasks (Smits-Engelsman *et al.*, 2018). In contrast, only activity-oriented and task-oriented interventions have been considered for the best results (Ferguson *et al.*, 2013; Smits-Engelsman *et al.*, 2018). Although results in South Africa within the kinderkinetics profession vary, some positive effects have been reported and therefore best practice principles will be valuable.

Best practice principles and recommendations for kinderkineticists are provided during training to become a kinderkineticist. However, the training textbook for kinderkinetics (Pienaar, 2020) mentions that the evidence for best practice is conducted from a Canadian perspective and that multidisciplinary cooperation in South Africa when working with children with DCD or p-DCD is still a work in progress. The service provided by a kinderkineticist could be valuable for children with DCD or p-DCD in South Africa and should play a supplementary role in a multidisciplinary therapeutic team. Currently, a standard motor intervention framework for kinderkineticists with practical experience in motor development is not available. The question can, therefore, be asked: What essential motor intervention framework for children with DCD or p-DCD in the South African context should be part of the kinderkinetics scope of practice? Developing a motor intervention framework provided by experts in the field of kinderkinetics is essential to proposing guidelines for kinderkineticists working with children with DCD or p-DCD, also within a field-based setting. Therefore, the aim of this study was to determine what the motor intervention framework should be for children with DCD or p-DCD in the field of kinderkinetics within the South African context.

METHODOLOGY

Research design

An e-Delphi survey was conducted to obtain quantitative opinions. According to Nasa *et al.* (2021) and Sablatzky (2022), the Delphi technique is a systematic process of forecasting using the collective opinion of panel members. It is also well documented that the structured method of developing consensus among panel members using Delphi methodol ogy has gained acceptance in diverse fields of medicine (Niederberger & Spranger, 2020; Veugelers *et al*., 2020; Nasa, 2021; Spranger *et al*., 2022). Therefore, this study provided the researchers with feedback and input on motor intervention for children with DCD and p -DCD in kinderkinetics to develop a motor intervention framework. The e-Delphi survey consisted of three rounds. Participants' opinions were requested in round one, and their responses were obtained and analysed to reach consensus. Statements and questions that did not reach co nsensus were added to the next round for review and consideration by the participants (Figure 1). If consensus co uld not be achieved in round three for reasons stipulated by the participants, this outcome was considered in the final framework.

Participants

An appropriate panel of experts was required for the e-Delphi method, to ensure quality responses, less potential bias, and credibility (Nworie, 2011). There is no current standard for the sample size of an e-Delphi; however, it should not be too small. The larger the group size, the greater the quality of feedback (Giannarou & Zervas, 2014). The authors ensured all these requirements were met when selecting the participants for the e-Delphi survey.

Twenty-nine qualified kinderkineticists were recruited for this e-Delphi survey, selected based on their professional kinderkinetics qualification with prerequisite experience, knowledge and insights related to different motor interventions for children with DCD or p -DCD. Kinderkinetics is a young profession, therefore their level of expertise consisted of 5 years or more experience practising as a kinderkineticist, and they were registered with the South African Professional Institute of Kinderkinetics (SAPIK). Qualified and practising kinderkineticists have expertise in presenting motor intervention programmes, as this is part of their concise training and is presented in various manners within their practices. The kinderkineticist was required to fulfil at least one of the following criteria: academic position in kinderkinetics with 5 or more years' experience or an employer or employee of a kinderkinetics practice with 5 or more years' experience in motor intervention programmes. Lastly, all the participants should have been based in various provinces and from various practices and universities in South Africa. If invited participants felt they did not have the required experience, they were allowed to decline to take part.

Procedure

Participants were invited by email to take part in this study. The consent letter provided information on the aim of the study, ethical clearance, how the e-Delphi works and what could be expected in the follow-up process. The participants were asked to provide consent to participate, which was applicable to all the rounds of the e-Delphi. After the participants' consent letter was received, the first round of the e-Delphi questionnaire was sent by email with clear information on how to complete the survey by clicking on the link provided. A glossary addendum was added with clarification on various motor intervention approaches and types. Participants had 2 weeks to complete each round of the survey and a reminder was sent every 4 days. After setting up round one, the questionnaire was piloted with two experts who were not taking part in the study, for feedback on the duration, clarity and structure of the questions to ensure that it was linguistically accurate.

The e-Delphi technique consists of several rounds until a consensus of 80% is reached between participants (Nworie, 2011). The participants' expression was anonymous to each other, thus providing the opportunity for the participants to give their honest opinions and reconsider and refine their views as the rounds continued (Giannariou & Zervas, 2014). The e-Delphi survey for this study consisted of three rounds. Each round focused on collecting information and opinions from the participants to draft a motor intervention framework for children with DCD or p-DCD in kinderkinetics.

Ethical considerations

Ethical clearance to conduct the research was obtained from the Human Research Ethics Committee (HSREC) of the Faculty of Health Sciences, University of the Free State (UFS - HSD2017/1363). Written informed consent was obtained from all the experts participating in the e-Delphi before data collection commenced.

Data collection

The e-Delphi survey focused on collecting participant opinions on motor intervention suggestions and recommendations in the literature, through a semi-structured questionnaire available online. The sections included in the questions for round one were based on information obtained from an in-depth literature review. The UFS EvaSys Survey System was used to set up the questions and for the participants to answer the questions. Only participants who responded to the first round of the e-Delphi survey were included in the next rounds, to limit attrition bias.

The e-Delphi consisted of 10 sections: additional role players; assessment tools; goal setting; types of motor intervention programmes; additional inclusions in the motor intervention; group and individual delivery mode; motor intervention setting; time of motor intervention; dosage (duration, frequencies and the number of sessions); and, lastly, evaluating the motor intervention programme. The questionnaire took approximately 20 minutes to complete in each round.

Round one included 89 questions consisting of closed-ended questions such as dichotomous questions (yes/no), multiple-choice questions and Likert scale (agree/disagree) questions, as well as questions with open-ended responses. The closed questions were evaluated for consensus by the EvaSys program and the primary researcher. The open-ended responses and comments from participants were compiled into questions and statements to use in round two. The experts' answers and opinions in round one were used to formulate the statements and questions in round two. Round two consisted of 144 questions and included mostly Likert scale (agree, disagree) questions and multiple-choice questions, with some open-ended questions. Participants were allowed to comment further if desired. Round three included 30 questions and consisted of Likert scale and multiple-choice questions and three open-ended questions to gain further input regarding intervention. A table was provided in round three with a summary of the findings drafted from rounds one and two. The main sections of the questions remained the same in all the rounds. If consensus (80%) was reached, it was indicated in the next round. If consensus was not reached, the question was repeated in the next round. In some cases, questions had been modified slightly or added, based on the participants' opinions in the previous round. Where consensus was not reached in round three, the statements by the participants were reported in the results of this article. After information was collected from round three, a motor intervention framework was developed.

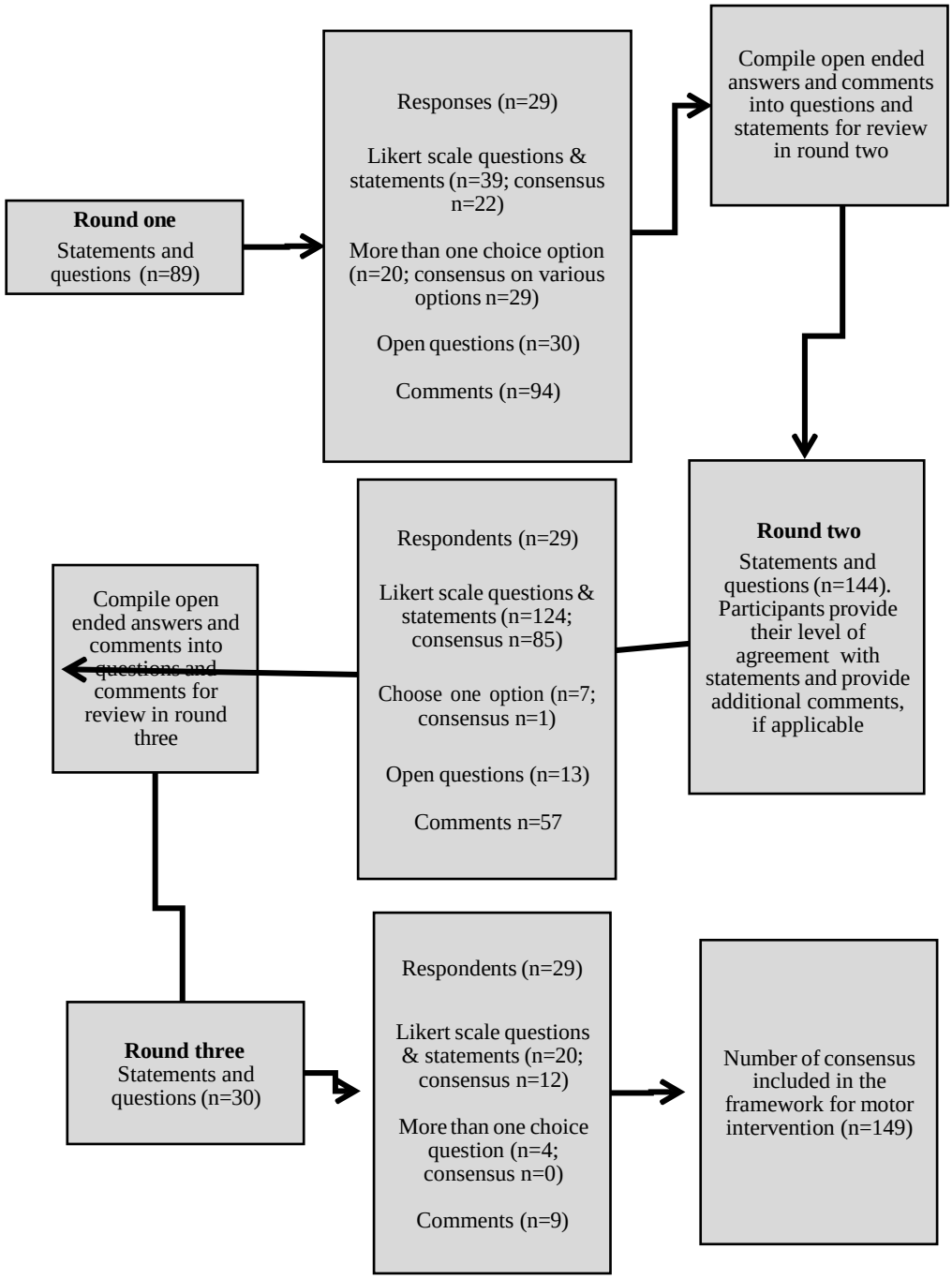


Figure 1. **FLOW DIAGRAM OF THE E-DELPHI PROCESS**

Validity and reliability of the e-Delphi

Thorough information was received from SAPIK and the participants themselves on the validity of the e-Delphi survey. The information received from SAPIK and further information obtained from the participants confirmed that they adhered to the required comp etence and knowledge in the field of kinderkinetics and motor intervention for children with DCD or p-DCD. Questions were further thoroughly planned and evaluated to ensure the validity of the captured data.

Analysis of data

The UFS EvaSys Survey System quantitatively analysed the responses from the participants provided during all three rounds. Descriptive statistics of the participants were further recorded and analysed by the EvaSys program. A consensus agreement of 80% or more was an indication of agreement. The researchers recorded and analysed the open-ended questions for each participant and incorporated them in the next round of questions and final motor intervention framework where applicable.

RESULTS

Twenty-nine kinderkineticists participated in the e-Delphi survey, with a 100% response rate for all three rounds. Table 2 summarises the demographic variables of the participants. Overall, 93.1% (n=27) of the participants were female and 6.9% (n=2) were male. The mean age of the group was 33.5 years, with a standard deviation (SD) of 6.67 years and range of 28 –62 years. On average, the participants had 11.3 years of experience with children aged 0 –13 years (SD 6.54, range 5–40 years). The highest qualification of most of the participants was an honours degree (n=20; 69.0%). Five (17.2%) held a master's degree and four (13.8%) had a PhD. Regarding years of experience with DCD intervention, 10% (n=3) had no experience, 3% (n=1) had less than a year, 21% (n=6) had 1–3 years of experience, 21% (n=6) had 4–5 years' experience and 45% (n=13) had more than 5 years' experience. Although it is indicated that some had no experience, all participants had extensive experience in working with children with motor difficulties.

Table 2. **DEMOGRAPHIC INFORMATION OF THE E-DELPHI PARTICIPANTS**

Variable	n (%)
Gender	
Male	2 (6.9)
Female	27 (93.1)
Highest qualification	
Honours degree	20 (69.0)
Master's degree	5 (17.2)
PhD	4 (13.8)
Additional qualification(s) related to motor development	
Yes	13 (44.8)
No	16 (55.2)
Author/co-authors of article(s) published in a peer-reviewed journal	
Yes	8 (27.6)
No	21 (72.4)

Province where employed [a]	
Eastern Cape	1 (3.4)
Free State	5 (17.2)
Gauteng	13 (44.8)
Kwa-Zulu Natal	0 (0)*
Limpopo	0 (0)*
Mpumalanga	2 (6.9)
North West	5 (17.2)
Northern Cape	1 (3.4)
Western Cape	5 (17.2)
Setting of employment [b]	
Gymnasium of health club	3 (10.3)
Multidisciplinary practice	6 (20.7)
Permanently at one school	8 (27.6)
Private practice	18 (62.1)
University	5 (17.2)
Various pre- and primary schools	16 (55.2)
Socioeconomic environment of employment [c]	
Low socioeconomic	7 (24.1)
Middle socioeconomic	26 (89.7)
High socioeconomic	17 (58.6)
Years of experience with DCD intervention[d]	
No experience	3 (10.3)
Less than one year	1 (3.4)
1–3 years	6 (20.7)
4–5 years	6 (20.6)
More than 5 years	13 (44.8)

[a] Some participants work in more than one province.
[b] Some participants work in more than one setting.
[c] Some participants work in more than one socioeconomic environment.
[d] All the participants had experience working with children with motor delays.
*No participants qualified according to the criteria

In round one, consensus (80%) was reached on 51 of the 89 questions (see Table 3 for all the questions that reached consensus). Ninety-four comments from the open questions (n=30) were reviewed and compiled into questions and statements for round two. A to tal of 144 statements and questions were identified for review in round two.

Table 3. **STATEMENTS AND QUESTIONS REACHING CONSENSUS IN ROUND ONE OF THE E-DELPHI SURVEY**

Section	Statement or question	Level of consensus
Additional role players	• Role players that should be included are:	
	o Parents.	100%
	o Physical education teacher.	100%
	o Class teachers.	97%
	• Other role players should be involved and play an essential role in the success of a motor intervention programme.	97%
	• Kinderkineticist should provide advice to the role players on the difficulties of a child with DCD.	90%
	• Kinderkineticist should provide advice to the role players on how to assist the child with DCD.	93%
	• Kinderkineticist should provide advice to the role players on the abilities of a child with DCD.	83%
Assessment tools for the identification of a motor intervention programme	• The following suggestions of assessment options to identify p-DCD and assist in goal setting have been identified:	
	o Motor proficiency tests.	100%
	o Parent and/or teacher-reported questionnaire.	100%
	• Information/resources to determine the environmental context and psychosocial factors of the child:	
	o Parents reports and/or feedback.	97%
	o Teacher reports and/or feedback.	97%
	o Medical history.	83%
	The test items and subcomponents in a motor proficiency test help identify the child's motor skill difficulties level.	90%
Goal setting	• Individual goals should be considered for a motor intervention programme.	97%
	• The following factors and/or viewpoints should be considered when planning goal setting:	
	o The health of the child.	97%
	o Physical factors.	93%
	o Strength and weakness of the child.	86%
	o Activities of daily living.	86%
	o Self-concept.	83%
	• At the end of the motor intervention programme, the child should have increased/improved:	
	o Participation in physical activity.	97%
	o Well-being.	97%
	o Activities of daily living.	97%
	o Functional tasks.	93%
	o Execution of challenging activities.	93%
	o Body functioning.	90%
	o Motor skills.	86%
	o Motivation.	86%

Types of a motor intervention programme	• Apparatus/equipment to use in a motor intervention:	
	○ Basic physical education apparatus.	100%
	○ Therapeutic equipment.	100%
	○ Playground apparatus.	90%
	• Body function-oriented intervention options to use:	
	○ Perceptual-motor intervention.	100%
	○ Fundamental motor skill intervention.	86%
	○ Motor skill training.	83%
	• A combination intervention approach is the best approach for a motor intervention programme for DCD children.	83%
Group and/or individual mode	• Factors to consider for group intervention:	
	○ Size of the group.	100%
	○ Manageability.	100%
	○ Instructions.	100%
	○ Effectiveness of motor intervention.	100%
	○ Goals of the motor intervention programme.	100%
	○ Ability to monitor individual progress.	100%
	○ Motor skill ability of the child.	96%
	○ Psychosocial factors of the child.	93%
	○ Professionals available.	90%
	○ Age of the child.	83%
Setting	• Therapy-based intervention is the most beneficial.	90%
Duration, frequency and number of sessions	• Consider the child's age.	100%
	• A session should be between 30 to 45 minutes.	88%
Evaluating the motor intervention programme	• Aspects to evaluate the effectiveness of a motor intervention programme:	
	○ Evaluate the effects of the intervention programme.	100%
	○ Determine if further intervention is required.	93%
	○ Evaluate if goals are reached.	90%
	• MABC-2 to evaluate the effectiveness of intervention.	93%

Participants reached a consensus on 89 of the 144 statements provided in round two. The 15 open questions and 57 comments were compiled into statements and questions for round three. The last round included 30 statements, of which consensus was reached for 12. The results are shown in Table 4.

Table 4. **STATEMENT AND QUESTIONS REACHING CONSENSUS (≥80%) IN ROUNDS TWO AND THREE OF THE E-DELPHI SURVEY**

Section	Statement or question	Level of consensus
Additional role players	• Provide clear instructions on when to stop assisting.	97%
	• Role players that should be included are:	
	o Occupational therapist.	90%
	o Other therapists currently working with the child.	90%
	o Additional caregivers.	83%
	• Provide general guidelines to the role players on daily living participation.	83%
Assessment tools for the identification of a motor intervention programme	• The child's age determines assessment tools to use in goal setting.	100%
	• Assessments and/or checklist should be used to determine underlying problems that cause movement difficulty.	100%
	• MABC-2 is the gold standard and should be used.	100%
	• BOT-2 can be used as an additional test.	100%
	• DCD Q'07 can be used as an additional screening.	100%
	• MABC-2 Checklist can be used as additional screening.	100%
	• Screening/testing options should be used depending on the child's problems.	93%
	• TGMD-3 can be used as an additional test.	86%
	• The START checklist can be used as an additional test to evaluate the impact of motor difficulties on the child's daily performance.	90%
	• PDMS-2 can assist if a young child shows DCD's characteristics features and to determine the need for ongoing monitoring.	86%
	• Tests evaluating underlying neuromotor components should be used in setting goals for motor intervention.	86%
	• Factors that will determine which information to use to determine the environmental context and psychosocial factors for the child with DCD:	
	o Resources available to use.	100%
	o Where the problem occurs (school or home).	100%
	o Living conditions of the child.	97%
	o Age of the child.	97%
	• The following information resources should be used to identify the child's environmental and psychosocial factors associated with DCD:	
	o Clinical examination, if available.	93%
	o Child self-report if the child is old enough.	90%
	o The results of a motor proficiency test.	90%
	o A family lifestyle report.	90%
Goal setting	• The child's baseline ability level will determine what the goals for the motor intervention programme will be.	100%
	• Emotional goals to boost the child's self-esteem through movement should be considered if emotional problems are experienced.	100%
	• The child should experience joy while moving.	100%
	• If sport-specific goals are considered for the motor intervention programme, the kinderkineticist should first start with fundamental movement skills that are the building blocks of sport-specific skills.	100%
	• Improvement, even if it is just 1%, can be celebrated.	100%
	• Functional goals for each individual should be used to determine the goals of the motor intervention programme.	97%
	• Sport-specific goals should be considered if the child is old enough and wants to participate in a specific sport or struggles with a sport.	93%

	• Individual or group-based intervention will help determine the goals of the motor intervention programme.	90%
	• Long-term health, well-being, body functioning, motor skills, general fitness, psychosocial factors, motivation, functional tasks, daily living activities, emotional skills, social skills, and participation in play activities, sports activities, physical activities are all interlinked with each other. If one link is not working, it will affect the rest of the factors.	90%
	• If group intervention is used, each child's problems should be used independently to determine goals.	86%
	• In order to determine if improvement has occurred, improvement should be measurable.	86%
	• The following factors and/or viewpoints should be considered when planning goal setting for a motor intervention programme:	
	o Childs' viewpoint if the child is old enough.	97%
	o If the child struggles with specific skills used to participate in free play activities.	97%
	o Emotional factors.	93%
	o Psychosocial factors.	93%
	o If a child experiences problems with general fitness.	93%
	o General problems.	93%
	o The child's family's viewpoint if they play an active role in the child's life.	86%
	o Social support.	86%
	o Environmental factors.	83%
	o Peer interaction.	83%
	o Self-care of the child.	83%
	o Academic performance if it is a problem for the child.	83%
	o The social ability of the child.	83%
Types of a motor intervention programme	• The most appropriate intervention approach should first be selected and combined with interventions from other approaches to address specific problems.	100%
	• The selection of intervention approach types will depend on the problems experienced.	97%
	• Part of the motor intervention programme should be child-centred, setting their own goals if they are old enough.	93%
	• The situation/s in which the child with DCD finds himself/herself should be considered a factor before choosing the type/s of interventions to use.	86%
	• The choice of additional body function and/or activity and/or participation-oriented intervention will depend on:	
	o Problems the child experiences.	100%
	o Functional problems the child experiences.	100%
	o Outcomes the kinderkineticist wants to achieve.	97%
	• Apparatus and/or resources to use in intervention:	
	o Age-appropriate sport-related equipment.	100%
	o Visual apparatus.	97%
	o Apparatus used for daily living.	90%
	o Academic apparatus if academic problems occur.	90%
	o Fine motor apparatus.	83%
Group and/or individua mode	• The size of the group would depend on:	
	o Age of the child.	100%
	o Skill level of the child.	100%
	o The attention span of the child.	100%
	o The cognitive capacity of the child.	97%
	o The ability of the child to follow instructions.	97%
	o Sensory profile of the child.	86%
	• Children who experience severe problems should be two to three in a group.	93%
	• A combination of individual-based intervention with group sessions is the best option for motor intervention.	83%

Time of motor intervention programme	• The time of the day a motor intervention programme will be presented will depend on:	
	○ School schedule of the child.	100%
	○ Child's concentration level.	93%
	○ When the child sleeps.	93%
	○ The availability of the venue or location.	93%
	○ The availability of transport.	93%
	○ Blood sugar levels of the child.	93%
	○ Age.	90%
	○ Self-regulation of the child.	86%
	○ When the child eats.	86%
	○ Energy levels.	83%
Durations, frequencies, and sessions	• The duration, frequency and number of sessions will depend on the _____of the child.	
	○ Prognosis.	100%
	○ Extent of the difficulties/severity of the problems.	100%
	○ How many sessions per week the child receives.	100%
	○ Progress rate.	97%
	○ Integration of skills and how to sustain these skills.	97%
	○ The financial status of the parents/caregivers.	97%
	○ Whether the child is committed to the home programmes provided.	97%
	○ If the child experiences regression after a while without intervention.	97%
	○ Goals that need to be achieved by the child.	97%
	○ The willingness of the child to participate.	97%
	○ Needs.	93%
	○ Number of functional areas that require attention.	93%
	○ Cognitive ability.	90%
	• The length of a session will depend on the _____of the child with DCD:	
	○ Age.	100%
	○ Endurance capacity.	100%
	○ Concentration level.	97%
	• If the motor intervention programme is presented three times a week, the therapist conducts the therapy twice a week, and the parents conduct the therapy once a week at home.	97%
	• Parents/caregivers should exercise with the child daily when the child does not receive the intervention.	93%
Evaluating the motor intervention programme	• The same test was used as the child's initial assessment to identify DCD before the motor intervention programme should be used to determine if real progress was made.	100%
	• It is important to evaluate whether there were any aspects of the motor intervention programme that was unsuccessful.	93%
	• Various assessment tools should be used to determine progress on different aspects of the child with DCD.	90%

DISCUSSION

CPR-DCD recommendations exist for intervention in a clinical setting (Blank *et al.*, 2019) and best practice guidelines for DCD intervention are provided during training for kinderkineticists (Pienaar, 2020). Despite this, a motor intervention framework was required for children with DCD or p-DCD, derived by kinderkinetics experts in the South African context, that could be used to overcome the contradictions existing in the literature. In this study, the experts identified 10 main aspects (intervention planning; goal setting; intervention approaches; intervention apparatus; intervention delivery mode; additional role players; settings; dosage (time; duration, frequency and number of sessions); and evaluation to form the fou ndation of

the motor intervention framework. The statements reaching agreement and forming part of the final framework (Table 3, Table 4 and Figure 2) are highlighted in this discussion. The percentages in brackets demonstrate the agreement percentages of each aspect being discussed.

The participants (28 of 29) stated that before choosing the resources to obtain information on the child's environmental context and psychosocial factors, their age (97%) should be determined. This was supported by the literature indicating that the child's development level should be used for planning intervention (APA, 2013; Blank *et al.,* 2019). To plan the correct motor intervention, the setting in which the problem occurs (100%), the child's living conditions (97%) and the resources available (100%) should further be established, as emphasised in Table 4. These results correlated with Blank *et al.* (2019) and further pointed out that the child's personality should also be considered. However, personality was not a focus point for the experts involved in this study. Resources to collect the above -mentioned information (Tables 3 and 4) include a medical history report (83%), parent and teacher questionnaire (97%), age-appropriate child self-report (90%), family lifestyle report (90%), clinical examination (if available) (93%) and the results of a motor proficiency test (90%) to determine environmental and psychosocial factors. This information will assist with goal setting within the scope of kinderkinetics, as well as determining the best intervention setting.

The participants agreed (100%) that the child's baseline ability level should be considered for goal setting. Furthermore, the child's health (97%), strength and weaknesses (86%), physical factors (93%), environmental factors (93%), psychosocial factors (93%), own viewpoint (97%), general fitness (93%), peer interaction (83%), self-care (83%) and academic performance (83%) should be considered when setting the goals for the intervention. The results correlate with Blank *et al.* (2019) who highlighted the importance of considering the environmental strengths and weaknesses that the child experiences, as well as with researchers who indicated that all factors that relate to the different problems present in the child should be considered to assist in planning and goal setting (Lucas *et al.,* 2016; Biotteau *et al.,* 2017; Smits-Engelsman *et al.,* 2018). The psychosocial and emotional factors of the child contribute to goal setting (Blank *et al.,* 2019) and could provide the therapist with the necessary information to determine if the emotional aspects identified in the child should be incorporated into the intervention programme (Draghi *et al.,* 2020). Lastly, 27 of the 29 participants highlighted general fitness (93%) as essential to consider for goal setting and agreed with Blank *et al.* (2019) that physical fitness is recommended during goal setting, due to many children with DCD and p-DCD experiencing overweight and obesity.

The results further demonstrated that the family's viewpoint (86%) should be considered if the family plays an active role in the child's life. The results were supported by the literature indicating that the family and the child's viewpoint should be considered for setting goals (Blank *et al.,* 2012; Blank *et al.,* 2019). Setting goals will further be established by environmental factors (83%) recommended by the e-Delphi results (Table 4) and agrees with the recommendations by Blank *et al.* (2019). The APA (2013) has determined that environmental factors can increase DCD risk and should be considered during motor intervention. DCD is further known to impact daily living activities, and therefore the e -Delphi emphasised consideration of these activities for goal setting. Blank *et al.* (2012) have pointed out that the goals should be to increase daily living activity participation comfortably to execute it independently. All the participants (100%) further had a strong feeling towards ensuring that the intervention should be joyful and set as one of the motor intervention goals. The reason for

a joyful intervention could be to invest in the importance of movement throughout life and to enhance physical activity and sport participation, which improves motor skills and lowers p - DCD, as well as to improve cooperation during therapy (Ferguson *et al.,* 2015). The results further pointed out that if sport-specific goals were considered for the motor intervention programme, the kinderkineticist should start with the fundamental movement skills required as the building blocks for sport-specific skills (100%).

This study's results have found that the goals should be determined by using motor proficiency tests. The Movement Assessment Battery for Children-2 (MABC-2) (100%) was recommended, with additional tests such as the Bruininks Oseretsky Test of Motor Proficiency - 2 (BOT-2) (100%), the Test of Gross Motor Development-3 (TGMD-3) (86%) and the Peabody Developmental Motor Scales-2 (PDMS-2) (86%) for younger children. The MABC-2 has been identified as the gold standard for identifying motor difficulties (Schoemaker *et al.,* 2012; Caçola, 2014; Blank *et al.,* 2019) and the BOT-2 has also been pointed out in the literature for use as a possible assessment for p-DCD (Novak, 2013; Blank *et al.,* 2019). All the participants further agreed (100%) that parent and teacher questionnaires could help with goal setting. It has been recommended that the Developmental Coordination Disorder Questionnaire '07 (Blank *et al.,* 2019) and the MABC-2 Checklist (Schoemaker *et al.,* 2012) is used by parents and teachers. Another example highlighted by the results is the Short-Term Assessment of Risk and Treatability (START) tool (90%), which can be used to evaluate the impact of motor difficulties on the child's daily activities. The test results should give an indication of the child's level of motor delay and, specifically, the motor skills the child struggles with, which should be used for goal setting, as stipulated by the e-Delphi survey. The findings correlated with reports in the literature giving prominence to the importance of considering the child's activity level for setting goals in an intervention programme (Lee *et al.,* 2016; Blank *et al.,* 2019).

The results of the e-Delphi further confirmed that the physical activities and play activities (97%) of the child should show improvement by the end of the motor intervention. The findings are supported by Smits-Engelsman *et al.* (2018), who stated that if specific skills were improved during the intervention, daily play activities will improve. The researchers specified that fundamental movement skills should be a goal for the intervention and improve ment to general skills and specific motor skills (Smits-Engelsman *et al.,* 2018). Improved specific motor skills will increase sports activities in children (Smits-Engelsman *et al.,* 2018). Other aspects identified by the participants that should improve after the motor intervention has been conducted are motor skills (86%), functional tasks (93%), daily living activities (97%) and challenging activities (93%). It has been documented that children with DCD struggle with participation in activities and have lower functional abilities, which should be addressed during the intervention and show improvement by the end of the intervention (Caçola *et al.,* 2016; Delgado-Lobete *et al.,* 2020).

Improvement in the skills mentioned above will increase motivation (86%), which was another aspect highlighted in the e-Delphi survey. Ashkenazi *et al.* (2013) have established that focusing on the correct goals could increase the child's motivation. Overall independent participation in meaningful life areas should be improved after the motor intervention and is therefore important for goal setting. The results are in accordance with Blank *et al.* (2019), who stated that interventions should be transferred to daily participation in real-life activities.

The results of the e-Delphi (Table 3) determined that individual goals (97%) should be used in planning and this agreed with Blank *et al.* (2019). These researchers stated that the child's individual goals should be the primary focus when planning the intervention programme. One of the additional goals to use during the planning of the motor intervention, on which the participants reached consensus, was that goals should be set by the child. However, the child's selection of goals should only be conducted if the child is old enough. It has previously been questioned in the literature if it would be beneficial for children to choose their own goals, as increasing anxiety levels and task engagement were reported (Zwicker *et al.,* 2015; Caçola *et al.,* 2016) and choosing their own goals will not improve their self-efficacy when participating in physical activity (Zwicker *et al.,* 2015). The results included functional goals (97%), emotional goals (100%) and sport-specific goals (93%) as other types of goals to consider. Emotional goals should be set only if emotional problems are experienced (100%) and sport - specific goals (93%) should be age appropriate. It has been reported that sport-specific skill training can effectively improve motor abilities (Caçola *et al.,* 2016).

The goals set by the child will further influence the type of intervention that will be chosen. Even though various intervention approaches are available, all the participants agreed that a combined motor intervention approach (100%) should be used by sele cting the most appropriate approach and combining it with some of the other approaches. These results contrasted with findings in the literature that stipulated using a task-oriented approach, more recently known as the activity-oriented approach (Lee *et al.,* 2016; Yu *et al.,* 2018; Blank *et al.,* 2019). However, one reason for choosing the combined approach is that it addresses the various problems related to DCD (Biotteau *et al.,* 2017) and the students studying their kinderkinetics degree are trained extensively in this approach (Pienaar, 2020). The participants agreed (97%) that the different approaches should be selected according to the problems the child experiences. The combined approach has pointed out that many of the approac hes described in the literature include aspects or characteristics of other approaches (Pienaar & Lennox, 2006; Smits-Engelsman *et al.,* 2012; Lucas *et al.,* 2016; Smits-Engelsman *et al.,* 2018). However, the participants' recommendations agreed with the statements of Pienaar and Lennox (2006), Wilson (2005) and Yu *et al.* (2018), who indicated that a combination approach is an effective strategy to reach success with children with DCD or p-DCD. More recently, it has been reported that body function-oriented approaches are combined with activity-oriented intervention approaches (Smits-Engelsman *et al.,* 2018). However, some participants (5/29; 17%) suggested that there might be specific cases where only one approach should be used, as indicated in Figure 2.

The results from the e-Delphi identified various kinds of apparatus that should be included in the motor intervention, such as playgroup (90%) and basic physical education (100%) apparatus, therapeutic equipment (100%) and age-appropriate sports equipment (100%). The results further indicated that visual (97%), academic (90%) and fine motor (83%) apparatus should be included when the child experiences problems in those areas due to DCD or p -DCD. Further comments suggested that the child's age should be a determining factor for choosing apparatus and that daily living apparatus could be included but should not be the main focus of the intervention programme. Literature on the type of apparatus used for motor intervention programmes in DCD or p-DCD has not yet been identified, and therefore the choice of apparatus will depend on the intervention type. However, it has been mentioned that hoops, ropes, ladders and outdoor equipment, which could be part of various kinds of apparatus

specified by the participants, have been used in motor intervention programmes (Preston *et al.,* 2017).

With regards to the mode of delivery of the intervention, participants (24 of 29) indicated that individual-based intervention is recommended but, in some instances, these interventions could include group sessions. The results are supported by literature indicating that individual-based intervention provides more opportunities to practise motor skills (Ernst, 2003; Pienaar & Lennox, 2006; Hung & Pang, 2010; Coetzee & Pienaar, 2013). Children do not have to wait a turn and there are fewer distractions to influence them. Also, a group-based intervention should be used if individual-based intervention is not possible, and literature has confirmed that group-based intervention can improve the motor skills of children (Peens & Pienaar, 2007; Caçola *et al.* 2016; Pienaar, 2020). In a group-based intervention, the size of the group (100%), instructions (100%), manageability (100%), effectiveness of the intervention (100%), number of professionals available (90%), motor skill ability of the child (96%), ability to monitor individual progress (100%) and the child's age (83%) should be considered. The results are supported by Smits-Engelsman *et al.* (2018) who specified the importance of managing the group to evaluate individual progress, and Martini *et al.* (2014) who identified that the children's age levels, degree of difficulties experienced by each child and the type of problems should be taken into consideration for a group-oriented approach. The results further showed that skill levels (100%), cognitive capacity (97%), ability to follow instructions (97%), sensory profile (86%) and attention span (100%) were determinants of a group versus individual approach. The group sizes recommended by the participants varied, as shown in Figure 2, and the literature reported inconsistencies, such as groups of five to eight children (Ferguson *et al.,* 2013), and four to six children (Hung & Pang, 2010; Caçola *et al.,* 2016). Suggestions from the e-Delphi survey (Table 4) further advised that children with severe motor difficulties should be in small groups (two to three per group) (93%), which correlated with Hung and Pang (2010), especially when considering the severity of the disorder (Blank *et al.,* 2019).

Class teachers (97%), physical education teachers (100%), occupational therapists (90%), parents (100%), additional caregivers (83%) and other therapists working with the child (90%) were a point of consensus to include in the motor intervention. This related to the literature specifying that other health professionals, parents, educational professionals, coaches and relevant others play an essential role in the intervention of children with DCD or p -DCD, and increase the effectiveness and training opportunities (Caçola, 2014; Lee *et al.,* 2016; Yu *et al.,* 2018). A small number of participants (5/29) commented that the role players will differ depending on the child's problems. The literature supported this comment and specified that supportive role players create opportunities by improving various secondary problems in children with DCD (Ashkenazi *et al.,* 2013; Caçola, 2014; Yu *et al.,* 2018; Blank *et al.,* 2019). It is therefore important that all the role players should also understand their function in the intervention programme, as shown in Figure 2.

The recommended setting for the motor intervention has been identified as a therapy -based setting (90%), considering school-based and home-based settings if therapy-based is too expensive. The results agreed with previous findings that school-based settings and home-based settings are cost-effective (Ashkenazi *et al.,* 2013; Yu *et al.,* 2018). Schools have further been identified as sustainable for keeping up with the motor intervention (Blank *et al.,* 2019), while home settings provide opportunities to practise activities more frequently (Ashkenazi *et al.,* 2013). One of the participants' comments suggested that a home-based setting will depend

on the child's living conditions, which was also highlighted in the literature and indicated that the home situation would be a determining factor (Lee *et al.,* 2016). The e-Delphi further determined that a once-off therapy-based session should be conducted with continuous school- and home-based follow-ups after the initial session, which agrees with Ashkenazi *et al.* (2013). Some participants commented that parents and teachers should be motivated; otherwise, these settings will not work.

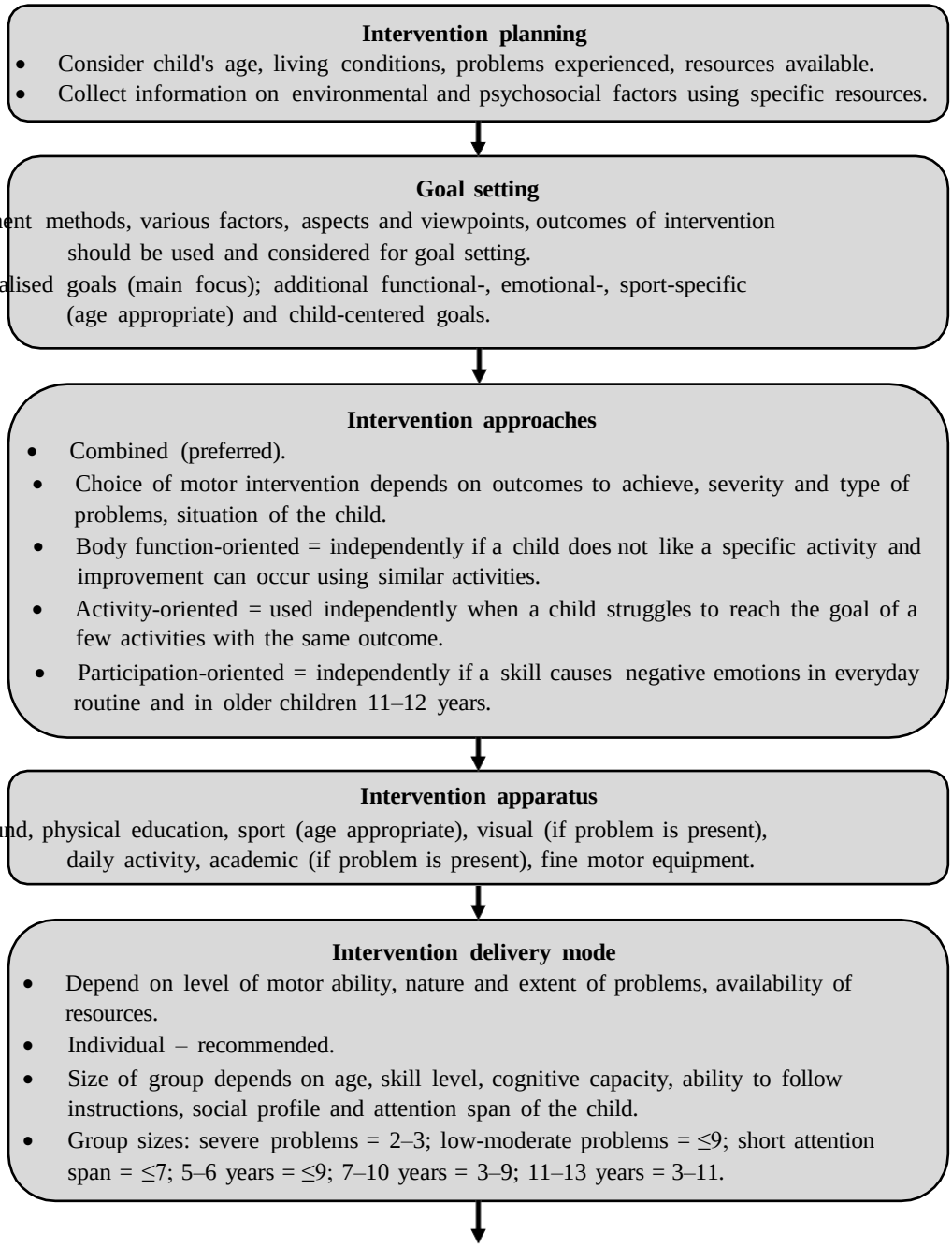
Consensus was reached on the time of the day (07h00–12h00) to conduct the motor intervention. Children are more awake during this time, making the intervention more effective, and the time does not interfere with extracurricular activities in the afternoon. The finding is important as no information is available in the literature regarding the best time to present a motor intervention and if consensus is reached, it can be provided to kinderkineticists to ensure the best results for a child with p-DCD. The participants agreed (ranging between 83% and 100% agreement) that various factors (Figure 2) such as the child's age, energy levels, school schedule and eating times should be considered to determine the time of day. Another limited and contradicting aspect reported was the recommended dosage (frequency, duration and number of sessions) of a motor intervention (Smits-Engelsman *et al.,* 2012; Ferguson *et al.,* 2013; de Milander *et al.,* 2015; Caçola *et al.,* 2016; Lucas *et al.,* 2016; Blank *et al.,* 2019). It was challenging in the e-Delphi survey to obtain consensus on specific dosage indications; however, the results pointed out that the motor intervention should not be less than 8 weeks. In addition, two studies recommended that an 8-week intervention is too short (Ernst, 2003; Pienaar & Lennox, 2006). The results further indicated that the intervention could be between one and three sessions per week, with sessions lasting between 30 and 45 minutes, depending on various factors (Figure 2) such as the child's age, prognosis and progress rate. However, Peens and Pienaar (2007) were of the opinion that 30 minutes twice a week would be sufficient. These factors will cause variation in the duration, frequency and number of sessions required for each child, and are supported by the literature stating that more than one standard exists (Lee *et al.,* 2016; Smits-Engelsman *et al.,* 2018). Smits-Engelsman *et al.* (2018), however, pointed out that interventions could be successful ranging between 4 and 18 weeks, while Amador-Ruiz *et al.* (2018) and Lee *et al.* (2016) suggested that adequate intervention could be ensured by providing three sessions a week. Lastly, the participants commented that several practice sessions should be provided and agreed with the literature that a larger training dose and high frequencies with several practice opportunities are required for a successful outcome (Lee *et al.,* 2016; Yu *et al.,* 2018; Blank *et al.,* 2019).

The e-Delphi survey recommended evaluation of the motor intervention's success informally (on or before 3 months) and formally (after 3 to 6 months), and again after a break of 8 to 12 weeks to determine if retention occurred. Informal evaluation can include feedback from parents/teachers and the child, whereas formal evaluation will be determined using a motor proficiency test, the same as before starting the intervention. These results are similar to the CPR-DCD recommendations indicating that formal standardised assessment should be repeated at the end of the intervention, and at least every 3 months afterwards when intervention has been conducted for a longer period of time, to determine the effectiveness (Blank *et al.,* 2019). The results should be used to determine if goals were met and whether more extended intervention is required (Blank *et al.,* 2019). Based on the e-Delphi survey results and findings reported in the literature, the motor intervention framework for kinderkinetics for children with DCD or p-DCD was developed and is presented in Figure 2. The main focus of the framework was on intervention planning, goal setting, intervention approaches, apparatus and delivery

mode, as well as additional role players, settings, time intervention, dosage and the evaluation of the intervention. This framework presents the kinderkineticist with a guideline to use when conducting a motor intervention programme for children with DCD or p-DCD that is suitable for the South African context.

Using an online medium was a cost-effective way of collecting information anonymously from participants. The online survey provided an opportunity for the participants to provide input on the different motor interventions that could be used for children with DCD or p -DCD living in South Africa within the scope of kinderkinetics. The survey was of great value due to the 100% response rate and the number of experts who participated in the study. The researchers' continuous communication with the participants ensured success in receiving feedback. Another advantage was that the participants were experts in kinderkinetics who work with children with motor delays and were trained in the different DCD interventions, contributing to the significance of the results.

A limitation identified was that the software used did not have a save option and so the participants were required to complete the survey in one session, which could have been strenuous. Another aspect to consider was that some participants felt that they required a longer time to complete the questionnaire. An indication of 20 minutes might not have been the correct estimate. The participants provided different opinions because their environments, schools and multidisciplinary approaches varied, which influenced obtaining consensus on all factors. A limitation of the study was that although the participants were experts in kinderkinetics, the number of years of experience with DCD children was not considered as a prerequisite for the e-Delphi participants, and this might explain the various opinions from the participants. This is a consideration for future e-Delphi surveys in which expert opinions are required. A further recommendation for future studies would be to obtain the input of other professionals with practical experience or knowledge in DCD interventions such as occupational therapists and physiotherapists working in the South African context, to add value to the framework and to generalise it to a national standard. Lastly, the generalisation of motor interventions across environments has not been addressed in this study and should be considered in future refinement of the framework.


Intervention planning
Consider child's age, living conditions, problems experienced, resources available.
Collect information on environmental and psychosocial factors using specific resources.
Goal setting
Assessment methods, various factors, aspects and viewpoints, outcomes of intervention should be used and considered for goal setting.
Individualised goals (main focus); additional functional-, emotional-, sport-specific (age appropriate) and child-centered goals.
Intervention approaches
Combined (preferred).
Choice of motor intervention depends on outcomes to achieve, severity and type of problems, situation of the child.
Body function-oriented = independently if a child does not like a specific activity and improvement can occur using similar activities.
Activity-oriented = used independently when a child struggles to reach the goal of a few activities with the same outcome.
Participation-oriented = independently if a skill causes negative emotions in everyday routine and in older children 11–12 years.
Intervention apparatus
Playground, physical education, sport (age appropriate), visual (if problem is present), daily activity, academic (if problem is present), fine motor equipment.
Intervention delivery mode
Depend on level of motor ability, nature and extent of problems, availability of resources.
Individual – recommended.
Size of group depends on age, skill level, cognitive capacity, ability to follow instructions, social profile and attention span of the child.
Group sizes: severe problems = 2–3; low-moderate problems = ≤9; short attention span = ≤7; 5–6 years = ≤9; 7–10 years = 3–9; 11–13 years = 3–11.

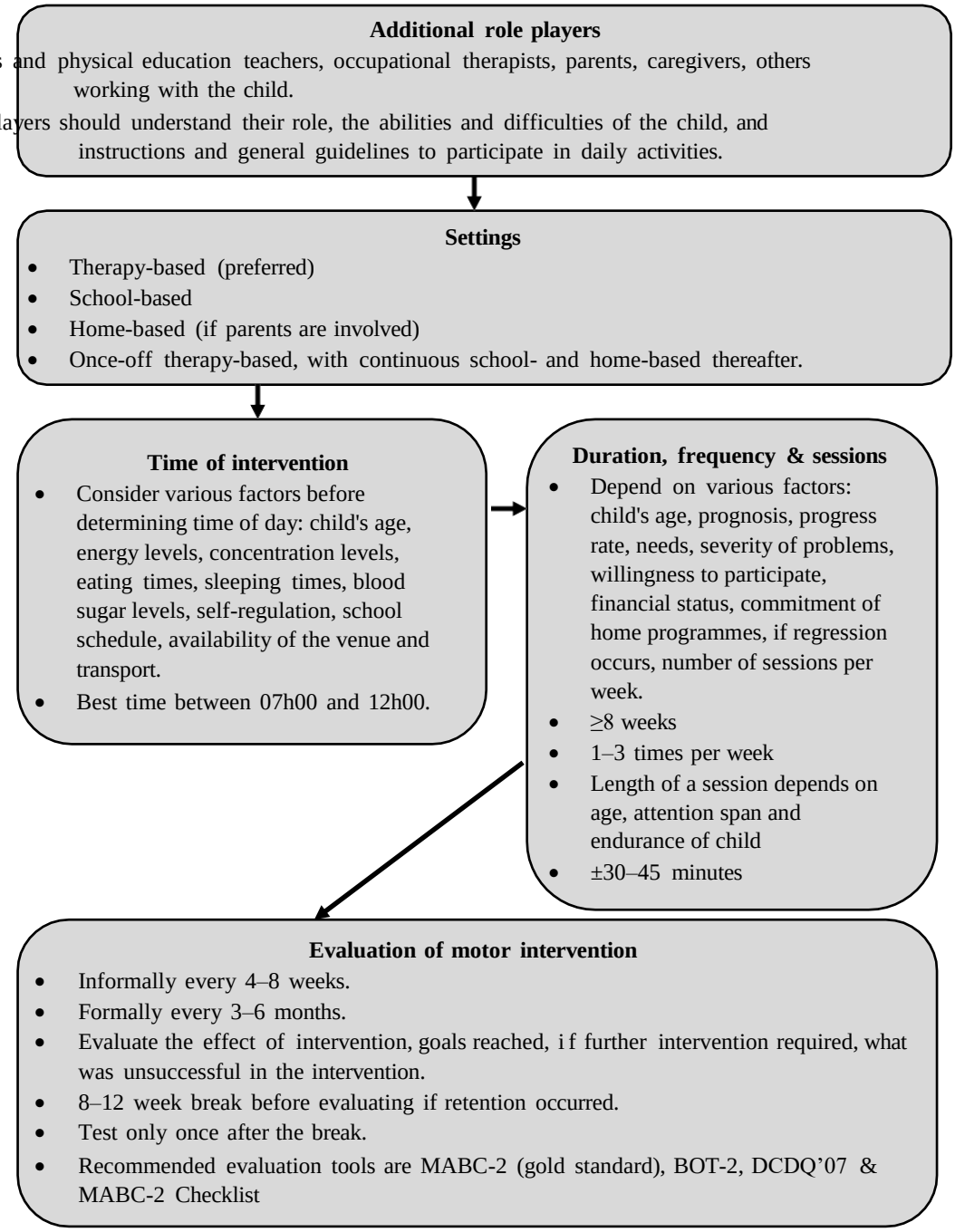


Figure 2. **KINDERKINETICS MOTOR INTERVENTION FRAMEWORK FOR CHILDREN WITH DCD OR PROBABLE DCD**

PRACTICAL APPLICATION

This research has significant value as it provided incisive and unique feedback and input from experts in kinderkinetics to develop a motor intervention framework for children with DCD or p-DCD by considering the South African context within the scope of kinderkinetics. This framework could be used as a guideline by kinderkineticists when working with children with DCD or p-DCD. Future research could focus on refining the framework to a more specific motor intervention programme with recommended specific intervention types, elements of the intervention programme, physical and informational materials required, mode of delivery, location and infrastructure requirements, exercise prescriptions (frequency, intensity, timing) and dosage (duration, number of sessions). Aside from its scope in the field of kinderkinetics, it could be promoted nationally and internationally, especially in developing countries, to determine its efficacy and the outcomes of its application in different cultural and socioeconomic settings.

CONCLUSION

The outcomes of this research led to the proposal of a motor intervention framework for kinderkineticists to use with children with DCD or p-DCD. The results identified 10 aspects (intervention planning; goal setting; intervention approaches; intervention apparatus; intervention delivery mode; additional role players; settings; dosage [time; duration, frequency and number of sessions]; and evaluation) that should be considered and form the foundation of the framework. It has further been established that children with DCD are heterogeneous and that problems in each child with DCD differ according to type and severity. Th is heterogeneity will directly impact planning of the intervention, setting the intervention goals, choosing the intervention approaches, deciding if an intervention should be individual or group -oriented, and determining the duration, frequency and number of motor intervention sessions. This research provides the first framework developed for kinderkineticists in South Africa and will play a valuable role in assisting children with DCD or p-DCD.

A few aspects were highlighted in the feedback from the experts that were not presented in previous literature and add to the uniqueness of the motor intervention framework. An issue that was only identified in this framework that differs from the literatu re is the importance of considering the child's personality when planning the motor intervention. The findings further agreed with the literature that the family's viewpoint of the child with DCD or p -DCD for motor intervention planning should be considered. However, the experts emphasised that this will only be applicable where the family plays an active role, as many children do not experience involvement of their family, especially in low-resourced environments in South Africa. Sport-specific skills were highlighted as important in the framework and emphasis was placed on starting with fundamental movement skills that are the building blocks of sport - specific skills. Furthermore, the experts identified the same assessment tools as reported in the literature to assist with determining goals, but also added the START tool for evaluating the impact of motor difficulties on the child's daily activities as an additional tool that should be used.

Controversies exist in the literature on whether the child should be allowed to set their own goals for the motor intervention. The experts provided the guideline that children should be allowed only if they are old enough, and under the supervision of the kinderkineticist. A unique aspect is that a combined approach has been recommended according to the framework of this

study, and not the recommended task-oriented approach as indicated in the literature. The experts were of the opinion that various problems could be addressed and that addressing these problems is also part of their training as a kinderkineticist. Another unique aspect is that the kinderkineticist should choose the apparatus according to the child's age and that the daily living apparatus that is included should not be the main focus, which has not been reported in the literature findings. Although the report by the experts that teachers and parents should be included in the intervention agreed with the literature, they further emphasised that these role players should be motivated, otherwise the intervention will not be successful at home and the school. Lastly, an indication of the time of intervention was made that has not been provided in the literature, and the guideline is in the morning between 7 am and 12 pm. Even though the literature findings could not provide clear indications of dosage of the moto r intervention, the guidelines recommended by the experts were that the motor intervention should not be less than 8 weeks' duration, with one to three sessions per week and each session between 30 to 45 minutes' duration. This was an important contribution to the motor intervention programme guidelines.

Therefore, this research has provided a valuable framework that is the first of its kind developed for kinderkineticists in South Africa and it will play a beneficial role in assisting children with DCD or p-DCD.

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Conflict of interest

The authors report no conflict of interest.

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