TITLE: Perceived Barriers, Enablers and Modifications to Tests Assessing Pediatric Lower Limb Neurological Impairment: An International Delphi Survey

RUNNING HEAD: Modifications to Pediatric Neurological Tests

TOC CATEGORY: Pediatrics

ARTICLE TYPE: Original Research

KEYWORDS: Anatomy: Lower Extremity, Cerebral Palsy, Charcot- Marie-Tooth Disease, Muscle Strength, Muscular Dystrophies, Neurology, Pediatrics, Physical Examination, Reflex, Sensation

ACCEPTED: December 1, 2020

SUBMITTED: May 5, 2020

AUTHOR BYLINE: Ramona Clark, Emmah Baque, Cherie Wells, Andrea Bialocerkowski

AUTHOR INFORMATION

R. Clark¹; E. Baque¹; C. Wells²; A. Bialocerkowski¹

¹School of Allied Health Sciences, Griffith University, Gold Coast, Queensland, Australia

²School of Community Health, Charles Sturt University, New South Wales, Australia

© The Author(s) 2021. Published by Oxford University Press on behalf of the American Physical Therapy Association. All rights reserved. For permissions, please email: journals.permissions@oup.com

Corresponding Author:

Ramona Clark

PhD Confirmed

School of Allied Health Sciences

Griffith University

Gold Coast, Queensland 4222

Phone: +61 7 373 53662

Email: ramona.clark2@griffithuni.edu.au

Objectives:

Accurate, clinically meaningful outcome measures that are responsive to change are essential for selecting interventions and assessing their effects. Little guidance exists on the selection and administration of neurological impairment tests in children with a neurological condition. Clinicians, therefore, frequently modify adult assessments for use in children, yet the literature is inconsistent. This study aims to establish consensus on neurological conditions most likely to require neurological impairment test in pediatrics and the barriers, enablers and modifications perceived to enhance test reliability.

Methods:

Over a 2-round modified Delphi study, a panel of experts (n = 24) identified neurological conditions perceived to typically require pediatric neurological testing and the modifications to address barriers/enablers to testing. Experts comprised of physical therapists with evidence of advanced training or research in pediatrics. Using a 6-point Likert scale, (6=strongly agree, 5=agree, 4=somewhat agree, 3=somewhat disagree, 2=disagree, 1=strongly disagree), experts rated statements from existing literature. Thematic analyses were conducted on responses to open-ended questions. A-priori consensus was pre-set at 65% agreement/disagreement. Median, mode and interquartile ranges estimated perceived importance. Cessation was pre-determined by non-consensus items <10% and panel fatigue.

Results:

Experts reached consensus on 107/112 (96%) items, including identifying 25/26 (96%) neurological conditions they perceived to require routine neurological testing. Experts strongly agreed with high importance that appropriately trained, experienced therapists are

less variable when testing children. Communication modifications were perceived most important.

Conclusions:

High levels of consensus support the use of lower limb neurological testing in a range of pediatric neurological conditions. Trained clinicians should document modifications such as visual aid use. Using recommended modifications could encourage consistency amongst clinicians.

Impact:

This is the first study to identify the barriers and enablers to pediatric neurological testing. Barriers and enablers were partially addressed through suggested modifications. Further rigorous examination of these modifications is required to support their use.

Lay summary:

This study supports that clinicians should adapt their communication for children and young people with neurological problems to include visual aids and equipment demonstration.

INTRODUCTION

Accurate, clinically meaningful and reliable outcome measures are essential for monitoring the treatment and progression of neurological conditions.¹ There is currently however, a lack of accepted criterion standards for neurological outcome measures in children and young people.² Neurological conditions in this population present with similar impairments in lower limb muscle strength, tactile sensitivity and/or reflexes when compared to adults.^{3,4} However, neurological development and growth occurs from birth into the early twenties irrespective of a neurological diagnosis.⁵⁻⁸ Outcome measures in children and young people, must therefore be responsive to clinical change independent of growth.² Use of standardized tests to accurately assess and document changes in lower limb neurological impairments over time is, therefore, integral to assure optimal clinical management of these children and young people.^{1,3,9}

Current tests of neurological impairment lack adequate evidence of clinimetric properties when used on children and young people with a neurological condition.^{4,10} A systematic review by Clark et al⁴ identified six lower limb neurological tests with limited evidence of validity, reliability, responsiveness to change and clinical utility for use in children and young people with a neurological condition. The identified tests included pinprick and light touch, manual muscle testing, use of handheld dynamometry and the standing heel rise as either standalone tests or included within a battery of tests.⁴ Evidence of reliability was predominantly limited by small sample sizes and inconsistent reporting of protocols.^{4,11} Most available tests have not been validated for use in children with a neurological condition.^{4,10} Evidence of clinimetric properties is population specific as evidence of tests is

not transferrable from use in adults to children¹² nor from typically developing individuals to those with a neurological condition. It remains unknown which neurological conditions are most likely to benefit from a standardized protocol to consistently assess neurological impairment.

The emergence of interventions for individuals with neurological conditions has advanced at a rapid pace,³ yet development of outcome measures that are responsive to change have not increased at the same rate.¹ Accurate assessment and interpretation of neurological impairment tests may enhance the understanding of factors contributing to a child's activity limitations or participation restrictions and assist in the design and administration of targeted interventions.^{3, 5, 13-15} Responsive outcome measures are important to monitor interventions, particularly those with lower levels of evidence.³ For example, Novak et al³ found strength interventions in children with Cerebral Palsy have a small effect size and recommend systematic and disciplined use of outcome measures to confirm future treatment effects. Though interventions also need improvement, outcome measures which are insufficiently responsive to change, or are administered or interpreted inconsistently, may mask the treatment effect including hiding deleterious effects.^{3, 9, 16}

In the absence of a standardized neurological tests, clinicians experience challenges selecting the best available outcome measure and consistently implementing it.⁴ For example, outcome measures evaluating muscle strength in Novak et al's³ systematic review were highly variable with no single outcome measure used in all studies. Understanding

clinicians' potential barriers or enablers to choosing and implementing a neurological test is the first step towards developing a standardized test and evaluating it for evidence of clinimetric properties.^{4, 13} Auld et al¹⁷ examined factors that influence physical therapists and occupational therapists to perform tactile assessment of the upper limb in children. They identified that the most prevalent barriers to administration of pediatric upper limb tactile assessments were a lack of perceived knowledge, confidence and availability of equipment.^{17, 18} Little is known about the barriers or enablers to using lower limb neurological impairment tests.^{4, 19}

Lower limb neurological impairment tests are often difficult to perform in children due to changes in behavioral states and anxiety relating to equipment and procedures that is often associated with variable ages and development.^{20, 21} In the absence of criterion standards for test administration, clinicians frequently modify neurological impairment tests to account for the child's potentially fluctuating compliance, effort and motivation.^{4, 13} Test selection and the methods of test administration are therefore highly variable, with administration protocols and modifications poorly described in the literature.^{4, 13, 20, 22, 23} This makes it difficult to compare results between studies and to pool data for meta-analyses.^{1, 4, 23}

A standardized protocol with appropriate clinimetric properties, when used by clinicians with appropriate training, may facilitate more accurate monitoring of children over time, and provide data that can be pooled across studies and clinical sites.¹ A standardized

protocol can provide clarity and direction for clinicians and researchers on how to measure lower limb neurological impairment in children and signpost when further assessment is required.^{19, 24-28} To develop a standardized protocol, consensus needs to be gained from experts in the field, as little guidance can be gained from the body of evidence on neurological impairment testing in children.²

This paper reports on the following aims, which were to seek expert panel consensus on:

1. Neurological pediatric conditions which clinicians typically test neurological impairment and perceive would most benefit from standardized testing
2. Barriers and enablers to the clinicians' selection and administration of a neurological impairment test of the lower limbs in children and young people with a neurological condition
3. Modifications clinicians perceive to enhance reliability in neurological impairment testing in children and young people with a neurological condition.

[H1] METHOD

An electronic Delphi technique, consisting of two sequential questionnaire rounds, was conducted between December 2016 and March 2017. A Delphi survey establishes consensus from an expert panel. In contrast to the nominal group technique or focus groups, a wide range of experts can respond anonymously from diverse geographical areas using electronic survey software.^{28, 29} This can reduce pressure to respond similarly to peers.²⁸ Ethical approval to conduct this study was gained from the Human Research Ethics

Committee, Griffith University, (GU Ref no: 2016/331). Participants provided informed consent to complete the questionnaire by agreeing to information and consent terms outlined prior to commencement of each round. Participants could withdraw from the study at any time without prejudice.

[H2] Item generation and pilot testing

Items for Questionnaire 1 were developed using both open-ended statements and pre-generated statements, including perceptions of the neurological tests on muscle strength, tactile sensitivity and reflexes identified within the literature.⁴ Statements generated from review of existing research were used to enhance the validity of consensus findings²⁹ and reduce panel fatigue.³⁰ A free text response box allowed participants to add their own comments. Open-ended questions were included to create additional expert driven statements³¹ on perceived enablers and barriers to standardized neurological testing and how the child's age could influence test administration. Children and young people were defined as aged between 5 to 22 years.³² Four physical therapists familiar with the Delphi consensus method and / or pediatric content piloted Questionnaire 1. These physical therapists provided feedback on the readability of statements, so improvements could be made to ensure statements were clear, unambiguous and non-leading.

[H2] Participants

Purposeful sampling and snowballing recruitment techniques were utilized to identify potential participants.³³ (Fig. 1) Participants were required to meet selection criteria (Fig. 2)

prior to commencing the Delphi study. Participant responses to an online demographic screening questionnaire were analyzed against the selection criteria by the primary researcher (RC) to determine participant eligibility. If responses were ambiguous, the primary researcher (RC) contacted individuals to request further information. The first thirty-five participants who met eligibility criteria were invited to participate, with the aim of a minimum sample of 20, as Delphi studies recommend 10 to 18 participants.³⁴ (Fig. 1) Ineligible participants were informed via email and thanked for their time. Once recruitment was complete all participants were collectively emailed Delphi Questionnaire 1.

Participants were asked to respond, within two weeks, to all items in each questionnaire. An additional two weeks was provided to maximize response rates over the December 2016 and January 2017 holiday period. Completion reminders were sent at both one week and 24 hours before the Delphi questionnaire closed. An additional email was sent asking if participants wished to continue if automatic leave responses were received from a participant's email account, or participants had commenced, but not yet completed the questionnaire.

[H3] Questionnaire 1

Questionnaire 1 consisted of four open-ended statements, and six pre-generated statements as part of a larger Delphi study. Participants rated their level of agreement on pre-generated statements using a 6-point Likert response scale (6="strongly agree", 5="agree", 4="somewhat agree", 3="somewhat disagree", 2="disagree", 1="strongly disagree").³⁵ A "neutral" option was not included to encourage participants to respond in

either agreement or disagreement to the specified statement.³⁵ Consensus was determined in each questionnaire round using the a-priori criteria of 65% agreement due to the variability reported in existing literature.³⁰ This meant that 65% or more of the panel had to strongly agree, agree or somewhat agree with each item. Consensus for disagreement was set at the same level.

[H3] *Questionnaire 2*

Items for Questionnaire 2 were developed using identified themes from the responses to the open-ended statements and non-consensus items from Questionnaire 1.²⁹ Items without consensus from Questionnaire 1 were repeated and participants were asked to re-rate their level of agreement on these items plus rate new items. Participants were provided with a de-identified summary of group responses from the Likert response to Questionnaire 1. This consensus building process allowed participants to reflect on their previous responses and answer items again.²⁹

[H3] *Cessation criterion*

A minimum of two questionnaire rounds were required for the Delphi.^{29, 31, 36} Items with consensus agreement or disagreement by the end of Questionnaire 2 were used to determine the need for additional rounds. If at least 90% of total items reached consensus and had a narrow interquartile range, a third questionnaire round would not be required.³⁷ Participant fatigue was also considered by calculating completion rates and response times for each round.

[H2] Statistical Analyses

Demographic data from the screening questionnaire were de-identified and summarized using descriptive statistics in SPSS (IBM SPSS Statistics, v22.0). Participation and completion rates for each questionnaire round were calculated and summarized as a percentage.

Responses on the 6-point Likert scale were translated into numerical scores to summarize the strength of agreement and level of importance for all items.³⁵ The number of responses from 4 to 6 were summated and expressed as a percentage of agreement for each statement in each survey. Similarly, the number of responses from 1 to 3 were summated and expressed as a percentage of disagreement.

The strength of agreement was described arbitrarily as low agreement (65-74%), moderate agreement (75-84%), strong agreement (85-94%) and very strong agreement (>95%).

Importance was quantified by calculating the median score and interquartile range for participants' responses.^{30, 33} Items were considered of low importance when participant responses had a wide interquartile range including ratings of somewhat disagree to agree (3-5), moderate importance (4-6) and high importance with narrow interquartile ranges of agree to strongly agree (5-6).³⁰ Central tendency was observed by calculating the mode for each item response.²⁷ Repeated questions were monitored for stability by observing the weighted kappa score between individual responses to the same statement over time.³⁰

[H3] *Thematic analyses*

Responses to open-ended statements in Questionnaire 1 were thematically analyzed using qualitative software (nVIVO, v11.0). Two researchers (RC and CW) conducted the thematic analysis and identified themes through a preliminary semantic coding of responses.^{26, 35, 38}

Unique themes were mapped to each core statement, then compared across all statements using an inductive approach.³⁸ The researchers compared themes for agreement and minor changes were made to the coding strategy. A third researcher (AB) was consulted to reach consensus on the coding strategy if the two researchers had continued disagreement. The numbers of themes were noted and used for statement generation in Questionnaire 2.

[H1] RESULTS

[H2] Participants

Twenty-eight participants consented to this study. Twenty-six completed Questionnaire 1 and 24 completed both questionnaires (attrition rate of 14%). (Fig. 1). A traditional response rate was unable to be calculated due to the use of snowballing recruitment techniques.³⁵

(Figure 1) Participants were physical therapists based in nine countries, with the majority from Australia (43%, n = 12) (Tab. 1). Most participants were female (96%, n = 27), with postgraduate qualifications (78%, n = 22), and a history of working with children aged 5 years of age or older (68%, n = 19). One third of participants (32%, n = 9) reported working across multiple clinical and/or academic roles.

[H3] Questionnaire 1: Thematic analysis and pre-generated items with agreement

Participants ranked the 12 pre-generated items and reached consensus agreement for 83% (10/12) of items. The two non-consensus items from Questionnaire 1 were used as items in Questionnaire 2. One hundred and two items were identified from four open-ended questions and additional comments (Suppl. Appendix). Eighteen themes were identified and grouped according to the three aims of the study. Frequent themes in each of the subcategories for muscle strength, tactile sensitivity and reflexes were grouped under neurological impairment for Questionnaire 2 to aid in minimizing participant fatigue.

[H3] Questionnaire 2: Items with and without agreement

Participants stated that they would use neurological impairment testing as a prognostic tool (67%), a diagnostic tool (79%), or an evaluative tool (96%) to detect changes in neurological impairment over time. Consensus agreement or disagreement (>65%) was attained on 96% (107/112) of items after two questionnaire rounds and thus the cessation criterion was met. Few items did not reach consensus (4%, 5/112). A trend towards stability was observed with converging importance rankings for items in Questionnaire 2. Weighted-Kappa results for within-participant importance of non-consensus items were poor-fair at baseline with no further results due to meeting cessation criterion prior to a third questionnaire. A trend towards participant fatigue was also observed with an increased number of participants requiring a second reminder to complete Questionnaire 2 (21% of participants in Questionnaire 2, compared with 8% in Questionnaire 1).

[H3] Neurological conditions

In Questionnaire 1, participants identified 26 neurological conditions they perceived to require routine neurological testing. Twenty-five of these conditions reached agreement (96%, 25/26) (Tab. 2). Torticollis did not reach consensus agreement. This item was not re-stated in Questionnaire 2 as torticollis is not typically defined as a neurological condition impacting the lower limb.³⁹ The decision was further supported by experts rating it with low importance (median = somewhat agree, IQR 3–5).

[H3] *Perceived barriers or enablers to the selection and administration of pediatric neurological impairment tests*

Barriers and enablers were grouped into statements on maintaining reliability in a neurological impairment test, influencing factors of age and the barriers and enablers to standardization. (Tab. 3) Consensus agreement was reached in 93% (56/60) of items. Experts perceived with strong agreement (>85%) and high importance (median = strongly agree, IQR 5–6) that experienced clinicians with appropriate training have less variability in the way they administer and interpret neurological tests. Experts also perceived with strong agreement and high importance that a child's communication and global mental functions influence neurological testing and are dependent on the age of the child. Environmental factors such as clear documentation and following a protocol were also perceived with strong agreement and high importance to increase reliability of neurological testing in children (Tab. 4).

Frequent themes for modifying neurological testing included methods to enhance impairment testing. All items (100%, 26/26) on modifications to neurological impairment testing for children and young people reached consensus (Tab. 4). Clinicians had strong agreement (>85%) for the majority of items on modifications and perceived them to have high importance (Median = Agree-strongly agree, IQR = 5-6). These included modifying environmental constraints to allow more time for examinations and having variable test durations to suit the child. Pre-testing protocols were perceived to require demonstration of a technique and equipment familiarization to the child or young person. Perceived modifications to communication methods included pointing or describing sensation in a child's own words (Tab. 4).

[H1] DISCUSSION

This is the first study to identify pediatric physical therapists' perceptions on the indications, administration and modifications to pediatric lower limb neurological tests using a modified Delphi consensus method. A diverse panel of international experts were recruited using a rigorous method. Consensus and stability of expert opinion was reached on 96% of items, including the identification of neurological conditions most likely to benefit from routine testing of lower limb neurological impairment, factors that may influence testing and potential modifications of tests for children. Consensus in these areas is the first step towards selecting appropriate neurological tests for rigorous clinimetric evaluation to develop clinical guidelines for pediatric neurological impairment testing.

This Delphi identified twenty-five neurological conditions most likely to benefit from neurological impairment testing using a standardized protocol. Identifying neurological change in both progressive and non-progressive neurological conditions is important to allow for early detection of deterioration and/or response to an intervention.⁷ Clinicians must, however, be able to differentiate between changes occurring over time due to physical growth, the pathophysiology of an underlying condition or an intervention.^{3, 40} For example, despite being a non-progressive condition, children with Cerebral Palsy have underlying muscle weakness^{3, 41} that changes over time at different rates depending on Gross Motor Function Classification System levels.^{5, 40} Interventions for spasticity management in these children, such as Botulinum toxin, may lead to muscle atrophy that produces additional long-term reductions in muscle strength.^{42, 43} Understanding the pathophysiology of the condition and interaction with an intervention is therefore integral for accurate interpretation of neurological impairment test results.⁴⁴⁻⁴⁶

Experts from this Delphi perceived that experienced clinicians are more consistent in their selection, administration and interpretation of neurological tests in pediatric populations. However, they lacked clarification on how they defined experience and whether they perceived there was a minimum amount a clinician should have. Mahony et. al.²¹ found clinicians with over 10 years of experience achieved the same muscle strength results (ICC = 0.76-0.83) as a student physical therapist when using handheld dynamometry in children with Spina Bifida. However, the same study found physical therapists' manual muscle test consistency varied between muscle groups, with good interrater reliability for hip abductors (ICC = 0.75), but poor reliability for hip flexors and knee extensors (ICC < 0.40). This

contrasts with Barr et al⁴⁷ who found manual muscle testing of hip abductors was unreliable between two experienced clinicians. Increasing a clinician's level of knowledge, skill and confidence through training could be an effective support strategy that ameliorates the need for years of experience by providing necessary technical experience.¹⁷

Consensus was reached that clinicians require appropriate training, however clarification is required on the type and duration of training needed to improve the consistency of the administration and interpretation of a test, ie, whether it should include skill development and/or practice in correctly interpreting results.^{12, 44, 47-50} Workshops, online manuals and videos^{12, 44, 47, 50} are reported types of training, however they are often poorly described with inconsistent guidelines for administration in different settings. The suggested amount of testing experience varies, with muscle strength studies on children with Duchenne's Muscular Dystrophy suggesting reliability improves after 3 to 9 months of testing practice^{44,47,50} while other studies reported that one to two training sessions are sufficient.¹² As a minimum, we recommend tests should include accessible self-training resources for the clinician, and clinicians should practice testing on at least two children, preferably with a clinician familiar with the test providing feedback.⁵¹ Further research needs to explore the education and training requirements to improve consistency in standardized test administration.^{12, 21}

Experts in this Delphi study agreed that a perceived barrier to test standardization is that it does not allow clinical reasoning to guide test selection. However, standardized testing

protocols can improve repeatability for stronger reliability.⁵² Auld et al¹⁷ also found clinicians perceived that training, in the tactile assessment domain of a neurological test, would increase their use of assessments in practice and lead to improved understanding of their client for targeted interventions and participation. Appropriate selection of tests for a standardized screening tool is required so clinical reasoning can be used for result interpretation and the selection of appropriate interventions. Clinicians must carefully interpret results in pediatric populations due to the developmental and physical growth in combination with underlying neurological conditions.^{1, 2, 53}

Experts in this Delphi study gained consensus that a neurological test should be able to accommodate to the variability in a neurological condition and/or developmental age of the child. This variability poses challenges in maintaining test repeatability.⁵² Many neuro-developmental assessments incorporate graduation of testing parameters in-line with the typical neuro-developmental growth that rapidly occurs in the first five years of life.⁵⁴⁻⁵⁶ However, most existing tests for children over five years focus on gross and fine motor skills and lack evidence of validity for neurological testing of the lower limb.⁵⁷⁻⁵⁹ Neurological testing beyond five years therefore begins to transition towards adult-based measures.^{21, 60} Translation of adult measures into a pediatric population has highlighted difficulties with cooperation, effort and motivation that often lead to clinicians modifying testing procedures.^{12, 21}

Communication was also an identified barrier that could prevent cooperation and effort in children during testing. Modifications that were perceived as being important by experts in this Delphi study included adjusting instructions to use child-friendly terminology, visual communication modes, such as gestures, or the use of communication boards.

Accommodating to a child's communication method could also include using a child's preferred assistive technology or the use of sign language.¹⁷ How these communication adaptations or modifications could affect the child's understanding and compliance with testing procedures, was not explored in this study. Consensus was, however, reached on additional modifications including use of games and play during clinical testing to encourage positive behaviors from the child, such as compliance and motivation to perform a test.

The expert panel gained consensus on having more time to conduct a test or being able to break a test into smaller components to accommodate the limitations in a child's attention and behavior. Experts also reached consensus that equipment should be demonstrated to allow children and young people to familiarize themselves with a testing procedure. By allocating additional testing time, clinicians would have time for play-based techniques, child-friendly explanations and familiarization of equipment that were perceived as important in this Delphi study. Incorporating these modifications could improve a child's comprehension and/or compliance in performing the test. Documentation of accommodations or modifications is considered an important requirement for repeatability between tests.

Equipment must be available to allow clinicians to consistently demonstrate and implement tests. Without access to this equipment, clinicians may modify tests differently or not testing at all. Improved access to low-cost equipment, such as tendon hammers and cotton tips, was considered important by experts in this Delphi study and could support the use of neurological tests. While results of this Delphi study suggest clinicians perceive low-cost equipment as preferred, tests using expensive equipment such as monofilaments or handheld dynamometers may be used by clinicians if clinimetric evidence supports its use over cheaper alternatives.⁶¹ Consistent test application using the same equipment is essential before rigorous evaluation of test reliability and further validation studies are undertaken.⁵²

[H1] CONCLUSION

This study supported the use of lower limb neurological testing in different neurological conditions in children and young people. Barriers and enablers to both the clinician conducting the test and the child completing the test were partially addressed through identified areas for modifications. These modifications in pediatric neurological testing require further rigorous investigation to support their use. Based on the results of this Delphi study we recommend that, considering the unique challenges this population presents, clinicians conducting neurological testing for children should be trained to ensure consistency, knowledge and confidence in test administration. Alternative communication methods such as the use of visual aids and test demonstration with consistent equipment use should be considered during pediatric testing to aid in reducing measurement errors. Additionally, all modifications, including alternative communication methods must be

clearly documented to enable replication on future tests or by other health professionals.

Future studies could examine consensus for administration and procedural processes for conducting tests of neurological impairment, including limb positioning, types of equipment and scales used to report and interpret findings in both typically developing children and those with a neurological condition. Further clinimetric testing of these adapted protocols is needed for this population before translation into clinical practice.

Author Contributions

Concept / idea / research design: R. Clark, C. Wells, A. Bialocerkowski

Writing: R. Clark, E. Baque, C. Wells, A. Bialocerkowski

Data collection: R. Clark

Data analysis: R. Clark, E. Baque, C. Wells, A. Bialocerkowski

Project management: R. Clark, A. Bialocerkowski

Fund Procurement: R. Clark

Providing Subjects: R. Clark

Providing Institutional Liasons: R. Clark

Clerical/ Secretarial Support: R. Clark

Consultation (including review of manuscript before submitting): R. Clark, E. Baque, C. Wells, A. Bialocerkowski

Acknowledgments

R. Clark was partially supported by a Griffith University Postgraduate Research Scholarship and Griffith Graduate Research School–International Experience Incentive Scheme Grant. We acknowledge the contributions of Melissa Locke and Dace Johnson for their assistance with study design, ethical clearance and pilot testing and the contributions of all participants. The authors have stated that they had no interests that might be perceived as posing a conflict or bias.

Funding

This study (R.C.) was partially supported by a Griffith University Research Scholarship and a Griffith Graduate Research School–International Experience Incentive Scheme Grant.

Disclosure

The authors completed the ICMJE Form for Disclosure of Potential Conflicts of Interest and reported no conflicts of interest.

References

1. McKay MJ, Baldwin JN, Ferreira P, et al. Normative reference values for strength and flexibility of 1,000 children and adults. *Neurol.* 2017;88:36-43.
2. Mercuri E, Messina S, Pane M, Bertini E. Current methodological issues in the study of children with inherited neuromuscular disorders. *Dev Med Child Neurol.* 2008;50:417-421.
3. Novak I, Morgan C, Fahey, M et al. State of the evidence traffic lights 2019: A systematic review of interventions for preventing and treating children with cerebral palsy. *Curr Neurol Neurosci Rep.* 2020;20:1-21.
4. Clark R, Locke M, Hill B, Wells C, Bialocerkowski A. Clinimetric properties of lower limb neurological impairment tests for children and young people with a neurological condition: A systematic review. *PLoS One.* 2017;12:e0180031.
5. Almasri NA, Saleh M, Abu-Dahab S, Malkawi SH, Nordmark E. Development of a Cerebral Palsy Follow-up Registry in Jordan (CPUP-Jordan). *Child Care Health Dev.* 2018;44:131-139.
6. Rosenbaum P, Paneth N, Leviton A, et al. A report: the definition and classification of Cerebral Palsy April 2006. *Dev Med Child Neurol Suppl.* 2007;109:8-14.
7. Smithers-Sheedy H, Badawi N, Blair E, et al. What constitutes cerebral palsy in the twenty-first century? *Dev Med Child Neurol.* 2014;56:323-328.
8. Pareyson D, Marchesi C. Diagnosis, natural history, and management of Charcot-Marie-Tooth disease. *Lancet Neurol.* 2009;8:654-667.
9. Brink Y, Louw Q, Grimmer-Somers K. The quality of evidence of psychometric properties of three-dimensional spinal posture-measuring instruments. *BMC Musculoskelet Disord.* 2011;12:93.
10. Gerber CN, Labruyere R, van Hedel HJ. Reliability and Responsiveness of Upper Limb Motor Assessments for Children With Central Neuromotor Disorders: A Systematic Review. *Neurorehabil Neural Repair.* 2016;30:19-39.
11. Brink Y, Louw QA. Clinical instruments: reliability and validity critical appraisal. *J Eval Clin Pract.* 2012;18:1126-1132.
12. Burns J, Ouvrier R, Estilow T, et al. Validation of the Charcot-Marie-Tooth disease pediatric scale as an outcome measure of disability. *Ann Neurol.* 2012;71:642-652.
13. Wright V, Majnemer A, Maltais DB, Burtner PA, Sanders H. Motor measures: a moving target? *Semin Pediatr Neurol.* 2013;20:84-99.
14. Bushby K, Finkel R, Birnkrant DJ, et al. Diagnosis and management of Duchenne muscular dystrophy, part 1: diagnosis, and pharmacological and psychosocial management. *Lancet Neurol.* 2010;9:77-93.
15. Vos-Vromans D, Ketelaar M, Gorter J. Responsiveness of evaluative measures for children with cerebral palsy: the Gross Motor Function Measure and the Pediatric Evaluation of Disability Inventory. *Disabil Rehab.* 2005;27:1245-1252.
16. Majnemer A, Limperopoulos C. Importance of outcome determination in pediatric rehabilitation. *Dev Med Child Neurol.* 2002;44:773-777.
17. Auld ML, Johnston LM. A touchy topic: tactile assessment among pediatric therapists. *Disabil Rehabil.* 2018;40:267-276.
18. Elvrum AK, Saether R, Riphagen, II, Vik T. Outcome measures evaluating hand function in children with bilateral cerebral palsy: a systematic review. *Dev Med Child Neurol.* 2016;58:662-671.

19. Verschuren O, Ketelaar M, Keefer D, et al. Identification of a core set of exercise tests for children and adolescents with cerebral palsy: a Delphi survey of researchers and clinicians. *Dev Med Child Neurol.* 2011;53:449-456.
20. Mulcahey MJ, Gaughan J, Betz RR, Johansen KJ. The International Standards for Neurological Classification of Spinal Cord Injury: reliability of data when applied to children and youths. *Spinal Cord.* 2007;45:452-459.
21. Mahony K, Hunt A, Daley D, Sims S, Adams R. Inter-Tester Reliability and Precision of Manual Muscle Testing and Hand-Held Dynamometry in Lower Limb Muscles of Children with Spina Bifida. *Phys Occup Ther Pedi.* 2009;29:44-59.
22. Bell A, Guido T, Krisa L, Muhlenhaupt M, Mulcahey MJ. Measures and Outcome Instruments for Pediatric Spinal Cord Injury. *Curr Phys Med Rehabil Rep.* 2016;4(3):200-207.
23. Mulder-Brouwer AN, Rameckers EA, Bastiaenen CH. Lower Extremity Handheld Dynamometry Strength Measurement in Children With Cerebral Palsy. *Pediatr Phys Ther.* 2016;28:136-153.
24. Nieuwenhuys A, Ounpuu S, Van Campenhout A, et al. Identification of joint patterns during gait in children with cerebral palsy: a Delphi consensus study. *Dev Med Child Neurol.* 2016;58:306-313.
25. McIntyre S, Novak I, Cusick A. Consensus research priorities for cerebral palsy: a Delphi survey of consumers, researchers, and clinicians. *Dev Med Child Neurol.* 2010;52:270-275.
26. Dewar R, Claus AP, Tucker K, Johnston LM. Perspectives on Postural Control Dysfunction to Inform Future Research: A Delphi Study for Children With Cerebral Palsy. *Arch Phys Med Rehabil.* 2017;98:463-479.
27. Hsu C-C, Sandford BA. The Delphi Technique-Making sense of consensus. *Pract Assess Res Eval.* 2007;12:1-8.
28. Novakowski N, Wellar B. Using the Delphi Technique in Normative Planning Research: Methodological Design Considerations. *Environ. Plan A.* 2008;40:1485-1500.
29. Hasson F, Keeney S. Enhancing rigour in the Delphi technique research. *Technol Forecast Soc Change.* 2011;78:1695-1704.
30. Holey EA, Feeley JL, Dixon J, Whittaker VJ. An exploration of the use of simple statistics to measure consensus and stability in Delphi studies. *BMC Med Res Methodol.* 2007;7:52.
31. Hasson F, Keeney S, McKenna H. Research guidelines for the Delphi survey technique. *J Adv Nurs.* 2000;32:1008-1015.
32. Clark R, Locke M, Bialocerkowski A. Paediatric terminology in the Australian health and health-education context: a systematic review. *Dev Med Child Neurol.* 2015;57:1011-1018.
33. Wells C, Kolt GS, Marshall P, Bialocerkowski A. Indications, benefits, and risks of pilates exercise for people with chronic low back pain: A Delphi survey of pilates trained physical therapists. *Phys Ther.* 2014;94:806-817.
34. Okoli C, Pawlowski SD. The Delphi method as a research tool: an example, design considerations and applications. *Inform Manage.* 2004;42:15-29.
35. Wells C, Kolt GS, Marshall P, Bialocerkowski A. The definition and application of Pilates exercise to treat people with chronic low back pain: a Delphi survey of Australian physical therapists. *Phys Ther.* 2014;94:792-805.

36. Keeney S, Hasson F, McKenna H. Consulting the oracle: ten lessons from using the Delphi technique in nursing research. *J Adv Nurs*. 2006;53:205-212.
37. von der Gracht HA. Consensus measurement in Delphi studies. *Technol Forecast Soc Change*. 2012;79:1525-1536.
38. Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psych*. 2006;3:77-101.
39. Tomczak KK, Rosman NP. Torticollis. *J Child Neurol*. 2013;28:365-378.
40. Davids JR, Oeffinger D, Bagley A, Sison-Williamson M, Gorton G. Relationship of strength, weight, age, and function in ambulatory children with Cerebral Palsy. *J Ped Ortho*. 2015;35:523-529.
41. Damiano DL, Dodd KJ, Taylor NF. Should we be measuring and training muscle strength in Cerebral Palsy? *Dev Med Child Neurol*. 2002;44:68-72.
42. Valentine J, Davidson S-A, Bear N, et al. A prospective study investigating gross motor function of children with cerebral palsy and GMFCS level II after long-term Botulinum toxin type A use. *BMC Pediatr*. 2020;20:7.
43. Multani I, Manji J, Hastings-Ison T, Khot A, Graham K. Botulinum Toxin in the Management of Children with Cerebral Palsy. *Paediatr Drugs*. 2019;21:261-281.
44. Florence JM, Pandya S, King WM, et al. Intrarater reliability of Manual Muscle Test (Medical Research Council Scale) grades in Duchenne's Muscular Dystrophy. *Phys Ther*. 1992;72:115-122.
45. McDonald CM, Abresch RT, Carter GT, et al. Profiles of neuromuscular diseases- Duchenne Muscular Dystrophy. *Am J Phys Med Rehabil*. 1995;74:S70-S92.
46. Ostensjo. Motor impairments in young children with cerebral palsy: relationship to gross motor function and everyday activities. *Dev Med Child Neurol*. 2004 45:580-589.
47. Barr AE, Diamond BE, Wade CK, et al. Reliability of testing measures in Duchenne or Becker Muscular Dystrophy. *Arch Phys Med Rehabil*. 1991;72:315-319.
48. Berry ET, Giuliani CA, Damiano DL. Intrasession and intersession reliability of handheld dynamometry in children with cerebral palsy. *Pediatr Phys Ther*. 2004;16:191-198.
49. Willemse L, Behm MA, Scholtes VA, Jansen L, Woudenberg -V, H., Dalmeijer AJ. Reliability of isometric lower-extremity muscle strength measurements in children with Cerebral Palsy: Implications for measurement design. *Phys Ther*. 2013;93:935-941.
50. Escolar DM, Henricson EK, Mayhew J, et al. Clinical evaluator reliability for quantitative and manual muscle strength strength in children. *Muscle Nerve*. 2001;24:786-793.
51. Russell DJ, Rosenbaum PL, Cadman DT, Gowland C, Hardy S, Jarvis S. The Gross Motor Function Measure: A means to evaluate the effects of physical therapy. *Dev Med Child Neurol*. 1989;31:341-352.
52. Bialocerkowski A, Bragge P. Measurement error and reliability testing: Application to rehabilitation. *Int J Ther Rehabil*. 2008;15:422-427.
53. Cornett KM, Menezes MP, Shy RR, et al. Natural history of Charcot-Marie-Tooth disease during childhood. *Ann Neurol*. 2017;82:353-359.
54. Noble Y, Boyd R. Neonatal assessments for the preterm infant up to 4 months corrected age: a systematic review. *Dev Med Child Neurol*. 2012;54:129-139.

55. Spittle AJ, Doyle LW, Boyd RN. A systematic review of the clinimetric properties of neuromotor assessments for preterm infants during the first year of life. *Dev Med Child Neurol.* 2008;50:254-266.
56. Burns YR, Ensbey RM, Norrie MA. The Neuro-Sensory Motor Developmental Assessment Part II: Predictive and Concurrent Validity. *Aust J Physiother.* 1989;35:151-157.
57. Slater LM, Hillier SL, Civetta LR. The clinimetric properties of performance-based gross motor tests used for children with developmental coordination disorder: a systematic review. *Pediatr Phys Ther.* 2010;22:170-179.
58. Spironello C, Hay J, Missiuna C, Faught B, Cairney J. Concurrent and construct validation of the short form of the Bruininks-Oseretsky Test of Motor Proficiency and the Movement-ABC when administered under field conditions: implications for screening. *Child: Care Health Dev.* 2010;36:499-507.
59. Ketelaar M, Vermeer A, Hadders PJ. Functional motor abilities of children with cerebral palsy: a systematic literature review of assessment measures. *Clin Rehabil.* 1998;12:369-380.
60. Gilmore R, Sakzewski L, Boyd R. Upper limb activity measures for 5- to 16-year-old children with congenital hemiplegia: a systematic review. *Dev Med Child Neurol.* 2010;52:14-21.
61. Lesko LJ, Zineh I, Huang SM. What is clinical utility and why should we care? *Clin Pharmacol Ther.* 2010;88:729-733.

Table 1. Delphi Study Participant Characteristics^a

Characteristics	n = 28
Sex, n (%)	
Male	1 (4)
Female	27 (96)
Age (y), $\bar{x}$ (range, y)	44 (28-62)
Years of physical therapy experience, $\bar{x}$ (range, y)	22 (6-38)
Country, n (%)	
Australia	12 (42.9)
England	1 (3.6)
Germany	1 (3.6)
Italy	5 (17.9)
Netherlands	2 (7.1)
New Zealand	2 (7.1)
Scotland	1 (3.6)
Spain	3 (10.7)
United States of America	1 (3.6)
Area of practice ^b , n (%)	
Community	6 (21.4)
Hospital	11 (39.3)
Non-hospital clinic	7 (25.0)
School (primary/middle/high school)	3 (11.7)
University (academia)	16 (57.1)
Research	1 (3.6)
Level of highest qualification, n (%)	
Other (Diploma)	1 (3.6)
Entry-level degree (BPhty/BPhty(Hons)/MPhty/DPhty/BSci(Phty))	20 (71.4)
Postgraduate degree (GradCert/GradDip/DClin)	11 (39.3)
Master degree	11 (39.3)
PhD	7 (25.0)
Pediatric workload, n (%)	
less than 25%	8 (28.6)
25-50%	6 (21.4)
50-75%	6 (21.4)
greater than 75%	8 (28.6)
Typical age ranges ^b , n (%)	
Infants: 0 to less than 1 year	17 (60.7)
Early childhood: 1 year to less than 5 years	21 (75.)
Child: 5 years to less than 13 years	19 (67.9)
Young people: 13 years to less than 22 years	9 (32.1)
Peer-reviewed publications in pediatrics or neurological outcome measures, n (%)	15 (53.6)

^aBPhty = Bachelor of physiotherapy; BSci(Phty) = Bachelor of Science (Physiotherapy); DClin = Diploma (Clinical); DPhty = Doctorate of physiotherapy; GradCert = Graduate certificate; GradDip = Graduate diploma; MPhty = Masters of physiotherapy.

^b Participants reported multiple responses.

Table 2. Conditions Perceived to Require Routine Pediatric Lower Limb Neurological Testing

Item	Percentage of Agreement	Median (Q1,Q3) ^a	Strength of Agreement ^b
With consensus^c			
Autoimmune disorder	91.7%	5 (4, 6)	Agree
Brain injury	100.0%	6 (6, 6)	Strongly Agree
Cerebellum disorder	100.0%	6 (5.75, 6)	Strongly Agree
Cerebral palsy	100.0%	6 (6, 6)	Strongly Agree
Charcot Marie Tooth	100.0%	6 (6, 6)	Strongly Agree
Child who was premature or had a low birth weight	95.8%	5.5 (5, 6)	Agree
Developmental Coordination Disorder	91.7%	5 (4, 6)	Agree
Developmental delay	95.8%	5 (4.75, 5.25)	Agree
Epilepsy and other seizure disorders	87.5%	5 (4, 6)	Agree
Genetic disorder	95.8%	5 (4, 6)	Agree
Hydrocephalus	100.0%	6 (5, 6)	Strongly Agree
Hypermobility disorders	83.3%	4.5 (4, 5)	Somewhat Agree
Idiopathic Toe walker	95.8%	5 (5, 6)	Agree
Myopathy	95.8%	6 (5, 6)	Strongly Agree
Medical or surgical complications	87.5%	4.5 (4, 5)	Somewhat Agree
Metabolic disease	83.3%	5 (4, 5.25)	Agree
Muscular dystrophy or atrophy	95.8%	6 (5.75, 6)	Strongly Agree
Myelodysplastic syndrome	95.8%	5 (4, 6)	Agree
Peripheral nerve lesions or disorder	95.8%	6 (5, 6)	Strongly Agree
Sensory processing disorder	95.8%	4 (4, 5)	Somewhat Agree
Spina bifida	100.0%	6 (5.75, 6)	Strongly Agree
Spinal cord injury	100.0%	6 (6, 6)	Strongly Agree
Stroke	100.0%	6 (6, 6)	Strongly Agree
Tumor affecting the brain and/or spinal cord ^a	100.0%	6 (6, 6)	Strongly Agree
Viral or bacterial conditions affecting the brain and/or spinal cord ^a	100.0%	6 (6, 6)	Strongly Agree
No consensus^d			
Torticollis	58.3%	4 (3, 5)	Somewhat Agree

^a Q1 = 25th percentile, Q3 = 75th percentile. Scores are on a scale from 6 to 1 where 6 = "Strongly Agree", 5 = "Agree", 4 = "Somewhat Agree", 3 = "Somewhat Disagree",

2 = "Disagree", 1 = "Strongly Disagree."

^b Qualitative descriptor of mode, most frequent response for that item.

^c 65%-100% of participants agreed.

^d 0-59% of participants agreed.

Table 3. Perceived Barriers/Enablers for Standardized Pediatric Neurological Testing

Item	Percentage of Agreement	Median (Q1,Q3) ^a	Strength of Agreement ^b
<i>Perceived influences of age on pediatric lower limb neurological testing</i>			
With consensus^c			
Attention span	95.8%	5 (5, 6)	Agree
Balance	70.8%	5 (3, 5)	Agree
Behavior	95.8%	5 (5, 6)	Strongly Agree
Biomechanics	66.7%	4 (3, 5)	Somewhat Agree
Cognitive ability and comprehension	95.8%	5 (4.75, 6)	Strongly Agree
Compliance	95.8%	5 (5, 6)	Strongly Agree
Expressive ability	79.5%	5 (4, 6)	Strongly Agree
Medical conditions	75.0%	4 (3.75, 5)	Somewhat Agree
Motivation level	91.7%	5 (4, 6)	Strongly Agree
Need for assistance (eg, manual handling demands)	87.5%	5 (4, 5)	Agree
Proprioception	66.7%	4 (3, 5)	Somewhat Agree
Range of movement (ie, range of motion, including active and / or passive)	66.7%	5 (3, 5.25)	Agree
Selective movement control	75.0%	5 (3.75, 5.25)	Agree
Sensation	66.7%	5 (3, 5)	Agree
Spasticity	66.7%	5 (3, 5.25)	Agree
Strength (eg, the amount of weight the child is able to lift relative to their size)	75.0%	4 (3.75, 5)	Somewhat Agree
Approaching consensus^d			
Reflexes	62.5%	4 (3, 5)	Somewhat Agree
No consensus^e			
Medical and family history	54.2%	4 (3, 4.25)	Somewhat Agree
Muscle length	54.2%	4 (3, 5.25)	Somewhat Agree
<i>Perceived procedures to increase reliability when performing lower limb neurological tests within and between sessions</i>			
With consensus^c			
Document procedure and results	100.0%	6 (6, 6)	Strongly agree
Ensure therapist is experienced	91.7%	5 (4, 5)	Agree
Equipment should be clean	100.0%	6 (5, 6)	Strongly agree
Follow a protocol	100.0%	6 (5, 6)	Strongly agree
Minimize changes in therapist/assessor	95.8%	6 (5, 6)	Strongly agree
Practice trial	95.8%	5 (4, 6)	Strongly agree
Repeat tests using the same brand of equipment	87.5%	5 (4, 6)	Strongly agree
Repeat tests using the same type of equipment	100.0%	5.5 (5, 6)	Strongly agree
Replace disposable items	95.8%	5 (5, 6)	Strongly agree
Therapists always use their dominant hand	75.0%	4 (3.75, 5)	Agree
<i>Perceived barriers for standardizing a pediatric lower limb neurological examination</i>			
With consensus^c			
Appropriate equipment may not be available	91.7%	5 (4.75, 5)	Agree
Assessment is not guided by clinical reasoning	75.0%	4 (3.75, 5)	Somewhat Agree
Assessment is not individualized and/or child or family centered	70.8%	5 (3, 5.25)	Agree
Child's neurological state may change throughout the day	83.3%	5 (4, 5)	Agree
Children of different age groups require	91.7%	5 (4, 6)	Strongly Agree

different assessment			
Children can vary in terms of their level of compliance	87.5%	5 (4.75, 6)	Agree
Examination may not relate to functional outcomes	75.0%	4 (3.75, 5.25)	Somewhat Agree
Inflexible content and procedure	75.0%	4.5 (3.75, 5)	Agree
Objective measurement is prone to subjective interpretation	75.0%	4 (3.75, 5)	Somewhat Agree
Parents may interrupt testing	66.7%	4 (3, 4)	Somewhat Agree
Item	Percentage of Agreement	Median (Q1,Q3)*	Strength of Agreement†
Test procedure interpretation differs linguistically and culturally	70.8%	4 (3, 5)	Somewhat Agree
Too many tests available to choose from	70.8%	4 (3, 5)	Agree
Therapists may differ in their training, experience, expertise, and confidence	91.7%	5.5 (4, 6)	Strongly Agree
Time constraints	91.7%	5 (4, 5)	Agree
Unable to vary testing according to diagnosis, co-morbidities, or being in pain or unwell	91.7%	4 (4, 5)	Somewhat Agree
Approaching consensus^d			
Unnecessary repetition of tests	62.5%	4 (3, 5)	Somewhat Agree
Perceived benefits of standardizing a lower limb neurological examination			
With consensus^c			
Neurological conditions			
Communication between professionals (eg, documentation, handovers)	100.0%	6 (5.75, 6)	Strongly Agree
Communication with children	87.5%	5 (4, 5)	Strongly Agree
Communication with family or carer	100.0%	5 (5, 6)	Agree
Comparing to typically developing children and other patient groups	91.7%	5 (4, 6)	Strongly Agree
Ease of clinician learning, with consistent application	100.0%	6 (4.75, 6)	Strongly Agree
Guiding treatment focus by providing measurement of clinical outcomes	91.7%	6 (5, 6)	Strongly Agree
Identification of diagnosis	95.8%	5 (5, 6)	Strongly Agree
Identification of prognostic factors	100.0%	5 (4.75, 6)	Agree
Monitoring change in medical condition	95.8%	6 (5.75, 6)	Strongly Agree
Monitoring progression of medical condition	95.8%	6 (5.75, 6)	Strongly Agree
Providing an objective, comprehensive assessment	100.0%	6 (5, 6)	Strongly Agree
Providing consistent and reliable measures	100.0%	6 (5.75, 6)	Strongly Agree
Providing valid and accurate measures	100.0%	6 (5, 6)	Agree
Reducing need for unnecessary repetition of tests across health professions	91.7%	6 (5, 6)	Strongly Agree
Research purposes (eg, outcome measurement)	100.0%	6 (5.75, 6)	Agree

^a "Agree", 4 = "Somewhat Agree", 3 = "Somewhat Disagree", 2 = "Disagree", 1 = "Strongly Disagree."

^b Qualitative descriptor of mode, most frequent response for that item.

^c 65%-100% of participants agreed.

^d 60%-64% of participants agreed.

^e 0-59% of participants agreed.

Table 4 – Perceived Modifications for Standardized Pediatric Neurological Testing

Item	Percentage of Agreement	Median (Q1,Q3) ^a	Strength of Agreement ^b
<i>Perceived Modifications Necessary for Conducting a Pediatric Lower Limb Neurological Examination</i>			
With consensus^a			
<i>Tactile sensitivity</i>			
Allowing more time for examination	95.8%	5 (5, 5)	Agree
Ask child to close eyes or look to the side	96.2%	5 (5, 6)	Strongly Agree
Ask child to describe sensation in their own words	95.8%	5 (5, 6)	Agree
Ask child to point to areas of sensation detection on lower limb	92.3%	5 (5, 6)	Agree
Breaking up testing into several sessions	83.3%	5 (4, 5)	Agree
Changing the amount of assistance provided (eg, from therapist or family/carer)	83.3%	5 (4, 5)	Agree
Changing the order of testing	91.7%	5 (4, 5)	Agree
Demonstrate technique (eg, on therapist, parent/carer, sibling or doll)	91.7%	5.5 (5, 6)	Strongly Agree
Demonstrating empathy for child and / or family	87.5%	6 (5, 6)	Strongly Agree
Ensure test components are developmentally appropriate	95.8%	6 (5, 6)	Strongly Agree
Include functional observation and assessment (eg, of activities)	95.8%	6 (5, 6)	Strongly Agree
Incorporate fun and play into assessment	91.7%	6 (5, 6)	Strongly Agree
Modify the duration of testing (eg, longer or shorter)	95.8%	5 (4.75, 5)	Agree
Positioning body so the child or young person cannot see their lower limb	95.8%	5 (4, 5)	Agree
Use a barrier (such as a sheet or board) so child cannot see their lower limbs	88.5%	5.5 (5, 6)	Strongly Agree
Use a communication board to ask children to point to areas of sensation detection on body chart	76.9%	5 (4, 6)	Agree
Use a flexible approach (eg, child-led assessment)	87.5%	5 (4.75, 6)	Agree
Utilize different communication methods (eg, mode of communication from verbal to non-verbal or use of a different language)	95.8%	5 (5, 6)	Strongly Agree
Utilize distraction techniques	87.5%	5 (4, 5)	Agree
<i>Reflexes</i>			
Demonstrating deep tendon reflexes on yourself (the clinician) or parent	96.2%	6 (5, 6)	Strongly Agree
Distracting the child or young person	84.6%	5 (4, 6)	Agree
Familiarizing the child or young person with any equipment	100.0%	6 (5, 6)	Strongly Agree
Approaching consensus^b			
Position body so the child or young person cannot see their lower limbs	61.5%	4 (3, 5)	Somewhat Agree

^a 65%-100% of participants agreed.

^b 60%-64% of participants agreed.

Figure Captions

Figure 1.

Figure 1. Delphi study flow diagram

Inclusion Criteria
1. Physiotherapist registered by their national physiotherapy board; AND
2. Six or more years of experience working with pediatric clients with neurological conditions; AND
3. Meet one of the following criteria:
a. Published pediatric research in a peer reviewed journal
b. Taught into pediatric physiotherapy curricula at a university accredited / recognized by their national physiotherapy council
c. Undergone additional post-graduate studies in pediatrics; AND/OR
d. Recognized as a titled or specialized pediatric physical therapist by their national physical therapy body
Exclusion Criteria
1. Are unable to understand AND/OR respond to the Questionnaire in English ¹
2. Are unable to commit to the timelines associated with a Delphi process
3. Do not have adequate access to the Internet
¹ Equivalent to approximately Grade 10 level

Figure 2. Expert panel eligibility requirements