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## Faculteit Revalidatiewetenschappen

master in de revalidatiewetenschappen en de kinesitherapie

### **Masterthesis**

***The inter-rater reliability of the Motor Learning Strategies Rating Instrument (MLSRI) in pediatric physiotherapy interventions for children with Developmental Coordination Disorder (DCD)***

**Karen Hannes**

**Lindsay Vercammen**

Scriptie ingediend tot het behalen van de graad van master in de revalidatiewetenschappen en de kinesitherapie, afstudeerrichting revalidatiewetenschappen en kinesitherapie bij musculoskeletale aandoeningen

### **PROMOTOR :**

Prof. dr. Katrijn KLINGELS

### **BEGELEIDER :**

Mevrouw Ingrid VAN DER VEER



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H.K.  
V.L.



### Research context

This master thesis is situated within the research field of pediatric rehabilitation and concerns the inter-rater reliability of the Motor Learning Strategy Rating Instrument (MLSRI-22) in pediatric physiotherapy interventions for children with Developmental Coordination Disorder (DCD). Motor learning strategies (MLS) are essential in therapeutic interventions of children with neuromotor conditions. Pediatric physiotherapists experience applying MLS as challenging. The Motor Learning Strategy Rating Instrument (MLSRI) was developed to gain insight into the current use of MLS by therapists, which allows pediatric physiotherapists and researchers to compare the use of MLS in physical therapy sessions between and within each therapist. This way, therapists can obtain more insights into their own actions and apply the MLS more consciously.

This study is a duo master thesis and was performed together. The implementation of the method was discussed in consultation between the students and the co-promoter. The students had no influence on the data acquisition, because the videos were already available from a previous study. The data analysis of this study was independently done by the students as well as the academic writing, which received regular feedback by the promoter and co-promoter.



## 1. Abstract

**Background:** Motor learning strategies (MLS) are essential in therapeutic interventions of children with neuromotor conditions. Pediatric physiotherapists experience applying MLS as challenging. The Motor Learning Strategy Rating Instrument (MLSRI) was developed to gain insight into the current use of MLS by therapists, which allows pediatric physiotherapists and researchers to compare the use of MLS in physical therapy sessions between and within each therapist.

**Objectives:** To evaluate the inter-rater reliability of the MLSRI-22 in recorded interventions for children with Developmental Coordination Disorder (DCD).

**Participants:** Participants were 11 pediatric physiotherapists who each video-taped a treatment session of themselves with a child with DCD. All therapists were women with a median age of 50 years (range 26 - 63). Their clinical experience ranged from 4 to 40 years. The children were five girls and six boys with a median age of six years and six months (range 5 - 9).

**Measurements:** The treatment was recorded with a camera. Eleven videos were scored with the MLSRI-22, which evaluates the frequency and extent of MLS use during the session, by two observers. The inter-rater reliability of three individual categories (*therapeutic verbalisation; therapist, and practice is*) and the total score were calculated using intraclass correlation coefficients (ICCs) and 95% confidence intervals (CI).

**Results:** The inter-rater reliability of the categories; *therapist, practice is*, and the total score was good, ICC varied from 0.80 to 0.84. In contrast, the *therapeutic verbalisation* category had a poor reliability with an ICC of 0.43.

**Conclusion:** The MLSRI-22 allows pediatric physiotherapists and researchers to compare the use of MLS in physical therapy sessions, in children with DCD, between and within each therapist. This way, therapists can obtain more insights into their own actions and apply the MLS more consciously.

**Keywords:** Child, DCD, inter-rater reliability, MLSRI, motor learning strategies, motor skills





## 2. Introduction

Motor learning strategies (MLS) are essential in the therapeutic treatment of children with neuromotor conditions (Levac, Wishart, Missiuna, & Wright, 2009). MLS consists of verbalizations, actions and practice organisation (Ryan, Levac, & Wright, 2019). These strategies are used by pediatric physiotherapists to enhance learning of new motor skills. MLS include giving instruction to the child, changing the schedule and amount of physical practice, and providing feedback (Levac et al., 2009). The goal of MLS application is to transfer the learnt movement in different contexts (Levac et al., 2016). Pediatric physiotherapists experience applying MLS as complicated due to lack in clarity (Zwicker & Harris, 2009), namely because motor learning consists of various concepts. These refer to a theoretical framework, with little specification on how to apply this in practice. Besides, there are many factors to take into account, such as the environment, type of task, amount of practice and the learning stage of the child. Which discourages pediatric physiotherapists from using the MLS consistently in practice (Zwicker & Harris, 2009). In addition, working habits and lack of time may form other barriers. This is mainly due to organisational problems. Therefore, motor learning principles are still underutilised by pediatric physiotherapists (Atun-Einy & Kafri, 2019).

The Motor Learning Strategy Rating Instrument (MLSRI) was developed to gain insight into the current use of MLS by pediatric physiotherapists. The MLSRI documents the MLS used by pediatric physiotherapists in video-recorded sessions (Levac, Missiuna, Wishart, Dematteo, & Wright, 2011). There are different versions of the MLSRI. Initially it was a 33 item version, but it is further developed into a 22 item version (Ryan, Wright, & Levac, 2020). With the MLSRI, a profile of the MLS used per treatment session can be made (Ryan et al., 2020), which allows pediatric physiotherapists and researchers to compare the use of MLS in physical therapy sessions between and within each therapist. It also provides an opportunity to identify the relationship between the used MLS and each child's needs. In addition, pediatric physiotherapists can optimise their use of the MLS by using the MLSRI (Ryan et al., 2019). The MLSRI was originally developed and validated for children with acquired brain injury (ABI). At the moment, the MLSRI is also used in other neuromotor disorders such as cerebral palsy (CP) (Levac et al., 2011).

The MLSRI is a valid measurement instrument, based on face and content validity evaluation (Levac et al., 2011). The MLSRI shows a good to high inter-rater reliability and excellent intra-rater reliability for children with ABI (Kamath et al., 2012; MacWilliam et al., 2022; Spivak et al., 2021). In addition, the inter- and intra-rater reliability for children with CP falls within acceptable limits (Ryan et al., 2019). The inter- and intra-rater reliability is not yet known for other populations.

The application of motor learning is common in many children with Developmental Coordination Disorder (DCD). Children with DCD have impaired motor coordination, due to differences in their brain structure (Wilson et al., 2017). The cortical thickness is reduced and there are alterations in the organisation of white matter (Langevin et al., 2015). This has an influence on motor control, especially in planning and anticipatory control of movements (Blank et al., 2019). They have problems with learning and performing gross and fine motor skills, including running, jumping, throwing and writing (Emck, Bosscher, van Wieringen, Doreleijers, & Beek, 2012). Top-down interventions, such as Neuromotor Task Training (NTT) and Cognitive Orientation to daily Occupational Performance (CO-OP), are effective to treat motor skill problems (Blank et al., 2019). These interventions are based on MLS, for that reason MLS are essential in the treatment of DCD (Blank et al., 2019). Therefore, it is of interest to assess the reliability of the MLSRI-22 in children with DCD. When the used MLS can be identified, there is the opportunity to link the use of MLS to the therapy outcomes (Levac et al., 2011). Hereby, it is reported that therapists often choose MLS based on the individual child, the task and the environment (MacWilliam et al., 2022).

The purpose of this study is to investigate the inter-rater reliability of the MLSRI-22 in children with DCD. This study may provide more insights into MLS, ensuring a more qualitative application of MLS in practice. Thereby, therapy can be more optimal for each individual child. As inter-rater reliability was high for children with ABI and CP, it is hypothesised that the inter-rater reliability of the MSLRI in this study is also expected to be good to high for children with DCD.

### 3. Methods

Eleven videos from a previous study were used for assessing the inter-rater reliability of the MLSRI-22. The previous study aimed to gain insights into how Dutch and Flemish pediatric physiotherapists applied motor learning in their interventions with children with DCD. The study was approved by the local ethics committee of Hasselt University and Maastricht University (references 2019/060 and 2019-1338). A written consent was obtained from the parents and treating pediatric physiotherapist to record the treatment session. The child orally assented.

#### 3.1. Participants

Pediatric physiotherapists could participate in this study if they were certified pediatric physiotherapists, worked for at least one year with children with DCD and used task-oriented interventions. They also had to be able to record a video of their treatment of a child.

The children with (probable) DCD were between the ages of 5 and 12. The child had to understand Dutch. In case of probable DCD, the child had to meet the criteria for DCD, see table 1.

**Table 1**  
*Criteria children*

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I.	Scoring $\leq$ 16th percentile of the Movement Assessment Battery for Children 2nd edn (Movement-ABC-2NL)
II.	Suspected of having DCD according to the Developmental Coordination Disorder Questionnaire (DCDQ)
III.	No other condition that could account for the motor skills deficits was reported by the therapist
IV.	There had been an early onset of symptoms, as reported by the therapist

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Operationalised criteria (Blank et al., 2019)

Each pediatric physiotherapist was asked to record a video in which they gave a regular motor learning treatment to a child with DCD. The treatment should be a part of the child's own treatment plan. This can involve either gross or fine motor tasks.

### 3.2. Procedure

The recruitment of the therapists was done by using a convenience sampling. A flyer was distributed by using three methods: 1) two regional networks of physiotherapists in the Southern Netherlands (RVFK and network Den Bosch); 2) network for PT clinical internships of Hasselt University, and 3) educational activities for therapists (e.g. Symposia). In order to obtain a heterogeneous sample, the therapists were selected based on different experiences in treating children with DCD and work setting (e.g. primary care - secondary care). In order to get more information about the demographics of the therapists, a short questionnaire was filled in with the following items: 1) age; 2) work setting; 3) year of graduation, and 4) years of experience in treating children with DCD.

Each therapist recorded the treatment sessions of one child with a video camera. This was placed somewhere where it did not influence the treatment. Eleven videos were scored with the MLSRI-22. The Observer 1 (KH) and 2 (LV) were trained in the use of the MLSRI-22 by a researcher (IvdV). First, the items of the MLSRI-22 were discussed, so each observer had the same interpretation of the items. Then, observers scored three pilot videos individually with the MLSRI-22. The results were compared and discussed in a consensus meeting with both observers and the researcher to enhance interpretation of the items. Additionally, one more pilot video was scored and discussed. For data-collection, each observer scored eleven videos independently with the MLSRI-22.

### 3.3. MLSRI-22

The MSLRI-22 consists of three categories and 22 items. The first category, **therapeutic verbalisation**, focuses on what the pediatric physiotherapist says and contains the following 11 items: 1) Provide encouragement; 2) Direct client's attention to object/environment; 3) Direct client's attention to the body; 4) Involve asking to problem solve; 5) Relate to performance; 6) Relate to results; 7) Indicate what was done well; 8) Indicate what was done poorly; 9) Involve analogy; 10) Link activity to other activities, and 11) Encourage mental practice.

Category 2, **therapist**, focuses on what the pediatric physiotherapist does and consists of the following six items: 12) Uses demonstration; 13) Provides physical guidance; 14) Permits errors as part of learning; 15) Uses an external device to augment feedback; 16) Recommends practice outside therapy, and 17) Provides training or education.

The third category, **practice is**, focuses on how the practice was organised and consists of the last 5 items: 18) Repetitive; 19) Whole (rather than part); 20) Variable (rather than constant); 21) Random (rather than blocked), and 22) Progressive.

The scoring system uses a five-point scale (0-4) where '0' indicates that the MLS was observed "very little/0-5% of the time". A score of '1' corresponds to "sometimes/6-24% of the time"; score 2 "often/25-49% of the time"; score 3 "very often/50-75% of the time", and a '4' indicates that the MLS was observed "most of the time/76-100% of the time". The subscore for the first category, **therapeutic verbalisation**, ranges from 0 to 44 points. The subscore for the second category, **therapist**, ranges from 0 to 24 points and the subscore for the third category, **practice is**, ranges from 0 to 20 points. The total score ranges from 0 to 88 points.

A score sheet was used to reflect the frequency and extent of MLS use during the session. MLSRI-22 profiles with higher scores do not necessarily indicate more use of MLS, neither that one session was superior nor inferior to another session with a different distribution of item scores. The distribution of item scores depended on the goals and context of a particular session in combination with the pediatric physiotherapist's clinical decisions in response to the child's actions (Ryan et al., 2020).

#### 3.4. Data analysis

The inter-rater reliability of three individual categories and the total score of the MSLRI-22 was calculated using Intraclass Correlation Coefficients (ICCs) and 95% Confidence Intervals (CI) with a two-way random model (absolute agreement, and single measures). An ICC  $\geq 0.90$  was interpreted as excellent reliability, values between 0.75 and 0.90 as good reliability and an ICC of less than 0.50 as poor reliability (Ryan et al., 2019). It was decided not to examine the reliability of the individual items as one item often influences another and so analysing the individual items did not indicate the overall reliability of the MLSRI-22. (Ryan et al., 2019). Bland Altman plots were generated for the three categories and the total score. Bland-Altman plots with Limits Of Agreement (LOA) were used to investigate absolute agreement between the two measurements. The LOA were established by: mean difference  $\pm 1.96 * SD$  of the difference between the two test measurements (Dogan, 2018). All analyses were conducted with the SPSS statistical programme.

#### 4. Results

After sending out the flyer, 41 therapists requested more information and 18 therapists were interested in participating. After providing more information to these therapists, six therapists could not participate in this study as they were unable to record a video. One therapist was excluded because this video was not usable as the instruction and feedback were not recorded in the video. A total of 11 therapists were included in the study (see figure 1).

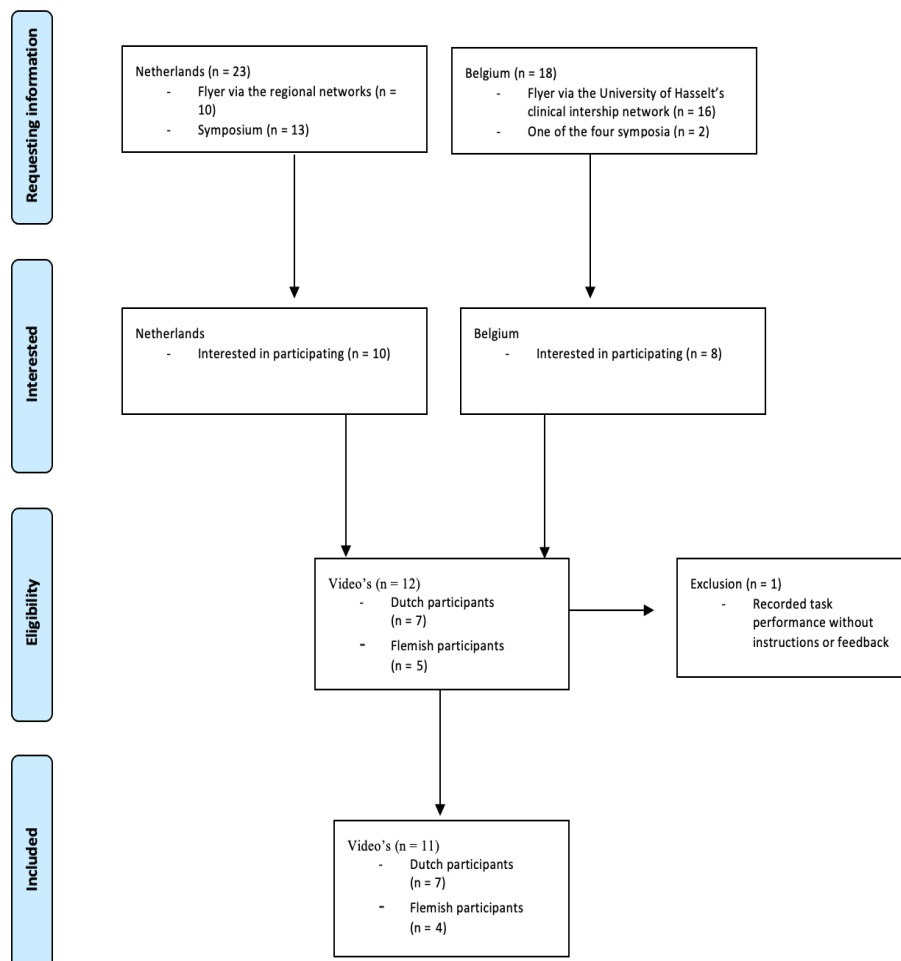


Figure 1. Flowchart

All pediatric physiotherapists were women with a median age of 50 years (range 26 - 63). The clinical experience ranged from 4 to 40 years. The children who participated in the videos were five girls and six boys with a median age of six years and six months (range 5 - 9). The raw scores of the two observers per item and category, see table 2.



**Table 2**  
**Results**

	TH1		TH2		TH3		TH4		TH5		TH6		TH7		TH8		TH9		TH10		TH11	
OB1 (K.H.) & OB2 (L.V.)	OB1	OB2	OB1	OB2	OB1	OB2	OB1	OB2	OB1	OB2	OB1	OB2	OB1	OB2	OB1	OB2	OB1	OB2	OB1	OB2	OB1	OB2
<b>Therapist verbalizations:</b>																						
Provide encouragement	2	2	4	4	3	3	3	3	3	4	1	0	4	4	3	2	4	3	2	1	3	1
Direct client's attention to object/environment	2	2	3	1	2	2	3	3	3	3	3	1	3	2	3	2	3	2	3	2	3	3
Direct client's attention to the body	1	1	2	3	3	3	1	1	1	2	0	0	1	0	2	2	2	1	2	1	2	1
Involve asking to problem solve	3	1	3	1	1	1	2	2	4	3	4	4	2	2	0	0	3	0	4	4	3	2
Relate to performance	2	0	2	3	3	1	3	0	2	1	1	1	2	1	3	2	2	2	2	1	3	3
Relate to results	0	1	3	0	1	0	1	2	1	0	2	0	0	0	0	1	1	0	1	0	0	0
Indicate what was done well	0	0	2	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	1	1
Indicate what was done poorly	1	1	1	2	1	1	1	1	2	0	1	1	2	1	2	2	2	1	1	0	2	3
Involve analogy	0	0	0	0	0	0	3	3	2	3	0	0	0	0	0	0	0	0	0	0	2	2
Link activity to other activities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Encourage mental practice	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Score:	11/44	8/44	20/44	15/44	14/44	11/44	17/44	15/44	18/44	16/44	12/44	7/44	15/44	10/44	13/44	11/44	17/44	9/44	16/44	9/44	19/44	16/44
<b>The therapist:</b>																						
Uses demonstration	0	0	0	0	4	4	1	1	1	1	0	0	0	0	3	3	3	3	1	1	3	3
Provides physical guidance	0	0	2	3	0	0	0	0	0	1	0	0	1	1	1	0	0	0	0	0	2	2
Permits errors as part of learning	1	2	3	3	2	3	2	4	3	3	3	4	3	3	2	3	2	3	3	4	1	3
Uses an external device to augment feedback	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Recommends practice outside therapy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0
Provides training or education	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Score:	1/24	2/24	5/24	6/24	6/24	7/24	3/24	5/24	4/24	5/24	3/24	4/24	4/24	4/24	5/24	6/24	5/24	6/24	5/24	6/24	8/24	8/24
<b>Practice is:</b>																						
Repetitive	3	3	4	1	3	2	4	4	3	3	4	3	4	3	4	4	4	3	3	3	4	4
Whole (rather than part)	3	4	4	4	2	4	4	3	4	4	1	2	4	4	1	1	4	4	3	4	4	1
Variable (rather than constant)	1	0	2	2	2	1	0	1	3	3	1	2	2	0	1	0	1	3	2	2	3	4
Random (rather than blocked)	0	0	3	4	0	1	0	0	0	0	0	0	0	0	1	0	1	1	1	0	0	1
Progressive	1	0	2	1	2	1	1	1	2	4	0	0	1	2	1	1	1	3	2	3	2	4
Score:	8/20	7/20	15/20	12/20	9/20	9/20	9/20	9/20	12/20	14/20	6/20	7/20	11/20	9/20	8/20	6/20	11/20	14/20	11/20	12/20	13/20	14/20
<b>Totaal score:</b>	<b>20/88</b>	<b>17/88</b>	<b>40/88</b>	<b>33/88</b>	<b>29/88</b>	<b>27/88</b>	<b>29/88</b>	<b>29/88</b>	<b>34/88</b>	<b>35/88</b>	<b>21/88</b>	<b>18/88</b>	<b>30/88</b>	<b>23/88</b>	<b>26/88</b>	<b>23/88</b>	<b>33/88</b>	<b>29/88</b>	<b>33/88</b>	<b>27/88</b>	<b>40/88</b>	<b>38/88</b>

In the category **therapeutic verbalisation**, Observer 1 had a mean score of 16.64 (SD 2.91), while Observer 2 had a mean score of 11.55 (SD 3.36). The inter-rater reliability was poor with an ICC of 0.43 (95% CI -0.92 - 0.82). The Bland-Altman plot had a mean of 4.09, the LOA varied from 0.03 to 8.15. (See Figure 2)

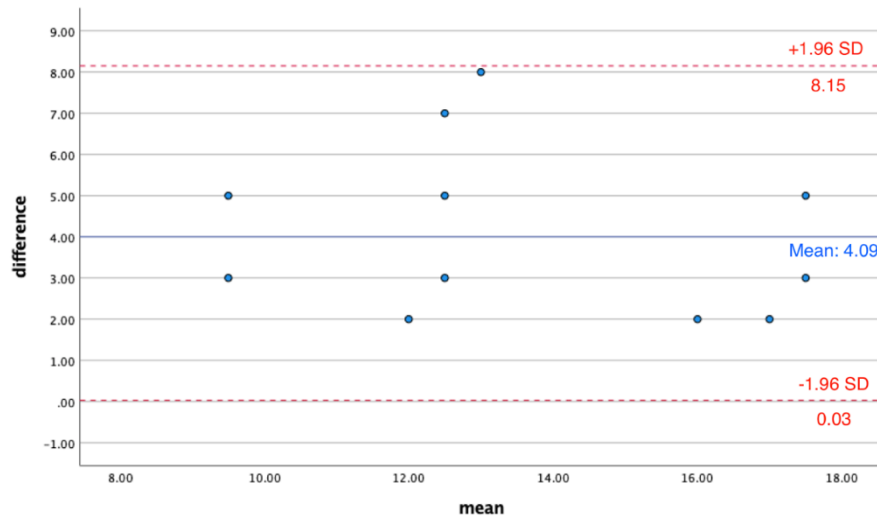


Figure 2. *Bland-Altman plot of the category therapeutic verbalisation*  
 \*Standard Deviation (SD)

In the category **therapist**, Observer 1 had a mean score of 4.45 (SD 1.81). Observer 2 had a mean of 5.36 (SD 1.63). The inter-rater reliability had an ICC of 0.84 (95% CI -0.37 - 0.97). The Bland-Altman plot had a mean of -0.91, the LOA varied from -1.97 to 0.15, no outliers were found. (See Figure 3)

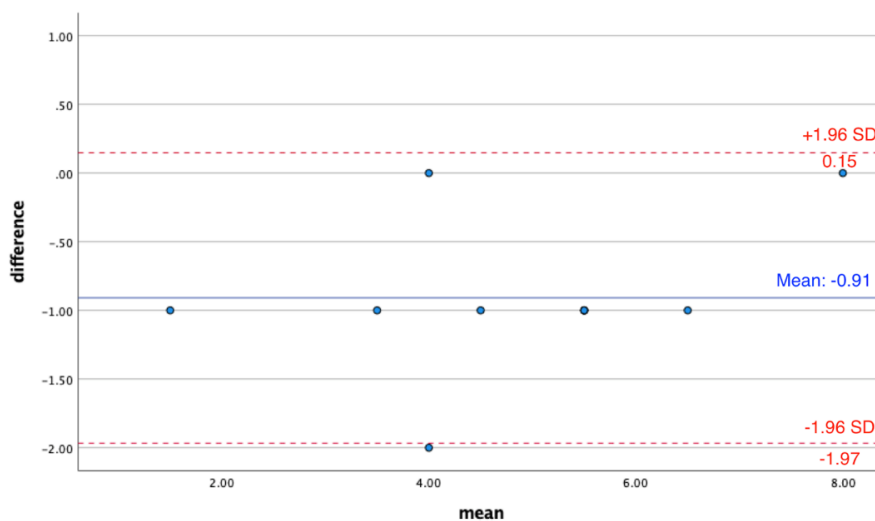


Figure 3. *Bland-Altman plot of the category the therapist*  
 There are only 8 values on the graph as there are 4 values at the same point (mean; 5.5, Difference; -1).  
 \*Standard deviation (SD)

In the category *practice is*, Observer 1 had a mean score of 10.27 (SD 2.57) and Observer 2 had a mean score of 10.27 (SD 3.04). The inter-rater reliability had an ICC of 0.80 (95% CI 0.41 - 0.94). The Bland-Altman had a mean of 0, the LOA varied from -3.61 to 3.61, no outliers were found. (See Figure 4)

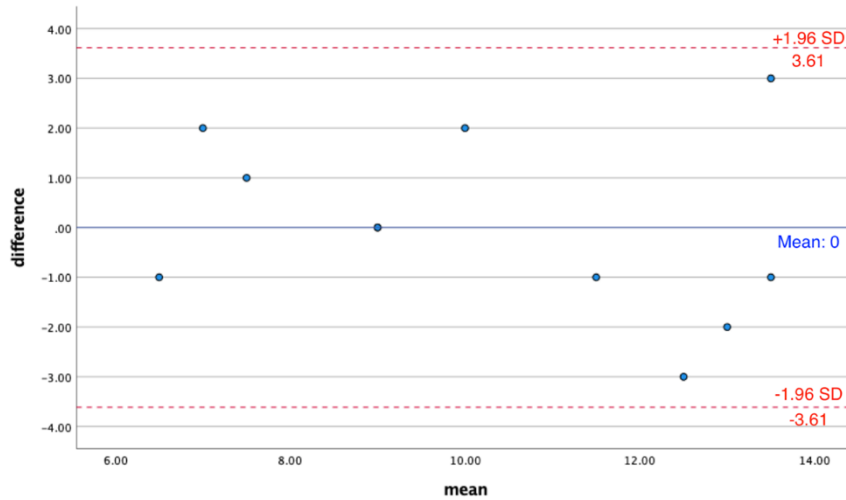


Figure 4. *Bland-Altman plot of the category practice is*  
 In this Bland-Altman plot there are only 10 values in the graph; this is because there is an overlap on the values (Mean; 9, Difference; 0). \*Standard Deviation (SD)

In the total score, Observer 1 had a mean score of 30.45 (SD 6.56). Observer 2 had a mean score of 27.18 (SD 6.65). The inter-rater reliability had an ICC of 0.83 (95% CI 0.49 - 0.96). The Bland-Altman plot had a mean of 3.27, the LOA varied from -1.85 to 8.39, no outliers were found. (See Figure 5)

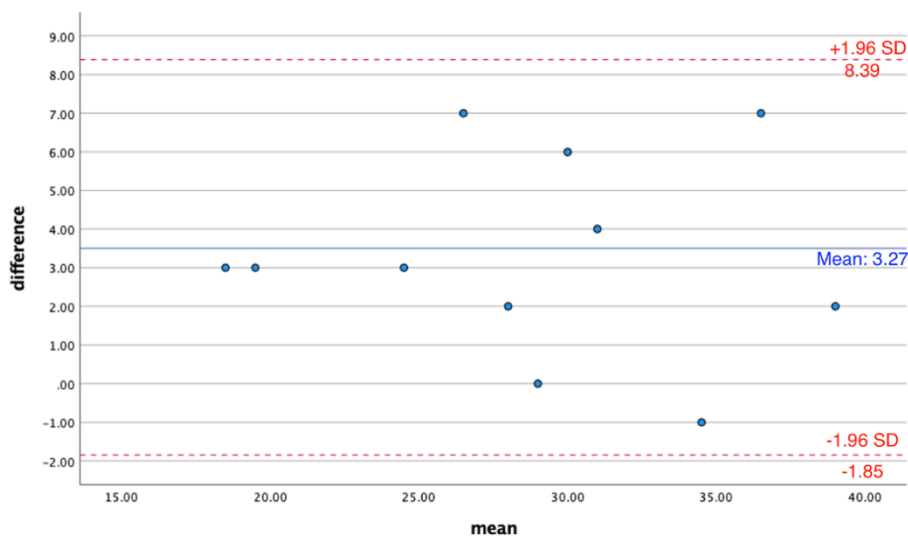


Figure 5. *Bland-Altman plot of the total score*  
 \*Standard Deviation (SD)

## 5. Discussion

The MLSRI-22 documents the MLS used by pediatric physiotherapists in video-recorded sessions (Levac et al., 2011). The inter-rater reliability of the MLSRI is known for children with ABI and CP. Motor learning strategies are also frequently used in interventions for children with DCD. Therefore, this study investigated the inter-rater reliability for children with DCD.

### 5.1. Total score

The inter-rater reliability of the total score was good. This result was in line with other studies that investigated the inter-rater reliability of the MLSRI and reported an ICC of 0.81 for children with ABI and 0.78 for children with CP (Kamath et al., 2012; Ryan et al., 2019; Spivak et al., 2021).

### 5.2. *Therapist* category

The category *therapist* had good inter-rater reliability. In the *therapist* category all non-verbal elements are scored, such as giving a demonstration or providing physical guidance to the child. Besides the level of permitting errors, recommending practice outside therapy and providing education is also evaluated. This is not in line with the result of other studies, which reported an ICC of 0.36 and 0.84 for the guidance category and 0.55 and 0.41 for the conduct category in children with ABI (Kamath et al., 2012; Levac et al., 2013). These categories of the MLSRI-33 correspond to the *therapist* category of the MLSRI-22. In this category, the item “recommends practice outside of therapy” was hardly ever used in the videos (Table 2). It might have been applied when the recordings were stopped, which means we could not evaluate it. The items “uses an external device to augment feedback” and “provides training or education” barely appear in the videos (Table 2). Because it was seldomly observed, it was easy to score, which might have resulted in a higher inter-rater reliability score in the category *therapist*.

### 5.3. *Practice is* category

The category *practice is* also had good inter-rater reliability. The organisation of the treatment is evaluated in this category. The amount of time spent on a task is scored in the item “repetitive”. The item “whole” practice is scored when the task is performed in its entirety

rather than performing the task in different parts. The item “variable” is scored when the pediatric physiotherapist returns to a certain task after at least one other task. The item “random” is scored when there is no specific order in the exercises. Lastly, progressing of the difficulty level of the task was evaluated, this includes reducing the amount of feedback, changing of distances or material. This is also not in line with the reported ICC values of other studies, which reported an ICC of 0.16 and 0.45 for children with ABI (Kamath et al., 2012; Levac et al., 2013). The higher ICC value may be due to the little variability in the videos of this study. This is particularly seen in the item “random” (Table 2).

#### 5.4. *Therapeutic verbalisation* category

However, the category therapeutic verbalisation had poor (0.43) inter-rater reliability. Other studies reported an ICC of 0.48 and 0.65 for this category (Kamath et al., 2012; Levac et al., 2013). It is known from previous studies that observers have the most difficulties and the least confidence in this category. This is due to the fact that this is the most subjective category. The observers need to unpack the content of each verbalisation, which can lead to overlaps and rating errors (Ryan et al., 2019). The Bland-Altman plot (figure 1) showed that Observer 1 consequently gave higher scores compared to Observer 2. As we examined this in further detail, it appeared that some items were interpreted slightly different. On the item “direct client’s attention to object/environment”, instructions or feedback with external focus should be scored. However, Observer 1 included questions with external focus as well, while Observer 2 did not include these. The attention can also be directed towards an object or environment in a demand driven form. This should have been better specified in the manual. On the item “involve asking to problem solve”, the questions of the pediatric physiotherapist that asked the child for feedback should be scored. However, Observer 1 included each question, while Observer 2 only included the questions related to feedback. Finally, there was confusion between the items “relate to performance” and “relate to results”. The item “relate to movement performance” concerned feedback on the execution of the task, whereas the item “relate to results” only concerned the outcome. Observer 1 perceived the feedback “bigger, harder...” as related to performance, whereas Observer 2 identified this feedback as related to results. As “relate to performance” has a more internal focus and “relate to results” has a more external focus, the feedback “bigger, harder,...” is more related to the results. To avoid discrepancies, we suggest using examples of each item.

### 5.5. Strengths and limitations

This study has several strengths, firstly a diverse group of pediatric physiotherapists was used to obtain a wide variety of MLS within the videos. Secondly, the videos were assessed independently without any discussion between the observers. Thirdly, the observers were trained in using the MLSRI-22 using pilot videos and the items were discussed in detail. Despite the training, some items were interpreted differently by the two observers, which highlights the importance of training in the use of the MLSRI-22. A limitation of this study was that not all of the items were observed in the videos. Due to this limitation the ICC-values tend to be higher. The fact that the treatment session was being video-taped, could have led to the Hawthorne effect. This occurs when the video-taped participants perform different behaviour than usual. We tried to avoid this effect by using a parent behind the camera instead of a researcher. Video-taping also had an advantage, allowing the observers to review the videos multiple times (Asan & Montague, 2014).

### 5.6. Recommendations

Some clinical recommendations can be made based on the results of this study. The MLSRI-22 is reliable to use by researchers and pediatric physiotherapists to document the use of MLS. However, the category **therapeutic verbalisation** showed poor inter-rater reliability, and should therefore be interpreted with some caution when used by different observers. In conclusion the inter-rater reliability is good for the total score, the categories **therapist** and **practice is**. However, there is more research needed on the category **therapeutic verbalisation**. As a recommendation for future research, we suggest that each item appears in the videos, this way all items can be evaluated. To avoid discrepancies in interpretation it is recommended to use an official manual. Furthermore, the intra-rater reliability of the MLSRI-22 should also be investigated in children with DCD. In conclusion, the MLSRI-22 allows pediatric physiotherapists and researchers to compare the use of MLS in physical therapy sessions, in children with DCD, between and within each therapist. This way, therapists can obtain more insights into their own actions and apply the MLS more consciously.



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