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Faculteit Revalidatiewetenschappen

master in de revalidatiewetenschappen en de kinesitherapie

Masterthesis

Feasibility and reliability study of a new assessment to evaluate sitting balance on the back of a horse in children with neurological disorders: The HippoTrunC

Kaat Hombroux
Aude Van Dessel

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

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CONTEXT

This feasibility and reliability study is part of the broader research field: pediatric rehabilitation. This study is part of the research line "Assessment and intervention in children with CP" and is conducted in cooperation with school and care institution Sint-Gerardus in Diepenbeek, Belgium and was sponsored by "Het Innovatiefonds – VZW Stijn". The target population of this study is children with neurological disorders, of which the majority suffers from poor postural control. All data was collected at the practical setting itself. A central format was followed.

Children with neurological disorders face various difficulties in daily life, for example maintaining sitting balance. Although hippotherapy as an intervention is a relatively unknown training approach, it has been proven an effective treatment strategy to improve balance problems in children with neurological disorders. However, its effect on sitting balance has not been thoroughly investigated in literature, which can be explained by the fact that a specific measurement tool to assess sitting balance when seated on a horse is still lacking. To provide the best possible patient-centered care, it is important for physical therapists to assess the sitting balance and measure possible changes after intervention and preferably when seated on the back of the horse. This study aims to develop a novel measurement tool that is feasible and reliable to examine the sitting balance on the back of the horse in children with neurological disorders after hippotherapy intervention.

The research question was formulated by the students in agreement with the promotor of this master thesis. Data collection was conducted by both students and data analysis was done independently. Disagreements were solved in a consensus meeting.

1 ABSTRACT

Background: Children with neurological disorders experience several impairments, one of the common is the lack of adequate sitting balance. Hippotherapy intervention is proven to be an effective treatment in this population. However, there is no specific measurement tool available to examine the possible changes in sitting balance after this intervention. Therefore, a novel composed measurement tool **'HippoTrunC'** was developed, and psychometric measurement properties were evaluated.

Objectives: To determine the feasibility and reliability of a new measurement tool **'HippoTrunC'** to evaluate sitting balance on the back of a horse in children with neurological disorders.

Participants: A group of 12 children with neurological disorders aged between two and 21 years was recruited and tested in the school 'Sint-Gerardus' in Diepenbeek, Belgium. The mean age (SD) was 10.4 (4.4) years. All five GMFCS levels were included, with most children in level IV.

Method: The developmental process of the measurement scale included item generation from a systematic review of existing sitting balance scales and expert opinions. Participants went through one test moment with video recording. These recordings were scored afterwards by two independent assessors. For inter- and intra-rater reliability on scale level, an ICC and CI were calculated. Weighted kappa and CI were used to evaluate reliability on item level.

Results: The HippoTrunC is feasible for use in this target population. Inter-rater reliability on item level varied between weighted kappa's of 0.349 to 1.00, intra-rater reliability varied between 0.651 to 1.00. Inter-rater (ICC=0.967) and intra-rater reliability (ICC= 0.998 and ICC=0.994) on scale level was shown to be excellent.

Conclusion: The results of this pilot study provide support for the HippoTrunC as a feasible and reliable measurement tool to assess sitting balance after hippotherapy intervention in children with neurological disorders. Further research is recommended to state these results and to assess other psychometric properties such as validity and responsiveness.

Keywords: 'sitting balance', 'neurological disorders', 'hippotherapy'

2 INTRODUCTION

Children with neurological disorders represent a significant rate of the global burden of disease worldwide, considering they live years with disability and contribute to premature mortality (Newton, 2018). Cerebral Palsy (CP) is described as a range of non-progressive syndromes of posture and motor impairment and the result of a permanent lesion of the cerebral motor cortex (Koman, Smith, & Shilt, 2004). With a prevalence of 2.4 per 1.000, children with CP account for a large proportion of the global burden of neurologic illness (Hirtz et al., 2007). This population experiences a wide spectrum of motor and sensory impairments at function level, activity limitations and participation restrictions according to International Classification of Functioning, Disability and Health for Children and Youth (ICF-CY) (Koman et al., 2004; World-Health-Organization, 2007). One of the common impairments is the lack of adequate sitting balance (Banas & Gorgon, 2014). Shumway-Cook and Woollacott (2017) defined balance as the ability to maintain the center of mass within the limits of the base of support, which is dependent on the requirements of the task and environment. Children with CP for example, have poor selective motor control especially in the trunk, which affects their ability to sit upright independently (Harbourne, 2010). In addition, adequate sitting balance also correlates with hand reaching performance and interacts with upper extremity control in daily life (Zulkapli, Mohd Saat, & Kamaralzaman, 2016). As such, inadequate sitting balance can result in decreased autonomy thereby making the children's daily life more challenging. Therefore, therapy modalities need to incorporate sitting balance as a key element.

There is a wide range of treatment options to maintain or improve the functionality in children with neurological disorders (Koman et al., 2004). Previous research showed that interventions such as gross motor task training, treadmill training with no body weight support, trunk-targeted training and hippotherapy are supported by a moderate level of evidence (Dewar, Love, & Johnston, 2015). Also Meregillano (2004) describes hippotherapy, as a powerful treatment tool, were the horse serves as a dynamic treatment tool which stimulates motor and proprioceptive systems and improves flexibility, balance and muscle strength (Meregillano, 2004). Several studies investigated the effects of hippotherapy intervention on gross motor function, standing balance and gait and proved its benefits for these outcome measures in children and adults with neurological disorders (Dominguez-Romero, Molina-

Aroca, Moral-Munoz, Luque-Moreno, & Lucena-Anton, 2019; Kim & Lee, 2020; Zadnikar & Kastrin, 2011). However, the outcome of interest "sitting balance", has not often been examined yet. Given its importance for functional activities, sitting balance should be evaluated and monitored based on objective and reliable measurement tools.

The lack of literature exploring the effect of hippotherapy interventions on sitting balance can be explained by the lack of a measurement tool that specifically evaluates siting balance on the back of a horse. Although the Sitting Assessment Scale (SAS), Segmental Assessment of Trunk Control (SATCo) and Gross Motor Function Measure (GMFM) are functional tools that measure sitting balance in a reliable, valid and responsive way, none of these instruments is suitable in an outdoor, practical setting (Adair, Said, Rodda, & Morris, 2012; Butler, Saavedra, Sofranac, Jarvis, & Woollacott, 2010). Based on the characteristics of these existing measurement tools and the need for developing a useful clinical tool that covers all the different aspects of sitting balance, a new test battery, the **'Hippotherapy Trunk Control Scale'** (**HippoTrunC)**, was developed. This assessment can be administered while seated on the horse and aims to detect the changes of sitting balance in children with neurological disorders after hippotherapy intervention. Before using the HippoTrunC in intervention studies and in clinical practice, its feasibility and psychometric properties need to be evaluated. Therefore, the aim of this study was to investigate both feasibility and reliability of a novel assessment used to examine sitting balance on the back of the horse in children with neurological disorders, The HippoTrunC.

3 METHOD

3.1 Research design

A cross-sectional study was conducted at a school for participants with disabilities. All individuals underwent a single test session.

3.2 Participants

Participants were recruited via the school and care institution 'Sint-Gerardus' in Diepenbeek, Belgium, between 18/03/2022 and 19/04/2022. Individuals who met the following inclusion criteria were recruited: (1) Diagnosis of a neurological disorder such as CP or Spina Bifida; (2) Aged between two and 21 years old; (3) Currently taking part in the hippotherapy sessions at the Sint-Gerardus school and care institution in Diepenbeek; and (4) Able to communicate verbally or non-verbally in Dutch. Participants were excluded if they were unable to understand and follow short, simple instructions. No exclusion was made based on Gross Motor Function Classification Scale (GMFCS) level of the participants. A number of 30 children were invited to participate in this study.

3.2.1 Medical ethics

All possible participants and their parents/guardians were given an explanation of the study by using an information sheet and were asked to voluntarily sign the informed consent forms before onset of the study. This research was approved by the University of Hasselt Medical Ethics Committee (B1152021000028).

3.2.2 Measurement tool development

The development of the HippoTrunC followed several steps summarized in ***Figure 1***.

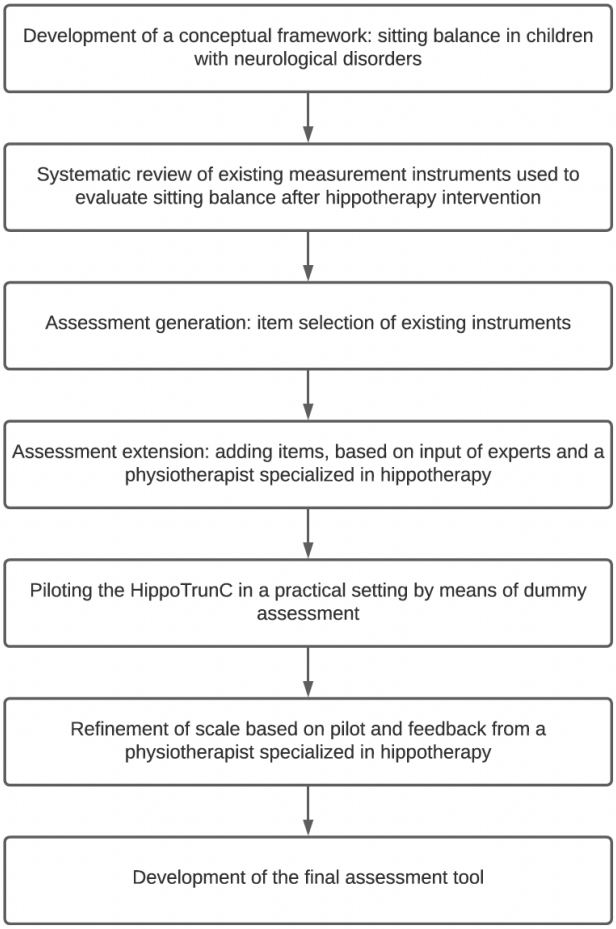

Figure 1: The development process of the HippoTrunC

3.2.2.1 Development of a conceptual framework

The concept to be measured was defined as the quality of sitting balance within the function domain of the ICF-CY. The measurement tool should reflect the progression, regression, or stagnation of the sitting balance of children with neurological disorders after hippotherapy intervention. Items should be selected to cover all aspects of sitting balance in daily life, which involves static, active and reactive control.

3.2.2.2 Systematic review of existing measurement instruments

A systematic review was performed to explore and analyze different existing measurement instruments used to evaluate the effectiveness of hippotherapy on sitting balance in children with CP. Both functional and technological measurement instruments were identified. Due to the feasibility of functional assessments in clinical settings, these instruments were preferred. The functional measurement instruments included the SAS, SATCo and GMFM (Adair et al., 2012; Butler et al., 2010). Although these instruments are standardized tools that measure different aspects of sitting balance, the total number of instruments is limited, none covers all

the different aspects of sitting balance, and none are specifically designed to assess sitting balance on the back of a horse.

3.2.2.3 Selection and adaptation of items

The 'HippoTrunC' is a newly composed measurement tool. Based on the literature study, a selection of different items of the existing measurement tools was made and used to develop a measurement instrument that covers all the different aspects of sitting balance. Several items of the SAS, SATCo, and GMFM were combined into the new scale. This selection was discussed with a team of experts and adapted afterwards. The physiotherapist of Sint-Gerardus was involved throughout the whole process by offering her opinion on task difficulty and relevance. Thereafter, the different items were tested independently on the back of a horse in clinical practice and if necessary, adapted to the situation and environment. Along with the items, the scoring was also reviewed and refined. Finally, a trail was set up with the different items of the measurement scale included and these items were performed in a specific order before the assessment was used in hippotherapy sessions for children. At the test moments, an external supervisor was involved to control the horse and to guide it through the different exercises. Another supervisor walked along the participant to ensure the children's safety.

The HippoTrunC investigates the head control and sitting balance of the participants. It includes a total of 10 items categorized in three domains of sitting balance: static, active and reactive control. A four-point score was assigned based on the degree of head and trunk alignment and the level of anticipation. Scores ranged from 0-40. The participants' functional aids and degree of manual support were recorded and considered during scoring. For each level of support, points were subtracted from the total score resulting in a corrected total score. ***Appendix table 1*** provides an overview of the HippoTrunC.

3.2.2.4 Evaluation

Participants were tested once, this moment took place in school and care institution Sint-Gerardus in Diepenbeek. A video recording of the predetermined course was made of each test session with four GoPro's at different angles (HERO8). These recordings of each

participant were reviewed afterwards and used for scoring. Each test was scored twice by two independent assessors. ***Appendix figure 1*** gives an overview of the predetermined trail.

3.2.3 Outcome measures

3.2.3.1 Feasibility

Feasibility refers to the extent to which a measurement tool is suitable for the target population and usable in the practical context. It includes participant and researcher acceptability which can be assessed through the given, qualitative feedback and the use of questionnaires (Bowen et al., 2009). The subjective experience of the participants, children in this case, was examined on a five-point ordinal scale by means of the Smileyometer (Read, 2009). The children were asked the following "How do you feel after this session of hippotherapy? The left one is very happy, the right one very sad. Now choose the corresponding smiley.". ***Appendix figure 2*** gives an overview of the Smileyometer. In order to assess the subjective perception of the tester, an opinion regarding several statements on a three-points ordinal scale was asked after using the measurement tool. These statements are summarized in ***Table 1***. Alongside the experiences of the participants and the tester, another key element of the feasibility of a new measurement tool is its applicability in the entire target population. Therefore, the distribution of test results was reported in function of the GMFCS levels of the children. A visual representation was used to determine the extent to which the measurement tool could be performed by children with different functional levels.

Table 1

Feasibility statements for tester

"The test was user friendly"	Disagree – Neutral– Agree
"The results are easy to interpret"	Disagree – Neutral– Agree
"The duration of the test is feasible within 15 minutes"	Disagree – Neutral– Agree
"I would like to use this test in clinical practice"	Disagree – Neutral– Agree

3.2.3.2 Reliability

Reliability of the instrument refers to the degree in which the instrument produces consistent results (Heale & Twycross, 2015). Intra-rater reliability refers to the consistency of the collected data of the participants within one assessor. Inter-rater reliability refers to the consistency of the collected data of the participants among two independent assessors

(McHugh, 2012). The inter- and intra-rater reliability was assessed both on item and scale level, based on the video recording. Both researchers independently scored the recordings twice with a minimum of five days in between. As such, the consistency of the participants' test results of the participants within one assessor and between both researchers was evaluated.

3.3 Data-analysis

All analyses were conducted using IBM-SPSS Statistics version 28.0.1.1. ("SPSS Statistics for Windows," 2021).

3.3.1 Feasibility

Descriptive statistics were used to describe the results provided by the Smileyometer. Additionally, the satisfaction of two assessors was reported descriptively by listing their opinions on different feasibility statements. Finally, total test scores were mapped as a function of the GMFCS levels.

3.3.2 Inter- and intra-rater reliability

3.3.2.1 Item level

The inter-rater reliability on item level was evaluated based on a weighted kappa. A linear weighted kappa was chosen. These weights are proportional to the deviation of individual ratings, like the number of categories of disagreement (Brenner & Kliebsch, 1996). This number ranges from zero (random agreement between two assessors) to one (complete agreement between two assessors) (Vanbelle, 2016). The interpretation of the magnitude of weighted kappa is the same as unweighted kappa (Fleiss, 2003). Values of the weighted kappa were interpreted as follows: <0.20: poor agreement; 0.21-0.40: fair; 0.41-0.60: moderate; 0.61-0.80: good; 0.81-1.00: excellent agreement (Altman, 1991).

For the intra-rater reliability analysis on item level, a weighted kappa was used to calculate the agreement between two scores of the same participant assigned by the same assessor. Intra-rater reliability of both assessors was determined.

3.3.2.2 Scale level

To determine the inter- and intra-reliability analysis on scale level, the intraclass coefficient (ICC) was calculated with a two-way random-effects model. Therefore, the reliability results can be generalized to any raters with the same characteristics as the raters in this study (Koo & Li, 2016). This number ranges from zero (no agreement) to one (complete agreement), the differences between scores can be explained by disagreements between the different assessors (Hallgren, 2012). An ICC less than 0.50 is indicative of poor reliability, values between 0.50 and 0.75 indicate moderate reliability. An ICC between 0.75 and 0.90 shows a good reliability, and values above 0.90 shows excellent reliability (Koo & Li, 2016). The mean scale score of each assessor, the ICC and a confidence interval (CI) at the 95% level around the two-way ICC was calculated.

4 RESULTS

4.1 Characteristics of participants

Out of the 30 children invited to participate, consent of 12 children was obtained before the deadline was reached. A total of 12 children with neurological disorders were assessed. The mean age (SD) was 10.4 (4.4) years and the sex distribution was 58.3% male participants. All GMFCS levels were included, with most children in level IV. Each child with CP was further classified according to the Surveillance of Cerebral Palsy in Europe Classification (SCPE) in order to specify the impairments. Although most participants had the diagnosis of CP, other neurological disorders like spinal muscle atrophy, spina bifida and Kabouki Syndrome were also included and even their gross motor abilities were classified using the GMFCS. ***Table 2*** provides a description of the participants with respect to age, sex, diagnosis, and degree of disability.

Table 2

Characteristics of the participants

	Age (Years)	Sex	Diagnosis	Degree of disability (GMFCS)				
				I	II	III	IV	V
1	7.7	M	SMA				x	
2	8.2	F	CP (bilateral)			x		
3	9.3	F	CP (bilateral)					x
4	12	M	CP (bilateral)				x	
5	6.7	M	Ponsglioma grade I				x	
6	7.7	F	Kabouki Syndrome		x			
7	17.4	M	CP (unilateral)	x				
8	14.2	M	CP/Cris-Du-Chat			x		
9	18.6	M	CP (unilateral)	x				
10	11.7	M	CP (bilateral)				x	
11	6.8	F	Spina Bifida				x	
12	4.6	F	CP (bilateral)					x

Legend: CP = Cerebral Palsy; F = Female; GMFCS = Gross Motor Function Classification Scale; Kabouki Syndrome = a genetic disorder with several neurological symptoms like intellectual disability, muscular hypotonia and epilepsy; M = Male; SMA = Spinal Muscle Atrophy

4.2 Feasibility

4.2.1 Smileyometer and statements of the assessor

Due to inability of two participants to identify their own feeling, the median, minimum and maximum of the data of only 10 participants were calculated. The total sample's median (score 5/5) indicated that most children reported they felt very happy after performing the HippoTrunC (minimum: 4/5; maximum: 5/5). ***Table 3*** provides an overview of the scores of the Smileyometer. Similar, both assessors reported a positive subjective experience afterwards. Both investigators selected four times "agree" on the several feasibility statements which means the new assessment tool was considered to be user friendly, easy to interpret and able to perform in less than 15 minutes. Both investigators would like to use the HippoTrunC in clinical practice.

Table 3

Smileyometer

		Participants												
Scoring		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Total**
Very happy	**5**	x	x	x	x*	x		x		x	x	x	x*	8
Happy	**4**						x		x					2
Neutral	**3**													
Sad	**2**													
Very sad	**1**													

Legend: * = unable to identify their own feelings

4.2.2 Distribution of test-scores in function of GMFCS-scores

Figure 2 provides a visualization of the individual test scores. It shows that the assessment is feasible for all functional levels within the group of children with neurological disorders. Scores vary between functional levels, but both children with high and low functional levels could perform the test items.

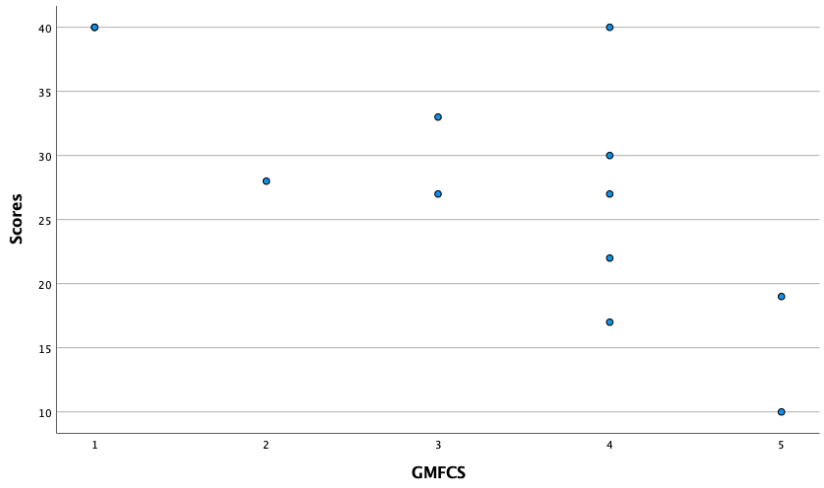

Figure 2: Distribution of test-scores in function of GMFCS-scores

4.3 Inter-rater reliability

4.3.1 Item level

Agreement varied between 0.349 (item 5) and 1.00 (item 4). One item showed a fair agreement (item 5), and two items scored moderate (items 1 and 6). Five items had a good agreement (items 2, 7, 8, 9, 10) and two items had an excellent agreement between both assessors (items 3 and 4). ***Table 4*** provides an overview of the weighted Kappa's for each item and a 95% CI.

Table 4

Inter-rater reliability – item level

Item		Weighted kappa	95% Confidence Interval	
			Lower bound	Upper bound
1	**Head control: static**	0.446	0.112	0.781
2	**Sitting balance: static**	0.718	0.415	1.020
3	**Sitting balance (A): reaching (SP)**	0.889	0.671	1.107
4	**Sitting balance (A): reaching (FP)**	1.00	1.00	1.00
5	**Sitting balance: active**	0.349	-0.115	0.814
6	**Head control: active**	0.422	0.056	0.787
7	**Sitting balance (A): acceleration**	0.721	0.482	0.960
8	**Sitting balance (A): slalom**	0.696	0.423	0.969
9	**Sitting balance (R): slalom**	0.718	0.466	0.970
10	**Sitting balance (R): start-stop**	0.604	0.273	0.936

Legend: A = active; FP= frontal plane; SP= sagittal plane; R= reactive

4.3.2 Scale level

The agreement for the total test score between both raters was excellent (ICC=0.967, 95% CI = [0.891;0.990]).

4.4 Intra-rater reliability

4.4.1 Item level

Agreement varied between 0.651 (items 2 and 5) and 1.00 (items 3, 4, 8, 10). One item showed a good agreement (item 2), five items an excellent agreement (items 1, 6, 7, 9, 10). Four items had either a good or excellent agreement (items 3, 4, 5, 8). ***Table 5*** gives an overview of the linear weighted kappa's per item and per rater. The 95% confidence interval is given.

Table 5
Intra-rater reliability – item level

Item		Rater	Weighted kappa	95% Confidence Interval	
				Lower bound	Upper bound
1	**Head control: static**	**1**	0.854	0.565	1.143
		2	0.912	0.743	1.081
2	**Sitting balance: static**	**1**	0.651	0.331	0.971
		2	0.783	0.475	1.091
3	**Sitting balance (A): reaching (SP)**	**1**	1.000	1.000	1.000
		2	0.760	0.472	1.048
4	**Sitting balance (A): reaching (FP)**	**1**	0.705	0.325	1.085
		2	1.000	1.000	1.000
5	**Sitting balance: active**	**1**	0.928	0.791	1.065
		2	0.651	0.313	0.990
6	**Head control: active**	**1**	0.854	0.565	1.143
		2	0.933	0.806	1.061
7	**Sitting balance (A): acceleration**	**1**	0.800	0.546	1.054
		2	0.852	0.656	1.048
8	**Sitting balance (A): slalom**	**1**	0.750	0.464	1.036
		2	1.000	1.000	1.000
9	**Sitting balance (R): slalom**	**1**	0.844	0.638	1.051
		2	0.928	0.789	1.066
10	**Sitting balance (R): start-stop**	**1**	0.931	0.806	1.056
		2	1.000	1.000	1.000

Legend: A = active; FP= frontal plane; SP= sagittal plane; R= reactive

4.4.2 Scale level

Excellent agreement between both scorings of rater 1 (ICC= 0.998, 95% CI=[0.992;0.999]) and of rater 2 (ICC=0.994, 95% CI=[0.978;0.998]) were found. The intra-rater reliability on scale level per researcher is summarized in ***Table 6***.

Table 6
Intra-rater reliability – scale level

	Rater 1	Rater 2
Mean score rating 1	29.3	28.2
Mean score rating 2	28.9	28.8
ICC	0.998	0.994
95% CI: Lower bound - Upper bound	0.992 - 0.999	0.978-0.998

Legend: CI = confidence interval; ICC = intraclass coefficient

5 DISCUSSION

Given the need to efficiently assess the sitting balance of children with neurological disorders after hippotherapy in an outdoor, practical setting, a new measurement tool was developed. The overall aim of this study was to determine the feasibility and reliability of this novel assessment tool, the **HippoTrunC**. This pilot study was the first to investigate evaluation of sitting balance specifically on the back of a horse. The use of the HippoTrunC for this purpose was shown to be feasible by both the raters and participants and could be performed by children of all GMFCS levels. Both intra- and inter-rater reliability on scale level were shown to have an excellent agreement. Furthermore, the preliminary data of the reliability of the new assessment indicate a moderate to excellent agreement on item level, except for item five.

5.1 Reflection of findings related to research question

5.1.1 Feasibility

Use of the HippoTrunC was defined as pleasant by both the participants and the testers, but some caution is required when interpreting these results. Administering the Smileyometer to evaluate the subjective feeling of the children after performing the HippoTrunC does not appear to be suitable for the whole target population. Some participants did not have the ability to describe their own feelings thus could not answer accurately on the researcher's question. On top of that, even for the other participants, the five options seemed to be difficult to interpret. Especially the ability to discriminate between smiley one and two, and between four and five, was missing. A scale with only three options would be preferable. Thereby, the options would be limited and less susceptible to interpretation.

The HippoTrunC consists of only 10 items and could be performed within 15 minutes, indicating a high feasibility in the practical setting. Besides the time-efficient character of the new measurement tool, the testers also reported the HippoTrunC to be user-friendly when scoring the feasibility statements. However, the testers were the developers of the scale too causing detection bias.

The video-recordings obtained from the four GoPro-cameras appeared to capture a clear overview of the participant’s performances, which enhanced a smooth scoring process. The

cameras were remotely controlled, easily stored and minimal training for use was required. However, using technology for this purpose has its limitations as well, including the cost associated with the cameras and other equipment as a computer, tripods and hard disks, and battery levels that should be monitored to avoid potential recording issues. Nevertheless, afterwards scoring using video recordings is preferrable over scoring without recording at the moment itself. When scoring without recording, only one perspective could be used, and important motions of the participant could be missed. However, two cameras seem sufficient to observe and evaluate all movements of the participant. Phones or cheaper cameras could be a solution to reduce the high costs of the GoPro's.

5.1.2 Reliability

A useful measurement scale should reliably measure and differentiate various aspects of sitting balance. For children with neurological disorders, the HippoTrunC shows excellent inter- and intra-rater reliability on scale level. Although for several items (items 1, 5, 6) inter-rater reliability showed fair to moderate agreement. These items evaluated head control in a static and active way, and active sitting balance. Inconsistencies could be explained due to broad, not accurate scoring options that are open to interpretation. Therefore, participants could not be classified under one option and a choice had to be made. However, this preliminary results regarding reliability on item level should be interpreted with caution. Further research is needed with a sample size of at least 30 participants to state these findings (Lancaster, Dodd, & Williamson, 2004) since recruiting more subjects will lead to a larger heterogeneous distribution of subjects and thus affect the ICC estimates.

5.2 Strengths and limitations of the study

This is the first study in the development of a new measurement scale to evaluate sitting balance in children with neurological disorders after hippotherapy, on the back of a horse. With the HippoTrunC, a clear transition to clinical practice is made. The assessment is suitable in an outdoor, practical setting and can be used to evaluate both short- and long-term effects on sitting balance in children with neurological disorders.

Next, only 12 participants were assessed in this present study. Despite the small sample size of 12 participants, the characteristics of the included participants were evenly distributed on

the level of age and sex and included all different GMFCS-levels, which promotes the generalization of the found results to the whole target population.

Overall, standardization of the testing was good. However, certain factors made the standardization process difficult. First, there were living animals involved. Even though they are used working with children during hippotherapy sessions, they sometimes have difficulties with standing still for a fixed period as expected in some testing items. Secondly, some participants needed more encouragement than others or needed more than two attempts due to lack of understanding. Thirdly, the participants were wearing rather thick coats due to the cold weather at the time of the testing, causing the trunk not always to be as visible as wanted.

5.2.1 Measurement instrument

When it comes to the different items of the assessment, several limitations need to be considered. Such was the term 'upright position/rightening' difficult to interpret. Due to the fact that the researchers saw the participants only at the testing moment, it was difficult to know what the maximal upright position was for each participant. Additionally, participants lost the upright position after a few minutes, currently there are no agreements whether an incentive may be used or not. An encouragement can ensure a better upright position and better scores for the participants. Next, participants with small height were obstructed by the handle in the reaching exercises. And besides that, the handle was often grasped while it seemed that it was out of fear to fall and not out of inability to perform the exercise. Another limitation is that the measurement tool not seemed to measure the best performance, due to stress, lack of attention or lack of understanding. Furthermore, a better distinction should be made between different scores of the test items. For example, there is no clarity about moving in a controlled manner, it is not clear whether the participants are allowed to compensate or not. Lastly, the participants in duo-sit need to have different scoring options than the participants in solo-sit. In duo-sit, participants always have at least minimal support from an external person. As a result, these participants could only score one or two. Further distinction between support at leg, trunk or head level is necessary as it has an important influence on the participant's sitting balance. Currently, the scoring options does not seem to accurately reflect the performances of these children in duo-sit and separate scoring options are advised.

Lastly, the reaching exercises require more standardization. Currently, two clothes pegs are used to measure the forward reaching distance. These pegs could move in the manes of the horse whereby the distance changed. Besides that, lateral reaching for only 10 centimeters seemed a short distance where not everybody needed to go out of their base of support, which decreases the ability to fulfill the purpose: assessing sitting balance during reaching tasks.

5.3 Recommendations for further research

A valid and reliable measurement tool for assessing sitting balance on the back of a horse, will help physiotherapists to evaluate sitting balance after hippotherapy intervention in children with neurological disorders. The HippoTrunC enables to indicate what the difficulties are for each individual and to adapt therapy sessions to the needs of each child. To state the positive findings regarding the feasibility of the HippoTrunC, the instrument should be further evaluated in clinical practice and should be administered by different testers. Furthermore, to confirm the inter- and intra-rater reliability both on item level and scale level, a study with a larger sample size is recommended and if necessary, a revision and finetuning of the items can be made. Besides reliability, other psychometric properties as validity and responsiveness need to be determined. For example, to further investigate a possible ceiling and/or floor effect and to determine to which degree the HippoTrunC can discriminate between groups known to differ on the variable 'sitting balance', known-group validity should be administered in further research.

6 CONCLUSION

The HippoTrunC meets the criteria for feasibility: the new assessment is short (10 items), easy to administer and can be completed in less than 15 minutes. However, this study is limited by the small number of participants to draw general conclusions about the reliability. These preliminary results provide support for the HippoTrunC as a feasible and reliable measurement tool to assess sitting balance after hippotherapy intervention in children with neurological disorders. Further research is recommended to confirm these results and to investigate other psychometric properties such as validity and responsiveness.

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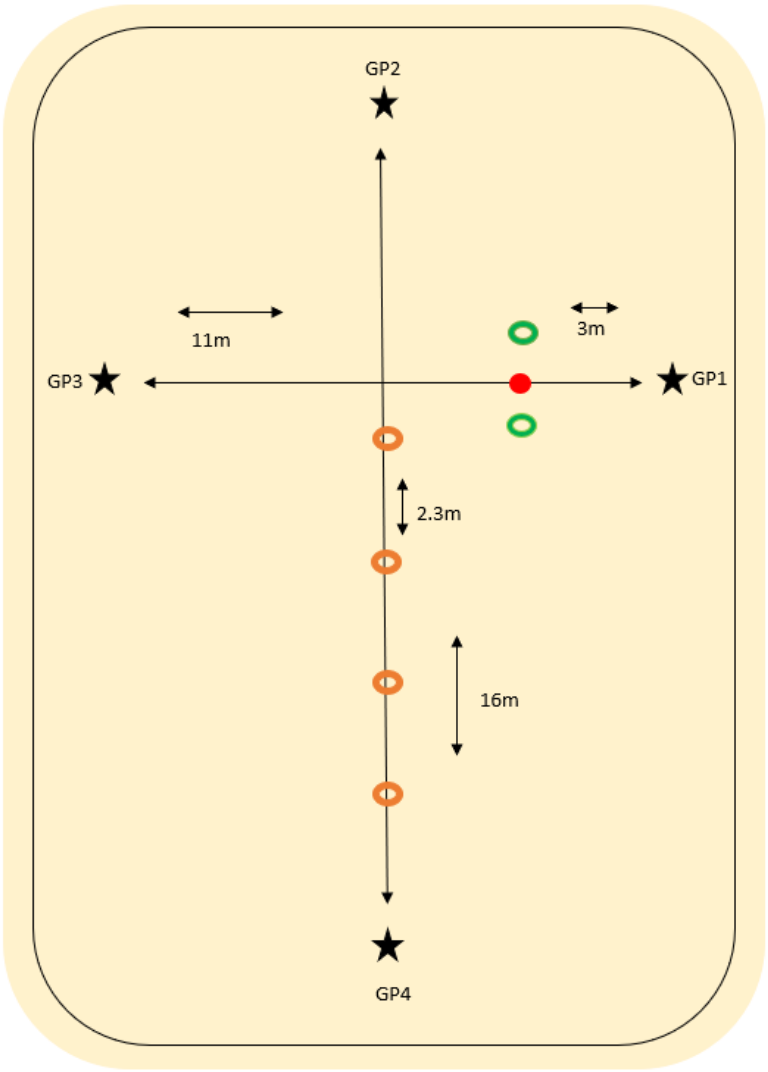
APPENDIX

Appendix Table 1
HippoTrunC

HippoTrunC				
Naam, voornaam: Geslacht: Geboortedatum: GMFCS level:			Testdatum: Naam pony:	
Hulpmiddelen Per hulpmiddel -1 punt van de totale score	• AFO's: ja - nee • Korset: elastisch (-1) - gips (-2) • Solo-zit – mate van ondersteuning: licht (-1) – matig (-2) – veel (-3) • Duo-zit – mate van ondersteuning: licht (-1) – matig (-2) – veel (-3) • Stijgbeugels: ja (-1) - nee			
Algemeen • Elke instructie mag 2x uitgelegd worden aan de zorggebruiker, vanaf dat moment wordt de zorggebruiker getest • Bij item 3 en 4 is een tweede poging toegestaan • Voor de test op een bewegend paard wordt afgenomen, worden er twee rondes in de piste toegestaan zodat het kind kan aanpassen aan het bewegend paard • Met "*recht" wordt in de testbatterij de maximale oprichting bedoeld, die mogelijk is per individu • De handen worden gedurende de test op de benen geplaatst, het handvat wordt niet vastgehouden				
Item 1. Hoofdcontrole: statisch Instructie: "Kijk recht voor je terwijl het paard stil staat"				
Score 1	**Score 2**	**Score 3**	**Score 4**	**Score**
Onmogelijk om het hoofd recht* te houden of heeft nek ondersteuning nodig	Houdt hoofd recht* voor < 10 sec	Houdt hoofd recht* voor < 30 sec	Houdt hoofd recht* voor > 30 sec	
Opmerking				
Item 2. Zitbalans: statisch Instructie: "Zit zo recht mogelijk en kijk voorwaarts"				
Score 1	**Score 2**	**Score 3**	**Score 4**	**Score**
Gebrek aan controle van de romp, heeft veel ondersteuning nodig van een persoon	Houdt romp recht, heeft minimale steun nodig van een persoon	Houdt romp recht zonder steun voor < 30 sec	Houdt romp recht zonder steun voor > 30 sec	
Opmerking				
Item 3: Zitbalans: actief (reiken) Voorbereiding: eerst wordt gevraagd de arm te strekken, vanaf het uiterste punt wordt 20cm gemeten en hier wordt de wasknijper geplaatst. Instructie: "Probeer met één hand een wasknijper te tikken, ga hiervoor zo ver mogelijk richting het oor van het paard"				
Score 1	**Score 2**	**Score 3**	**Score 4**	**Score**
Onmogelijk om voorwaarts te reiken	Mogelijk om de arm richting het oor te	Mogelijk om de arm te strekken (<20cm)	Mogelijkheid om voorwaarts te reiken	

of de arm te strekken richting het oor zonder zijn balans te verliezen of met manuele ondersteuning van de romp	strekken met manuele ondersteuning van de romp	richting het oor zonder steun	(>20cm) op een gecontroleerde manier	
Opmerking				
Item 4: Zitbalans: actief (zijwaarts reiken) Voorbereiding: eerst wordt gevraagd de arm zijwaarts te strekken, vanaf het uiterste punt wordt 10cm gemeten en hier wordt de stok geplaatst. Instructie: "Probeer met één hand de stok te tikken die naast het paard staat, ga hiervoor zo ver mogelijk richting de stok."				
Score 1	**Score 2**	**Score 3**	**Score 4**	**Score**
Onmogelijk om zijwaarts te reiken of de arm te strekken richting de stok zonder zijn balans te verliezen of met manuele ondersteuning van de romp	Mogelijk om de arm richting de stok te strekken met manuele ondersteuning van de romp	Mogelijk om te reiken (<10cm) richting de stok zonder steun	Mogelijkheid om zijwaarts te reiken (>10cm) op een gecontroleerde manier	
Opmerking				
Item 5: Zitbalans: actief (normaal tempo) Instructie: "Blijf zo recht mogelijk op het paard zitten terwijl hij voortbeweegt."				
Score 1	**Score 2**	**Score 3**	**Score 4**	**Score**
Gebrek aan controle van de romp, heeft veel ondersteuning nodig van een persoon	Houdt romp recht, heeft minimale steun nodig van een persoon	Houdt romp recht zonder steun voor de helft van de lengte (5m)	Houdt romp recht zonder steun voor de volledige lengte (>5m)	
Opmerking				
Item 6: Hoofdcontrole: actief Instructie: "Kijk recht voor je terwijl het paard beweegt" en "Kijk naar (voorwerp aan de rechterzijde in de ruimte, voorwerp aan de linkerzijde in de ruimte -> 5-10s naar een kant kijken)				
Score 1	**Score 2**	**Score 3**	**Score 4**	**Score**
Onmogelijk om het hoofd recht* te houden	Houdt hoofd recht* wanneer het paard beweegt maar niet tijdens rotatie	Houdt hoofd recht* en kan naar één zijde roteren, dit 5 sec aanhouden of naar beide zijden roteren en 5 sec aanhouden zonder dissociatie tussen romp en hoofd	Houdt hoofd recht* en kan hoofd roteren naar beide zijdes en dit 5 sec aanhouden, met dissociatie tussen romp en hoofd	
Opmerking				
Item 7: Zitbalans actief (versneld tempo) Instructie: "Blijf zo recht mogelijk zitten op het paard terwijl hij sneller gaat stappen."				
Score 1	**Score 2**	**Score 3**	**Score 4**	**Score**
Gebrek aan controle van de romp, heeft	Gebrek aan controle van de romp, heeft	Houdt romp recht zonder steun voor de	Houdt romp recht zonder steun voor de	

veel ondersteuning nodig van een persoon	minimale steun nodig van een persoon	helft van de lengte (5m)	volledige lengte (>5m)	
Opmerking				
Item 8. Zitbalans: actief (slalom) Instructie: "Probeer zo rechtop mogelijk te zitten wanneer het paard beweegt in bochten" (Kinesitherapeut/vrijwilliger beweegt met het paard aan de hand en bepaalt de bewegingen tussen de slalom)				
Score 1	**Score 2**	**Score 3**	**Score 4**	**Score**
Gebrek aan rompcontrole, ondersteuning van de romp nodig door een persoon	Gebrek aan controle van de romp, heeft minimale steun nodig van een persoon	Houdt romp rechtop maar kan niet altijd anticiperen op de beweging van het paard/kinesitherapeut	Houdt romp rechtop en anticipeert correct	
Opmerking				
Item 9. Zitbalans: reactief (slalom 2) Instructie: "Probeer zo rechtop mogelijk te zitten" (Kinesitherapeut/vrijwilliger beweegt met het paard aan de hand en bepaalt de bewegingen tussen de slalom, deze bochten zijn scherper dan de vorige)				
Score 1	**Score 2**	**Score 3**	**Score 4**	**Score**
Gebrek aan rompcontrole, ondersteuning van de romp nodig door een persoon	Gebrek aan controle van de romp, heeft minimale steun nodig van een persoon	Houdt romp rechtop maar kan niet altijd anticiperen op de beweging van het paard/kinesitherapeut	Houdt romp rechtop en anticipeert correct	
Opmerking				
Item 10: Zitbalans: reactief (start-stop) Instructie: "Probeer zo rechtop mogelijk te zitten" (Kinesitherapeut/vrijwilliger beweegt met het paard aan de hand en bepaalt de momenten van starten en stoppen)				
Score 1	**Score 2**	**Score 3**	**Score 4**	**Score**
Gebrek aan rompcontrole, ondersteuning van de romp nodig door een persoon	Gebrek aan controle van de romp, heeft minimale steun nodig van een persoon	Houdt romp rechtop maar kan niet altijd anticiperen op de beweging van het paard/kinesitherapeut	Houdt romp rechtop en anticipeert correct	
Opmerking				
Totale score (/40)				
Downgrade				
Gecorrigeerde totale score				



Legend: Colored disks = cones; GP= GoPro; Red dot= starting and end point; m = meters

Appendix figure 1: HippoTrunC course overview

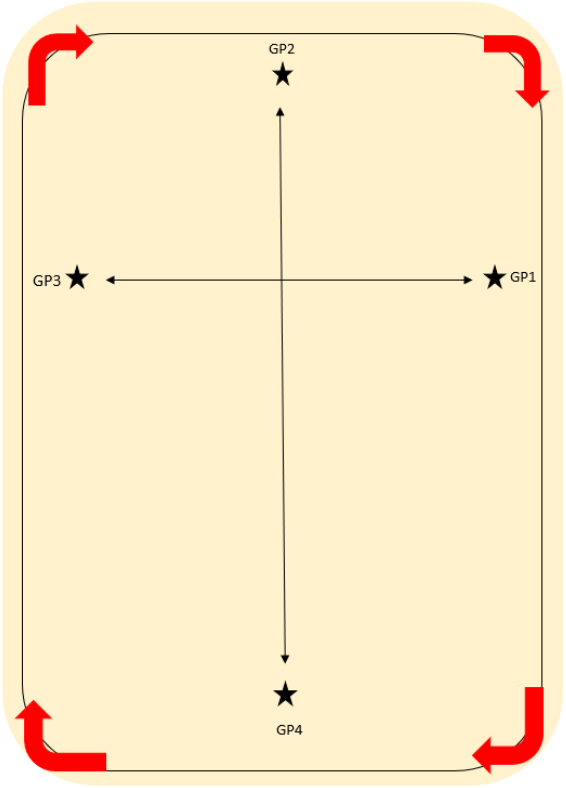


Figure 1A: Warming-up

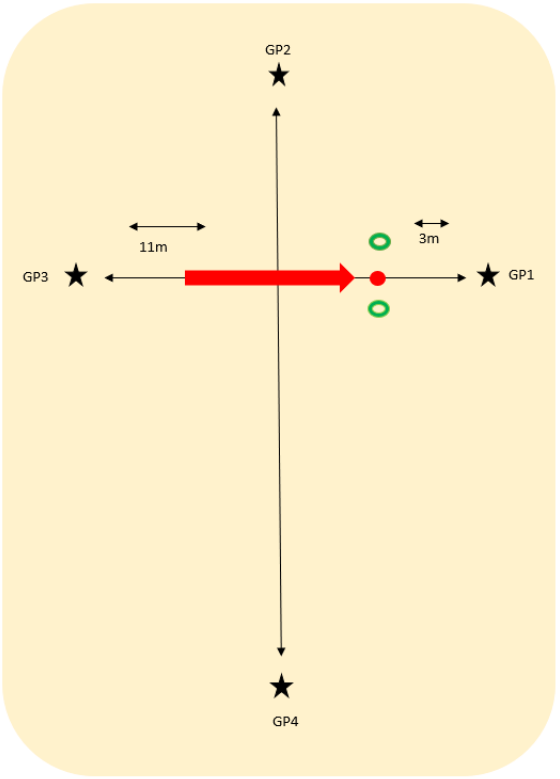


Figure 1B*:* Item 1, 2, 3 and 4

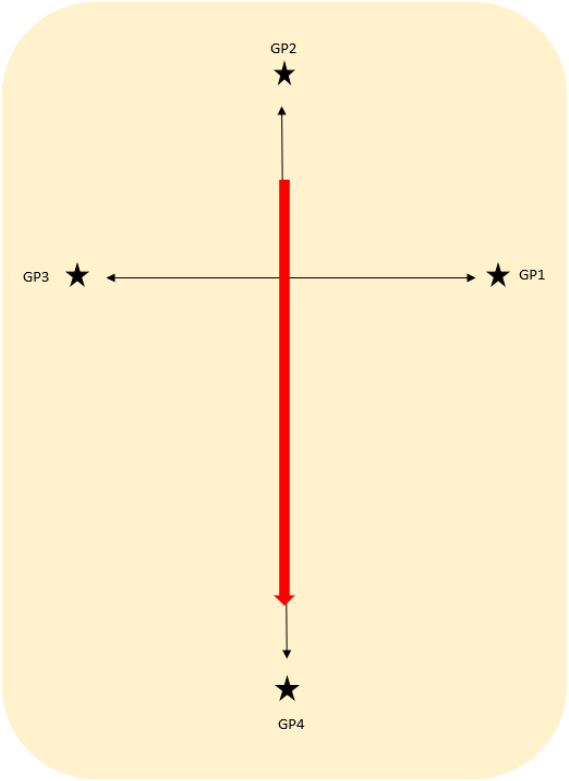


Figure 1C*:* Item 5

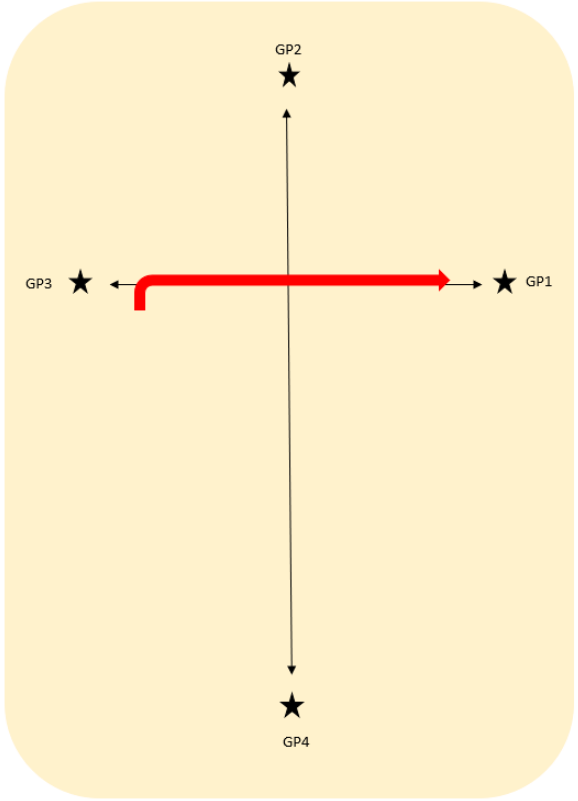


Figure 1D: Item 6

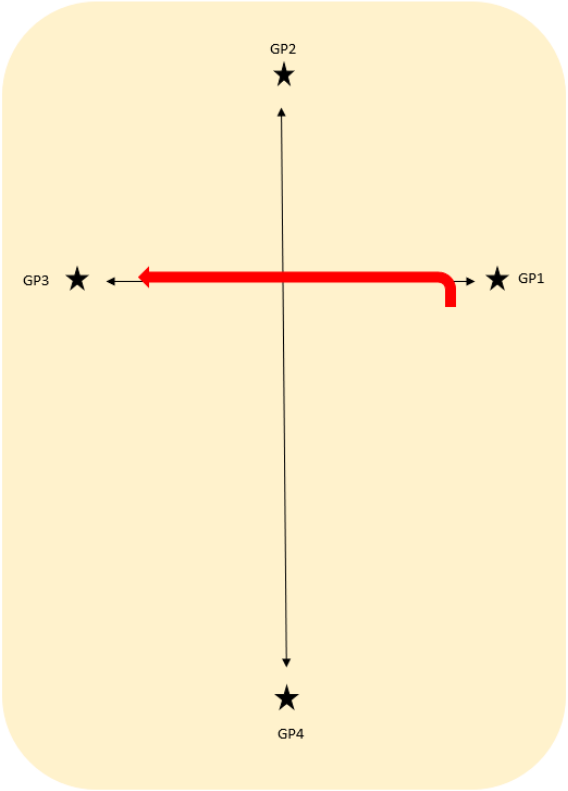


Figure 1E*:* Item 6 (part 2)

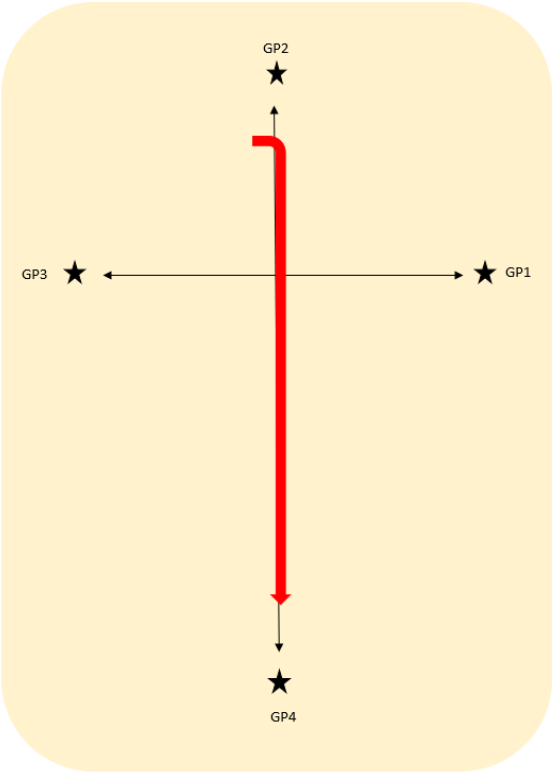


Figure 1F: Item 7

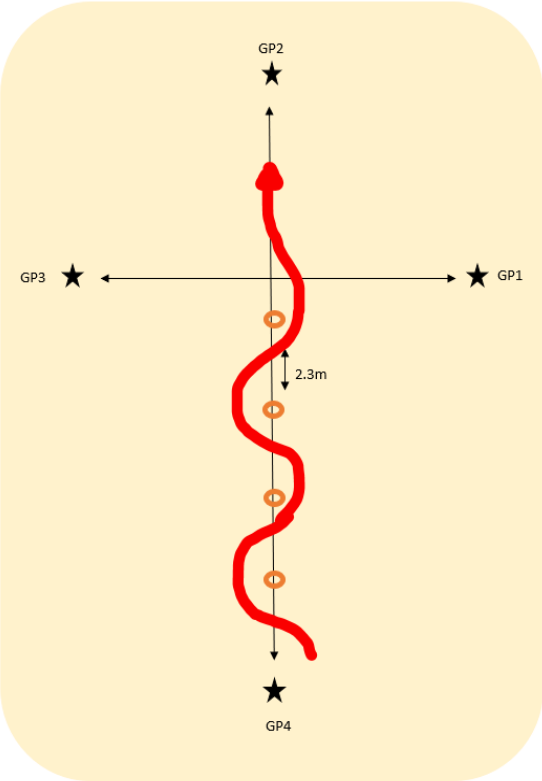


***Figure 1G**:* Item 8

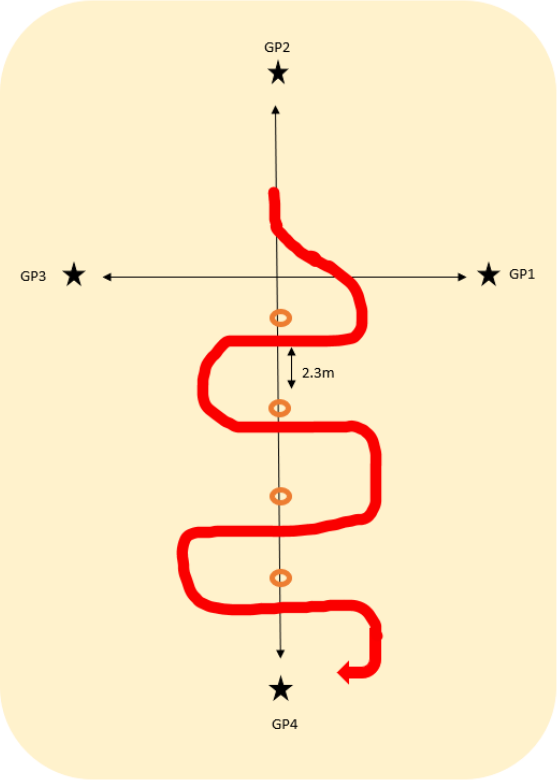


Figure 1H: Item 9

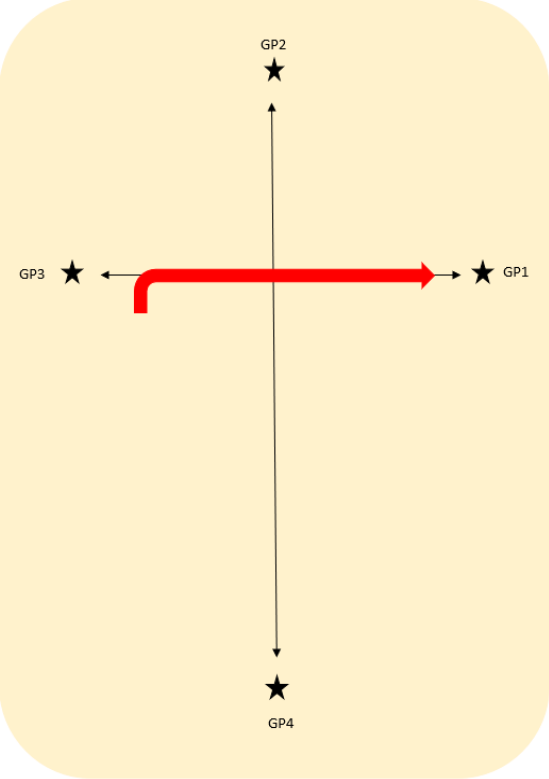


Figure 1I: Item 10

Appendix figure 2: Smileyometer

ATTACHEMENT 1: Declaration of honour – AVD

Verklaring op Eer

Ondergetekende, student aan de Universiteit Hasselt (UHasselt), faculteit Revalidatiewetenschappen aanvaardt de volgende voorwaarden en bepalingen van deze verklaring:

1. Ik ben ingeschreven als student aan de UHasselt in de opleiding Revalidatiewetenschappen en kinesitherapie, waarbij ik de kans krijg om in het kader van mijn opleiding mee te werken aan onderzoek van de faculteit Revalidatiewetenschappen aan de UHasselt. Dit onderzoek wordt beleid door prof. dr. Katrijn Klingels en dr. Evi Verbecque en kadert binnen het opleidingsonderdeel wetenschappelijke stage/masterproef deel 2. Ik zal in het kader van dit onderzoek creaties, schetsen, ontwerpen, prototypes en/of onderzoeksresultaten tot stand brengen in het domein van pediatrische revalidatie (hierna: "De Onderzoeksresultaten").

2. Bij de creatie van De Onderzoeksresultaten doe ik beroep op de achtergrondkennis, vertrouwelijke informatie[1], universitaire middelen en faciliteiten van UHasselt (hierna: de "Expertise").

3. Ik zal de Expertise, met inbegrip van vertrouwelijke informatie, uitsluitend aanwenden voor het uitvoeren van hogergenoemd onderzoek binnen UHasselt. Ik zal hierbij steeds de toepasselijke regelgeving, in het bijzonder de Algemene Verordening Gegevensbescherming (EU 2016-679), in acht nemen.

4. Ik zal de Expertise (i) voor geen enkele andere doelstelling gebruiken, en (ii) niet zonder voorafgaande schriftelijke toestemming van UHasselt op directe of indirecte wijze publiek maken.

5. Aangezien ik in het kader van mijn onderzoek beroep doe op de Expertise van de UHasselt, draag ik hierbij alle bestaande en toekomstige intellectuele eigendomsrechten op De Onderzoeksresultaten over aan de UHasselt. Deze overdracht omvat alle vormen van intellectuele eigendomsrechten, zoals onder meer – zonder daartoe beperkt te zijn – het auteursrecht, octrooirecht, merkenrecht, modellenrecht en knowhow. De overdracht geschiedt in de meest volledige omvang, voor de gehele wereld en voor de gehele beschermingsduur van de betrokken rechten.

6. In zoverre De Onderzoeksresultaten auteursrechtelijk beschermd zijn, omvat bovenstaande overdracht onder meer de volgende exploitatiewijzen, en dit steeds voor de hele beschermingsduur, voor de gehele wereld en zonder vergoeding:

   - het recht om De Onderzoeksresultaten vast te (laten) leggen door alle technieken en op alle dragers;
   - het recht om De Onderzoeksresultaten geheel of gedeeltelijk te (laten) reproduceren, openbaar te (laten) maken, uit te (laten) geven, te (laten) exploiteren en te (laten) verspreiden in eender welke vorm, in een onbeperkt aantal exemplaren;

[1] Vertrouwelijke informatie betekent alle informatie en data door de UHasselt meegedeeld aan de student voor de uitvoering van deze overeenkomst, inclusief alle persoonsgegevens in de zin van de Algemene Verordening Gegevensbescherming (EU 2016/679), met uitzondering van de informatie die (a) reeds algemeen bekend is; (b) reeds in het bezit was van de student voor de mededeling ervan door de UHasselt; (c) de student verkregen heeft van een derde zonder enige geheimhoudingsplicht; (d) de student onafhankelijk heeft ontwikkeld zonder gebruik te maken van de vertrouwelijke informatie van de UHasselt; (e) wettelijk of als gevolg van een rechterlijke beslissing moet worden bekendgemaakt, op voorwaarde dat de student de UHasselt hiervan schriftelijk en zo snel mogelijk op de hoogte brengt.

- het recht om De Onderzoeksresultaten te (laten) verspreiden en mee te (laten) delen aan het publiek door alle technieken met inbegrip van de kabel, de satelliet, het internet en alle vormen van computernetwerken;
- het recht De Onderzoeksresultaten geheel of gedeeltelijk te (laten) bewerken of te (laten) vertalen en het (laten) reproduceren van die bewerkingen of vertalingen;
- het recht De Onderzoeksresultaten te (laten) bewerken of (laten) wijzigen, onder meer door het reproduceren van bepaalde elementen door alle technieken en/of door het wijzigen van bepaalde parameters (zoals de kleuren en de afmetingen).

De overdracht van rechten voor deze exploitatiewijzen heeft ook betrekking op toekomstige onderzoeksresultaten tot stand gekomen tijdens het onderzoek aan UHasselt, eveneens voor de hele beschermingsduur, voor de gehele wereld en zonder vergoeding.

Ik behoud daarbij steeds het recht op naamvermelding als (mede)auteur van de betreffende Onderzoeksresultaten.

7. Ik zal alle onderzoeksdata, ideeën en uitvoeringen neerschrijven in een "laboratory notebook" en deze gegevens niet vrijgeven, tenzij met uitdrukkelijke toestemming van mijn UHasseltbegeleider prof. dr. Katrijn Klingels en dr. Evi Verbecque.

8. Na de eindevaluatie van mijn onderzoek aan de UHasselt zal ik alle verkregen vertrouwelijke informatie, materialen, en kopieën daarvan, die nog in mijn bezit zouden zijn, aan UHasselt terugbezorgen.

Gelezen voor akkoord en goedgekeurd,

Naam: Aude Van Dessel

Adres: Herentalsedijk 192, 2440 Geel

Geboortedatum en -plaats : 22/12/1999, te Herentals

Datum: 05/06/2022

Handtekening: 

ATTACHEMENT 2: Declaration of honour – KH

Verklaring op Eer

Ondergetekende, student aan de Universiteit Hasselt (UHasselt), faculteit Revalidatiewetenschappen aanvaardt de volgende voorwaarden en bepalingen van deze verklaring:

1. Ik ben ingeschreven als student aan de UHasselt in de opleiding Revalidatiewetenschappen en kinesitherapie, waarbij ik de kans krijg om in het kader van mijn opleiding mee te werken aan onderzoek van de faculteit Revalidatiewetenschappen aan de UHasselt. Dit onderzoek wordt beleid door prof. Dr. Klingels en dr. Verbecque en kadert binnen opleidingsonderdeel Masterproef deel 2. Ik zal in het kader van dit onderzoek creaties, schetsen, ontwerpen, prototypes en/of onderzoeksresultaten tot stand brengen in het domein van Pediatrische revalidatie.

2. Bij de creatie van De Onderzoeksresultaten doe ik beroep op de achtergrondkennis, vertrouwelijke informatie[1], universitaire middelen en faciliteiten van UHasselt (hierna: de "Expertise").

3. Ik zal de Expertise, met inbegrip van vertrouwelijke informatie, uitsluitend aanwenden voor het uitvoeren van hogergenoemd onderzoek binnen UHasselt. Ik zal hierbij steeds de toepasselijke regelgeving, in het bijzonder de Algemene Verordening Gegevensbescherming (EU 2016-679), in acht nemen.

4. Ik zal de Expertise (i) voor geen enkele andere doelstelling gebruiken, en (ii) niet zonder voorafgaande schriftelijke toestemming van UHasselt op directe of indirecte wijze publiek maken.

5. Aangezien ik in het kader van mijn onderzoek beroep doe op de Expertise van de UHasselt, draag ik hierbij alle bestaande en toekomstige intellectuele eigendomsrechten op De Onderzoeksresultaten over aan de UHasselt. Deze overdracht omvat alle vormen van intellectuele eigendomsrechten, zoals onder meer – zonder daartoe beperkt te zijn – het auteursrecht, octrooirecht, merkenrecht, modellenrecht en knowhow. De overdracht geschiedt in de meest volledige omvang, voor de gehele wereld en voor de gehele beschermingsduur van de betrokken rechten.

6. In zoverre De Onderzoeksresultaten auteursrechtelijk beschermd zijn, omvat bovenstaande overdracht onder meer de volgende exploitatiewijzen, en dit steeds voor de hele beschermingsduur, voor de gehele wereld en zonder vergoeding:

   - het recht om De Onderzoeksresultaten vast te (laten) leggen door alle technieken en op alle dragers;
   - het recht om De Onderzoeksresultaten geheel of gedeeltelijk te (laten) reproduceren, openbaar te (laten) maken, uit te (laten) geven, te (laten) exploiteren en te (laten) verspreiden in eender welke vorm, in een onbeperkt aantal exemplaren;

[1] Vertrouwelijke informatie betekent alle informatie en data door de UHasselt meegedeeld aan de student voor de uitvoering van deze overeenkomst, inclusief alle persoonsgegevens in de zin van de Algemene Verordening Gegevensbescherming (EU 2016/679), met uitzondering van de informatie die (a) reeds algemeen bekend is; (b) reeds in het bezit was van de student voor de mededeling ervan door de UHasselt; (c) de student verkregen heeft van een derde zonder enige geheimhoudingsplicht; (d) de student onafhankelijk heeft ontwikkeld zonder gebruik te maken van de vertrouwelijke informatie van de UHasselt; (e) wettelijk of als gevolg van een rechterlijke beslissing moet worden bekendgemaakt, op voorwaarde dat de student de UHasselt hiervan schriftelijk en zo snel mogelijk op de hoogte brengt.

- het recht om De Onderzoeksresultaten te (laten) verspreiden en mee te (laten) delen aan het publiek door alle technieken met inbegrip van de kabel, de satelliet, het internet en alle vormen van computernetwerken;
- het recht De Onderzoeksresultaten geheel of gedeeltelijk te (laten) bewerken of te (laten) vertalen en het (laten) reproduceren van die bewerkingen of vertalingen;
- het recht De Onderzoeksresultaten te (laten) bewerken of (laten) wijzigen, onder meer door het reproduceren van bepaalde elementen door alle technieken en/of door het wijzigen van bepaalde parameters (zoals de kleuren en de afmetingen).

De overdracht van rechten voor deze exploitatiewijzen heeft ook betrekking op toekomstige onderzoeksresultaten tot stand gekomen tijdens het onderzoek aan UHasselt, eveneens voor de hele beschermingsduur, voor de gehele wereld en zonder vergoeding.

Ik behoud daarbij steeds het recht op naamvermelding als (mede)auteur van de betreffende Onderzoeksresultaten.

7. Ik zal alle onderzoeksdata, ideeën en uitvoeringen neerschrijven in een "laboratory notebook" en deze gegevens niet vrijgeven, tenzij met uitdrukkelijke toestemming van mijn UHasseltbegeleiders: prof dr. Klingels en dr. Verbecque

8. Na de eindevaluatie van mijn onderzoek aan de UHasselt zal ik alle verkregen vertrouwelijke informatie, materialen, en kopieën daarvan, die nog in mijn bezit zouden zijn, aan UHasselt terugbezorgen.

Gelezen voor akkoord en goedgekeurd,

Naam: Kaat Hombroux

Adres: Dijkstraat 7, 3806 Velm

Geboortedatum en –plaats : 08/07/1998, te Sint-Truiden

Datum: 05/06/2022

Handtekening: Hombroux K.

ATTACHEMENT 3: Progress form

www.uhasselt.be
Campus Hasselt | Martelarenlaan 42 | BE-3500 Hasselt
Campus Diepenbeek | Agoralaan gebouw D | BE-3590 Diepenbeek
T + 32(0)11 26 81 11 | E-mail: info@uhasselt.be

UHASSELT
KNOWLEDGE IN ACTION

INVENTARISATIEFORMULIER WETENSCHAPPELIJKE STAGE DEEL 2

DATUM	INHOUD OVERLEG	HANDTEKENINGEN
09/11/2021	**Online** Bespreking praktische zaken protocol + aanvraag goedkeuring CME	Promotor: Copromotor/Begeleider: Student(e): Student(e):
15/12/2021	**Sint-Gerardus Diepenbeek** Finetuning meetinstrument	Promotor: Copromotor/Begeleider: Student(e): Student(e):
08/04/2022	**Sint-Gerardus Diepenbeek** Uittesten camerasystemen *Enkel studenten + begeleider aanwezig*	Promotor: Copromotor/Begeleider: Student(e): Student(e):
19/04/2022	**Sint-Gerardus Diepenbeek** Voorbereiding datacollectie (finetuning parcours, revisie testitems, eerste trial HippoTrunC met camerasystemen)	Promotor: Copromotor/Begeleider: Student(e): Student(e):
21/04/2022	**Sint-Gerardus Diepenbeek** (Datacollectie *Enkel studenten + begeleider aanwezig*	Promotor: Copromotor/Begeleider: Student(e): Student(e):
22/04/2022	**Sint-Gerardus Diepenbeek** Datacollectie *Enkel studenten + begeleider aanwezig*	Promotor: Copromotor/Begeleider: Student(e): Student(e):
26/04/2022	**Sint-Gerardus Diepenbeek** Datacollectie *Enkel studenten + begeleider aanwezig*	Promotor: Copromotor/Begeleider: Student(e): Student(e):
28/04/2022	**Online** Werkvergadering statistiek	Promotor: Copromotor/Begeleider: Student(e): Student(e):
11/05/2022	**Online** Inhoudelijke discussie	Promotor: Copromotor/Begeleider: Student(e): Student(e):

20/06/2022	**Campus UHasselt Diepenbeek** Proefverdediging	Promotor: Copromotor/Begeleider: Student(e): Student(e):

In te vullen door de promotor(en) en eventuele copromotor aan het einde van MP2:

Naam Student(e): …… Datum:…….....

Titel Masterproef: ……

1) Geef aan in hoeverre de student(e) onderstaande competenties zelfstandig uitvoerde:
   - NVT: De student(e) leverde hierin geen bijdrage, aangezien hij/zij in een reeds lopendestudie meewerkte.
   - 1: De student(e) was niet zelfstandig en sterk afhankelijk van medestudent(e) ofpromotor en teamleden bij de uitwerking en uitvoering.
   - 2: De student(e) had veel hulp en ondersteuning nodig bij de uitwerking en uitvoering.
   - 3: De student(e) was redelijk zelfstandig bij de uitwerking en uitvoering
   - 4: De student(e) had weinig tot geringe hulp nodig bij de uitwerking en uitvoering.
   - 5: De student(e) werkte zeer zelfstandig en had slechts zeer sporadisch hulp en bijsturingnodig van de promotor of zijn team bij de uitwerking en uitvoering.

Competenties	**NVT**	**1**	**2**	**3**	**4**	**5**
Opstelling onderzoeksvraag	O	O	O	O	O	O
Methodologische uitwerking	O	O	O	O	O	O
Data acquisitie	O	O	O	O	O	O
Data management	O	O	O	O	O	O
Dataverwerking/Statistiek	O	O	O	O	O	O
Rapportage	O	O	O	O	O	O

2) <u>Niet-bindend advies:</u> Student(e) krijgt toelating/geen toelating (schrappen wat niet past) ombovenvermelde Wetenschappelijke stage/masterproef deel 2 te verdedigen in bovenvermelde periode. Deze eventuele toelating houdt geen garantie in dat de student geslaagd is voor dit opleidingsonderdeel.

3) Deze wetenschappelijke stage/masterproef deel 2 mag wel/niet (schrappen wat niet past)openbaar verdedigd worden.

4) Deze wetenschappelijke stage/masterproef deel 2 mag wel/niet (schrappen wat niet past)opgenomen worden in de bibliotheek en docserver van de UHasselt.

Datum en handtekening Student(e)	Datum en handtekening promotor(en)	Datum en handtekening Co-promotor(en)

ATTACHEMENT 4: Registration form jury Master's thesis

UHASSELT
KNOWLEDGE IN ACTION

Inschrijvingsformulier verdediging masterproef academiejaar 2021-2022,
Registration form jury Master's thesis academic year 2021-2022,

GEGEVENS STUDENT - *INFORMATION STUDENT*

Faculteit/School: **Faculteit Revalidatiewetenschappen**
Faculty/School: ***Rehabilitation Sciences***

Stamnummer + naam: **1746450 Van Dessel Aude**
Student number + name

Opleiding/*Programme*: **2 ma revalid. & kine kinderen**

INSTRUCTIES - *INSTRUCTIONS*

Neem onderstaande informatie grondig door.

Print dit document en vul het aan met DRUKLETTERS.

In tijden van van online onderwijs door COVID-19 verstuur je het document (scan of leesbare foto) ingevuld via mail naar je promotor. Je promotor bezorgt het aan de juiste dienst voor verdere afhandeling.

Vul luik A aan. Bezorg het formulier aan je promotoren voor de aanvullingen in luik B. Zorg dat het formulier ondertekend en gedateerd wordt door jezelf en je promotoren in luik D en dien het in bij de juiste dienst volgens de afspraken in jouw opleiding.
Zonder dit inschrijvingsformulier krijg je geen toegang tot upload/verdediging van je masterproef.

Please read the information below carefully.

Print this document and complete it by hand writing, using CAPITAL LETTERS.

In times of COVID-19 and during the online courses you send the document (scan or readable photo) by email to your supervisor. Your supervisor delivers the document to the appropriate department.

Fill out part A. Send the form to your supervisors for the additions in part B. Make sure that the form is signed and dated by yourself and your supervisors in part D and submit it to the appropriate department in accordance with the agreements in your study programme.
Without this registration form, you will not have access to the upload/defense of your master's thesis.

LUIK A - VERPLICHT - IN TE VULLEN DOOR DE STUDENT
PART A - MANDATORY - TO BE FILLED OUT BY THE STUDENT

Titel van Masterproef/*Title of Master's thesis:* FEASIBILITY AND RELIABILITY STUDY OF A NEW ASSESSMENT TO EVALUATE SITTING BALANCE ON THE BACK OF A HORSE IN CHILDREN WITH NEUROLOGICAL DISORDERS : THE HIPPOTRUNC

☒ behouden - *keep*

☐ wijzigen - *change to:*

UHvoorlev5 23/05/2022

/:

O behouden - *keep*

O wijzigen - *change to:*

In geval van samenwerking tussen studenten, naam van de medestudent(en)/*In case of group work, name of fellow student(s):* KAAT HONBROUX

● behouden - *keep*

O wijzigen - *change to:*

LUIK B - VERPLICHT - IN TE VULLEN DOOR DE PROMOTOR(EN)
PART B - MANDATORY - TO BE FILLED OUT BY THE SUPERVISOR(S)

Wijziging gegevens masterproef in luik A/*Change information Master's thesis in part A:*

O goedgekeurd - *approved*

O goedgekeurd mits wijziging van - *approved if modification of:*

Scriptie/*Thesis:*

O openbaar (beschikbaar in de document server van de universiteit)- *public (available in document server of university)*

O vertrouwelijk (niet beschikbaar in de document server van de universiteit) - *confidential (not available in document server of university)*

Juryverdediging/*Jury Defense:*

De promotor(en) geeft (geven) de student(en) het niet-bindend advies om de bovenvermelde masterproef in de bovenvermelde periode/*The supervisor(s) give(s) the student(s) the non-binding advice:*

O te verdedigen/*to defend the aforementioned Master's thesis within the aforementioned period of time*

O de verdediging is openbaar/*in public*

O de verdediging is niet openbaar/*not in public*

O niet te verdedigen/*not to defend the aforementioned Master's thesis within the aforementioned period of time*

LUIK C - OPTIONEEL - IN TE VULLEN DOOR STUDENT, alleen als hij luik B wil overrulen
PART C - OPTIONAL - TO BE FILLED OUT BY THE STUDENT, only if he wants to overrule part B

In tegenstelling tot het niet-bindend advies van de promotor(en) wenst de student de bovenvermelde masterproef in de bovenvermelde periode/*In contrast to the non-binding advice put forward by the supervisor(s), the student wishes:*

O niet te verdedigen/*not to defend the aforementioned Master's thesis within the aforementioned period of time*

O te verdedigen/*to defend the aforementioned Master's thesis within the aforementioned period of time*

UHvoorlev5 23/05/2022

LUIK D - VERPLICHT - IN TE VULLEN DOOR DE STUDENT EN DE PROMOTOR(EN)
PART D - MANDATORY - TO BE FILLED OUT BY THE STUDENT AND THE SUPERVISOR(S)

Datum en handtekening student(en)
Date and signature student(s)

23/5/2022

Datum en handtekening promotor(en)
Date and signature supervisor(s)

UHASSELT
KNOWLEDGE IN ACTION

Inschrijvingsformulier verdediging masterproef academiejaar 2021-2022,
Registration form jury Master's thesis academic year 2021-2022,

GEGEVENS STUDENT - *INFORMATION STUDENT*

Faculteit/School: **Faculteit Revalidatiewetenschappen**
Faculty/School: ***Rehabilitation Sciences***

Stamnummer + naam: **1746759 Hombroux Kaat**
Student number + name

Opleiding/*Programme*: **2 ma revalid. & kine musc.**

INSTRUCTIES - *INSTRUCTIONS*

Neem onderstaande informatie grondig door.

Print dit document en vul het aan met DRUKLETTERS.

In tijden van van online onderwijs door COVID-19 verstuur je het document (scan of leesbare foto) ingevuld via mail naar je promotor. Je promotor bezorgt het aan de juiste dienst voor verdere afhandeling.

Vul luik A aan. Bezorg het formulier aan je promotoren voor de aanvullingen in luik B. Zorg dat het formulier ondertekend en gedateerd wordt door jezelf en je promotoren in luik D en dien het in bij de juiste dienst volgens de afspraken in jouw opleiding.
Zonder dit inschrijvingsformulier krijg je geen toegang tot upload/verdediging van je masterproef.

Please read the information below carefully.

Print this document and complete it by hand writing, using CAPITAL LETTERS.

In times of COVID-19 and during the online courses you send the document (scan or readable photo) by email to your supervisor. Your supervisor delivers the document to the appropriate department.

Fill out part A. Send the form to your supervisors for the additions in part B. Make sure that the form is signed and dated by yourself and your supervisors in part D and submit it to the appropriate department in accordance with the agreements in your study programme.
Without this registration form, you will not have access to the upload/defense of your master's thesis.

LUIK A - VERPLICHT - IN TE VULLEN DOOR DE STUDENT
PART A - MANDATORY - TO BE FILLED OUT BY THE STUDENT

Titel van Masterproef/*Title of Master's thesis:* FEASIBILITY AND RELIABILITY STUDY OF A NEW ASSESSMENT TO EVALUATE SITTING BALANCE ON THE BACK OF A HORSE IN CHILDREN WITH NEUROLOGICAL DISORDERS : THE HIPPOTRUNC

● behouden - *keep*

○ wijzigen - *change to:*

UHvoorlev5 23/05/2022

/:

O behouden - *keep*

O wijzigen - *change to*:

In geval van samenwerking tussen studenten, naam van de medestudent(en)/*In case of group work, name of fellow student(s)*: AUDE VAN DESSEL

● behouden - *keep*

O wijzigen - *change to:*

LUIK B - VERPLICHT - IN TE VULLEN DOOR DE PROMOTOR(EN)
PART B - MANDATORY - TO BE FILLED OUT BY THE SUPERVISOR(S)

Wijziging gegevens masterproef in luik A/*Change information Master's thesis in part A:*

O goedgekeurd - *approved*

O goedgekeurd mits wijziging van - *approved if modification of:*

Scriptie/*Thesis:*

O openbaar (beschikbaar in de document server van de universiteit)- *public (available in document server of university)*

O vertrouwelijk (niet beschikbaar in de document server van de universiteit) - *confidential (not available in document server of university)*

Juryverdediging/*Jury Defense:*

De promotor(en) geeft (geven) de student(en) het niet-bindend advies om de bovenvermelde masterproef in de bovenvermelde periode/*The supervisor(s) give(s) the student(s) the non-binding advice:*

O te verdedigen/*to defend the aforementioned Master's thesis within the aforementioned period of time*

O de verdediging is openbaar/*in public*

O de verdediging is niet openbaar/*not in public*

O niet te verdedigen/*not to defend the aforementioned Master's thesis within the aforementioned period of time*

LUIK C - OPTIONEEL - IN TE VULLEN DOOR STUDENT, alleen als hij luik B wil overrulen
PART C - OPTIONAL - TO BE FILLED OUT BY THE STUDENT, only if he wants to overrule part B

In tegenstelling tot het niet-bindend advies van de promotor(en) wenst de student de bovenvermelde masterproef in de bovenvermelde periode/*In contrast to the non-binding advice put forward by the supervisor(s), the student wishes:*

O niet te verdedigen/*not to defend the aforementioned Master's thesis within the aforementioned period of time*

O te verdedigen/*to defend the aforementioned Master's thesis within the aforementioned period of time*

UHvoorlev5 23/05/2022

LUIK D - VERPLICHT - IN TE VULLEN DOOR DE STUDENT EN DE PROMOTOR(EN)
PART D - MANDATORY - TO BE FILLED OUT BY THE STUDENT AND THE SUPERVISOR(S)

Datum en handtekening student(en)
Date and signature student(s)

23/05/2022

Hombaux K.

Datum en handtekening promotor(en)
Date and signature supervisor(s)

ATTACHEMENT 5: Reply - Positive advice registration form

Katrijn KLINGELS wo 25 mei 11:15 (5 dagen geleden)
aan mij, Evi, Aude

Beste Kaat en Aude,
Via deze mail geef ik jullie goedkeuring om je MP in te dienen. Ik mail maandag de formulieren door.
Met vriendelijke groeten,
Katrijn Klingels

Prof.dr. Katrijn Klingels

Associate professor

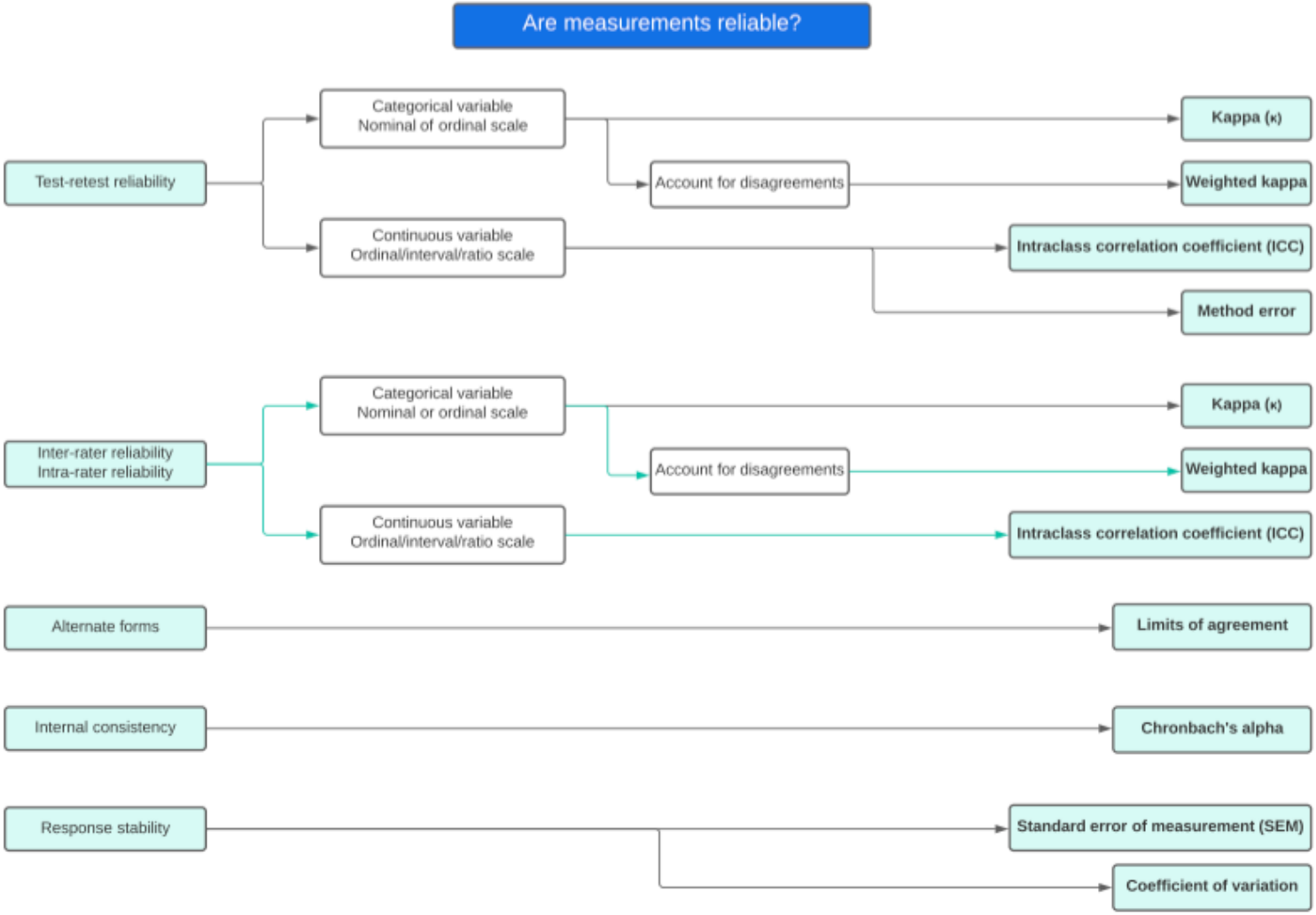
Pediatrische Revalidatie - Faculteit Revalidatiewetenschappen

Onderzoeksgroep REVAL

T +32(0)11 26 93 94

www.uhasselt.be
Universiteit Hasselt - Campus Diepenbeek
Agoralaan Gebouw A - B-3590 Diepenbeek
Kantoor BMO-A027

ATTACHEMENT 6: Statistical flowchart



Portney, L. G., & Watkins, M. P. (2009). *Foundations of Clinical Research: Applications to Practice 3rd (third) edition* (3de edition). Pearson Education.