Development and Content Validity of the Clinical Assessment of Body Alignment for Children With Cerebral Palsy

Frances K. George, MSc; Alex Benham, PhD; Lynne Gabriel, PhD; Judy Purton, PhD

School of Health Sciences (Ms George and Dr Purton) and School of Psychological and Social Sciences (Dr Gabriel), York St John University, York, UK; Department of Health, Psychology and Social Studies (Dr Benham), University of Cumbria, Carlisle, UK.

Purpose: The purpose of this study is to describe the development and content validity of the clinical assessment of body alignment (CABA) to measure body alignment in children with cerebral palsy.

Methods: Content validity and clinical utility were examined through expert opinion of 283 pediatric physical therapists. Participants reviewed items as matching or not to the domain of body alignment. Clinical utility was evaluated on a 5-point scale. Means and standard deviation were calculated for each attribute. Fleiss' kappa examined interrater reliability of expert responses.

Results: Percentage agreement was high for 19 items and good for 1 item. Clinicians' ratings showed overall fair to good agreement. Four clinical utility attributes had a net importance score of more than 90%, although interrater reliability was low.

Conclusion: Content validity of the CABA was supported. Construct validity, reliability, and responsiveness require further study. *What this adds to the evidence:* The CABA has potential to offer clinicians and researchers a clinically practical measure of postural alignment for children with cerebral palsy. Preliminary investigation of CABA shows good content validity. However, more studies to assess the assessments' psychometrics including construct validity, reliability, and responsiveness are required. (Pediatr Phys Ther 2020;32:137–143)

Key words: assessment, cerebral palsy, posture

INTRODUCTION AND PURPOSE

The relationship between body alignment, postural control, and motor development has been discussed in several research studies.[1-6] To accomplish efficient motor skill performance, postural control must be present and developed.[1] The efficiency and success of postural control and motor performance is related to an individual's ability to achieve body segment alignment.[6] In its absence, a child's stability, efficiency, movement, and function are impaired against gravity.[7] Given the importance of body alignment for functional movement in children with cerebral palsy (CP), a valid, reliable, and clinically feasible assessment is important for describing when and how change in alignment occurs. A standardized approach should lead to improved clinical assessment of specific interventions, namely posture management programs.

Postural orientation is defined as the alignment of body segments (head, trunk, pelvis, arms, legs, and feet) in relation to one another and with respect to the support surface, gravity, and environment.[8,9] Postural orientation can be an issue for some individuals with CP and therefore is of interest to health professionals.[10] Musculoskeletal issues such as joint range, muscle and soft tissue shortening, chest asymmetry, spine scoliosis, and hip dislocation are commonly associated with poor postural alignment.[11,12] The development of postural deformities can result in movement and function being severely compromised.[12] Early identification and prevention of body alignment asymmetries from occurring at the outset is important in the management of posture in children with CP.

Available standardized clinical assessments of body segment alignment for children with CP are limited. The Posture and Posture Ability Scale (PPAS) observes posture symmetry across body segments of trunk, head, pelvis, legs, and arms in midline position.[13,14] Scoring is limited to yes/no responses to indicate a deviation from midline, with no demarcation of left or right sides of the body. As such, this limits the responsiveness of the assessment to changes in alignment and its accuracy in

0898-5669/110/3202-0137
Pediatric Physical Therapy

Correspondence: Frances K. George, MSc, Humberston Park School, St Tomas Close, N E Lincs, Grimsby DN36 4HS, UK (georgef@hpark.org.uk).

At the time this article was written, Frances George was a PhD student at York St John University, School of Health Sciences, York, UK.

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

The authors declare no conflicts of interest.

DOI: 10.1097/PEP.0000000000000685

determining graded demarcation from midline and differences between left and right sides of the body. Other measures of alignment are subsections of developmental motor assessments such as the Chailey Levels of Ability (CLAS)[15] and the Seated Postural Control Measure (SPCM).[16,17] Alternatively, other body alignment assessments such as the Spinal Alignment and Range of Motion Measure (SAROMM),[18] Goldsmith Indices,[19] and Index of Windswept Deformity[20] focus specifically on one body segment rather than the whole body. A review of tests from the perspective of this research project cultivated the following conclusions.

Only 4 of the measures—the PPAS,[13,14] SPCM,[16,17] SAROMM,[18] and CLAS[15]—demonstrated psychometric properties of reliability and/or validity. However, these measures demonstrated limitations in the scope of body positions assessed and ability to selectively identify changes in overall body posture asymmetry. Subsequently, we did not identify a single measure that adequately examined whole body alignment in children with CP. Therefore, this study aimed to develop a tool to specifically address the need for a clinical measure to assess postural alignment.

Aims

This study has the goal to develop a tool to provide a clinically useful measure of postural alignment and to examine the content validity. Ethical approval was obtained from the Ethics Review Board of York St John University, UK.

METHODS

Construction of the Clinical Assessment of Body Alignment

An initial list of items was compiled by the primary researcher, with just over 15 years' clinical experience within pediatric physical therapy. The items were based on the researchers' knowledge of posture and movement as well as clinical experience. Items were compared to items on the PPAS,[14] SPCM,[17] and CLAS[15] to ensure no significant items were missed. No outstanding items were identified; it was noted that sections of the clinical assessment of body alignment (CABA) were common to those in other assessments items (head, trunk, pelvis, arms, legs, and feet); however, the subsections of these sections where different in the CABA. A preliminary list of body segment items was collated and items expanded to cover all planes of movement across lying, sitting, and standing; this created a detailed initial list of 56 items for the CABA (see Supplemental Digital Content 1, available at: http://links.lww.com/PPT/A286).

The initial 56 items were reviewed by 3 researchers. Discussions were held among the researchers to reach consensus regarding (1) how to reduce clinical and respondent burden by decreasing the number of items, (2) identification of technical item-construction flaws and bias, and (3) how to improve item/test readability.

No items were removed; 2 items were added to enable differentiation between upper and lower leg positions in sitting (Section E: leg in sitting: flexion/extension upper leg and flexion/extension lower leg). In a second revision, items scored on the right and left sides (eg, hip internal rotation) were combined into a single item with a separate score for each side. This decreased the number of items but captured asymmetries between sides of the body. This resulted in 36 items combined, reducing the total number to 20 items (see Supplemental Digital Content 2, available at: http://links.lww.com/PPT/A287).

Study Design

A nonexperimental, cross-sectional design was used to examine the content validity of the CABA.

Participants

A purposeful sample of all members of the Association of Pediatric Chartered Physical Therapists (APCP), a special interest group within the field of pediatric physical therapy, was undertaken.

Procedure

The revised CABA items were sent electronically to APCP members. Participants were asked to contribute if they worked within the field of posture/postural management with children with CP. Respondents were asked to consider and score the 20 items (see Supplemental Digital Content 2, available at: http://links.lww.com/PPT/A287) in relation to relevance to body alignment. One open-ended question was also provided for respondents to state any other item assessment that they felt should be included.

Respondents were also asked to consider and rate the importance of clinical utility attributes which they felt would assist assessments in clinical practice. As the CABA is intended to be a clinically based assessment, ensuring it aligned with crucial attributes was an important consideration in its development. They were asked to rate items identified as supportive of the clinical efficiency of an assessment including training (formal), cost, time to administer, format (paper vs electronic or both), environments applicable to assessment use, ease of administration (equipment, therapist stress, and demand on child), transportability of the assessment, and ease of scoring analysis.

The domain of interest, body alignment in children with CP, was clearly defined and the participants were provided with a structured framework for the matching of items.

Framework for Matching Items. The respondents were instructed to systematically proceed through the assessment (see Supplemental Digital Content 3, available at: http://links.lww.com/PPT/A288). Respondents were given clear descriptions of the items to be considered for matching to the domain of body alignment. Each body segment to be assessed was clearly titled; each corresponding body alignment item relating to the specific body segment was outlined underneath the titled section (Figure).

The CABA assessment items were rated as matching (yes/no) to the domain of body alignment. Clinical utility items were rated in terms of importance to the rater using a 5-point Likert scale (1 = essential, 2 = important, 3 = acceptable, 4 = marginally relevant, and 5 = not relevant). A common

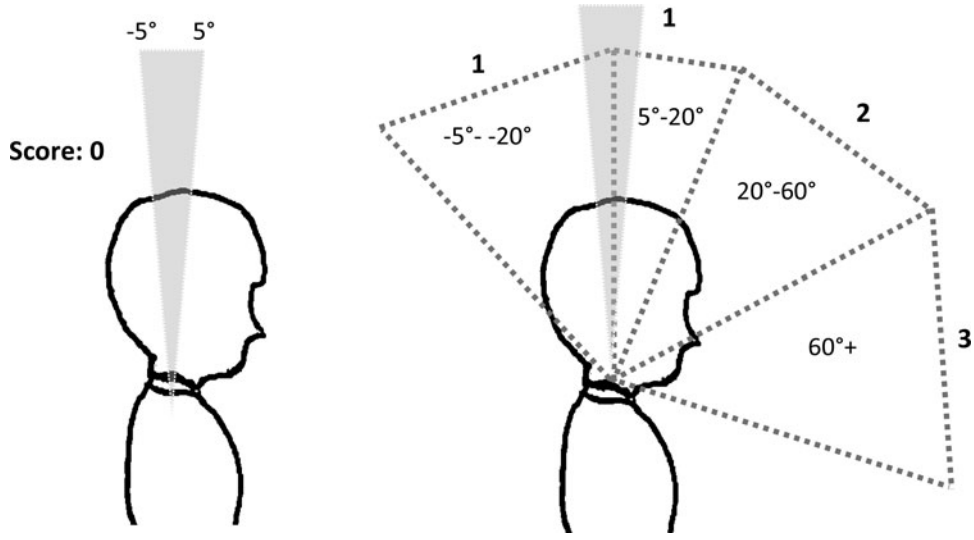

Fig. Item example.

definition of importance was provided; essential (1) was defined as an item that must be included to ensure the assessment has clinical utility. To exclude this would mean that the assessment had an extremely high risk of not being able to be used in everyday clinical settings. Not relevant (5) defined as an item that would never impact on the assessment being used within everyday clinical practice.

Posture Categorization. The CABA posture classifications used a 0- to 3-point scoring system to rank the alignment, with 0 indicating a position within 5°, either side of optimal alignment, and 3 indicating the most significant deviation away from optimal alignment. All revised CABA items (see Supplemental Digital Content 2, available at: http://links.lww.com/PPT/A287) were based on this scoring system with the exception of 3 items (items 15, 16, and 20). Due to the limited joint range from optimal, which would result in narrow ranges within each score, these items were scored based on a 0- to 2-point scale to minimize observer error. With the exception of 3 items (1, 4, and 7), all scoring was designed to differentiate the left and right of the body. Items 1, 4, and 7 are scored based on the direction of the movement.

Data Analysis

Each participant was assigned a unique reference number and the questionnaire responses were extracted from Qualtrics into the IMB Statistical Package for the Social Science (SPSS version 25). Data analyses were conducted using IMB Statistical Package for the Social Science (SPSS version 25).

Characteristics of clinicians who returned partial versus complete questionnaires were analyzed using a χ^2 test. Matching items to the attribute of body alignment was quantified by calculating the percentage of agreement to each item. Items with a high agreement score (>70%) were judged to be a "good match," indicating a strong agreement and representation of the construct. To assess the overall agreement of importance for the identified clinical utility attributes, percentage agreement, means, and standard deviation were calculated for each attribute. Respondent interrater reliability was assessed using the Fleiss' kappa statistic to measure the extent to which the different clinicians (raters) gave the same responses to the rating questions.[21] Fleiss' kappa is an extension of the more common Cohen's kappa used when there are multiple raters. The kappa statistic ranges from −1 to +1. A score of zero or less shows that there is no agreement between raters; scores greater than zero can be graded using the bands proposed by Fleiss,[21] 0.75 to 1.00 very good, 0.41 to 0.75 fair to good, and less than 0.40 poor.

RESULTS

Response

In total, 2196 physical therapists were contacted. Participants were invited to contribute if they worked within the field of posture/postural management with children diagnosed with CP. Two hundred eighty-three questionnaires were returned for a response rate of 13%. Fourteen participants completed the screening element only; 185 partially completed the questionnaire and 84 respondents completed the full questionnaire. The descriptive data relating to respondents' characteristics were collectively analyzed and grouped by region, years of experience, place of work, and area of specialty.

Respondents came from all 4 nations of the UK and from all regions of England. Over half of respondents, 54%, had been in the profession for 20 years or more. The majority, 83%, worked in the National Health Service (NHS) with 9% in private practice and 8% in education. Seventy-six percent worked in neurodisability and 54% worked in the community. Fifty-eight percent of respondents worked in multiple areas of the 8 listed specialties.

Content Validity (Item Agreement)

The proportion of respondents who indicated that the 20 CABA items matched body alignment varied from a low of

TABLE 1

Percentage Agreement and 95% CI That CABA Items Matched Body Alignment

Item	Description	No—Does Not Match Body Alignment	Yes—Matches Body Alignment	95% CI
1	Head flexion/extension	6.1% (n = 5)	93.9% (n = 77)	89%-99%
2	Head side flexion	7.2% (n = 6)	92.8% (n = 77)	87%-98%
3	Head rotation	22.9% (n = 19)	77.1% (n = 64)	68%-86%
4	Trunk flexion/extension	10.8% (n = 9)	89.2% (n = 74)	82%-96%
5	Trunk side flexion	10.8% (n = 9)	89.2% (n = 74)	82%-96%
6	Trunk rotation	25.6% (n = 21)	74.4% (n = 61)	65%-84%
7	Pelvis anterior/posterior tilt	11.0% (n = 9)	89.0% (n = 73)	82%-96%
8	Pelvic obliquity	20.5% (n = 17)	79.5% (n = 66)	71%-88%
9	Pelvis rotation	19.5% (n = 16)	80.5% (n = 66)	72%-89%
10	Arm flexion/extension	18.1% (n = 15)	81.9% (n = 68)	74%-90%
11	Arm abduction/adduction	18.1% (n = 15)	81.9% (n = 68)	74%-90%
12	Leg flexion/extension	23.5% (n = 19)	76.5% (n = 62)	67%-86%
13	Leg abduction/adduction	16.9% (n = 14)	83.1% (n = 69)	75%-91%
14	Leg internal/external rotation	34.9% (n = 29)	65.1% (n = 54)	55%-75%
15	Upper leg flexion/extension	18.1% (n = 15)	81.9% (n = 68)	74%-90%
16	Lower leg flexion/extension	18.1% (n = 15)	87.9% (n = 68)	74%-90%
17	Leg abduction/adduction	16.9% (n = 14)	83.1% (n = 69)	75%-91%
18	Leg internal/external rotation	14.6% (n = 12)	85.4% (n = 70)	78%-93%
19	Foot inversion/eversion	22.0% (n = 18)	78.0% (n = 64)	69%-87%
20	Foot planar flexion/dorsiflexion	13.6% (n = 11)	86.4% (n = 70)	79%-94%

Abbreviations: CABA, clinical assessment of body alignment; CI, confidence interval.

65% for leg internal/external rotation to high of 94% for head flexion/extension (Table 1).

Among the participating clinicians, all items, except number 14, were identified as highly related to body alignment with an agreement level of greater than 70%. Item 14 (leg internal/external) was the only item below with an agreement of 65%. In 14 out of the 20 items, the agreement was more than 80%, indicating a consensus that these items strongly relate to the construct of body alignment.

In 15 of the CABA items, the 95% confidence interval (CI) lower range was more than 70%. Four of the CABA (items 3, 6, 12, and 19) had a 95% CI of more than 65% and one item (14) had more than 55%. The CI values of item 1 (head flexion/extension) were greater than CI values of item 14, indicating that clinicians felt item 1 was a better indicator of body alignment than item 14 (leg internal/external). No additional items were reported frequently from the open-ended question (n = 13 responses). Of these, 4 responses related to body linkages, and other responses (n = 7) related to a broad range of issues not directly related to body position such as environmental, muscle tone, and task demand.

Respondent Interrater Reliability

Fleiss' kappa was used to assess interrater reliability among respondents with moderate agreement ($\kappa = 0.422$; 95% CI, 0.33-0.51; $P < .005$). In addition, interrater reliability was also assessed within clinician subgroups (based on years of experience and workplace description) (Table 2). Agreement between raters was higher for those who have been in the profession for more than 20 years compared to those with fewer years served. Agreement was higher among non-NHS clinicians (those in private practice or education) and for those who do not work in the community.

TABLE 2

Respondents' Interrater Reliability Fleiss' Kappa Value Based on Years of Experience and Location of Employment

Subgroup (Valid Cases)	Fleiss' Kappa
In profession >20 y (n = 51)	0.51
In profession ≤20 y (n = 29)	0.33
NHS (n = 66)	0.40
Not NHS (n = 14)	0.53
Work in community (n = 46)	0.36
Work in acute care (n = 34)	0.47

Abbreviation: NHS, National Health Service.

Clinical Utility

The combined totals of essential/important scores for each attribute, percentage agreement among respondents, and the mean scores and standard deviation for each attribute are presented in Table 3. The rating of essential was highest (76%) for "overall ease of use" with "time to complete," "usable in different environments," and "ease of analysis" rated as essential by greater than 50% of the respondents. Format was least important, receiving a rating of essential from only 20% of the respondents.

The total combined essential ratings ranged from a low of 35% (format paper) to 98% (ease of use) (Table 3). The rating of essential was highest (76%) for "overall ease of use," with "time to complete," "usable in different environments," and "ease of analysis" rated as essential by greater than 50% of the respondents. Format was least important, receiving a rating of essential from only 20% of the respondents. Four attributes had a combined score more than 90%: ease of use, time to complete, ease of analysis, and usable in different environments. The largest variation is noted in the attribute "requirement of equipment."

TABLE 3

Percent Agreement and Mean and SD of Clinical Utility Attributes

Description	Essential and Important Percentage Agreement Scores of Each Attribute (n)	Mean (SD) Scores[a]
Formal training	76% (63)	2.0 (1.0)
Informal training	77% (64)	1.9 (0.8)
Cost	70% (58)	2.2 (1.0)
Time to complete	93% (76)	1.6 (0.7)
Format—electronic	53% (42)	2.4 (0.9)
Format—paper based	35% (28)	2.8 (1.0)
Format—paper based and electronic	58% (47)	2.4 (1.0)
Usability in different environments	95% (79)	1.5 (0.6)
Ease of use	98% (80)	1.3 (0.5)
Requirement of equipment to conduct assessment	51% (42)	2.4 (1.1)
Demand on the child	88% (72)	1.7 (0.8)
Transportability	89% (73)	1.7 (0.8)
Ease of analysis	96% (78)	1.5 (0.6)

Abbreviation: SD, standard deviation.

[a]Lower mean scores indicate a higher essential attribute rating.

Ease of use has the smallest variation. There is no significant level of agreement between the respondents' rating levels (Fleiss' $\kappa = 0.21$; 95% CI, 0.11-0.31, $P < .005$).

DISCUSSION

Content Validity (Item Agreement)

Content validity for the CABA item development was supported by the high percentage agreement of items matching the construct of body alignment. The level of agreement among clinicians regarding item affiliation to body alignment was calculated using percentage agreement along with 95% CIs. The 95% CIs indicate that while all items, except one (item 14), were highly representative of body alignment, there were differences in the magnitude of agreement between individual items. Four of the CABA items (items 3, 6, 12, and 19) had a lower 95% CI range score below 70%, overall the agreement percentage by respondents was high, signifying that these items matched the domain of body alignment.

The lowest agreement was within 1 item (item 14: leg internal/external), which scored a lower percentage agreement (65.1%) and 95% CI range (55%-75%) compared with the rest of the items. The reason for this is unclear; this discrepancy could be attributed to the movement direction being assessed by this item when set in the context of CABA. However, the movement direction analyzed by this item has important implications to overall body alignment with previous research having established a relationship between hip position and alteration in postural orientation.[1,2] Given that the percentage agreement was close to the threshold of 70%, the decision was made not to exclude item 14 from the assessment.

We suggest that this supports 19 of the 20 CABA items as highly representative of the construct of body alignment measurement, with 1 item moderately representative. Content validity often involves subject matter experts evaluating the degree to which test items match the test specification domain.[22] Most studies investigating psychometric properties of body alignment measurements use expert opinion in test construction.[14,15,17,18] The existing accounts on test construction give a brief description of development, with little published data to allow quantifiable analysis on expert level of agreement in relation to test items and their construct. As such, comparison of item relevance and validity cannot be made between previously published research and those of this study.

Respondent Interrater Reliability

Interrater reliability between respondents was fair to good ($\kappa = 0.422$) in matching CABA items to the domain of body alignment. A higher agreement was seen in those with more than 20 years' clinical experience. This could reflect that the highest percentage of respondents to this study had more than 20 years' experience (n = 88). Posture and body alignment in children with CP is a postgraduate skill; therefore, clinicians working in this field and area are likely to have more than less experience in the assessment of body alignment.

There was higher agreement reliability between respondents who are non-NHS clinicians, those working in private practice or education ($\kappa = 0.53$) compared with those who work in the NHS ($\kappa = 0.40$). No specific reports could be found on specific areas of clinical work and working environment. Therefore, it could be speculated that non-NHS clinicians are more likely to work frequently within specialist areas such as postural management, compared with those who work in the NHS. Results from this study suggest that this hypothesis could be substantiated.

Clinical Utility

Clinical utility refers to how applicable an assessment is within clinical settings.[22] It relates to attributes which influence functionality and usefulness of an assessment, such as time and ease of use.[22] The time it takes to administer an assessment and complexity of completing may determine how usable an assessment is within day-to-day assessments. The longer and more complex an assessment takes, the less likely it is to be selected by therapists within day-to-day clinical practice. Four attributes relating to the clinical utility of clinical assessments had a net importance score of more than 90%, between respondents, indicating they are significant to assessment functionality within clinical practice. These attributes were ease of use, time to complete, ease of analysis, and usable in different environments. This is not surprising, given that assessments like the CABA may need to be applied in a variety of settings with multiple individuals. Failure to recognize critical components of a measure's clinical utility, such as cost and application, can result in the measurement being impracticable within the clinical environment.[23] To date, this area has received scant attention in research literature investigating body alignment measurements, with existing studies omitting recognition and discussion on the practicalities of clinical application. Although the level of agreement between respondents was low, we propose that the CABA, as a clinically usable tool, needs to align with the utility attributes identified

as being important in order to be applicable and accessible to clinicians.

Benefits of the CABA

The CABA construction has a high level of content validity to the domain of body alignment with high level of agreement and good reliability in response from experts within the field of CP and posture. The CABA is an easy, inexpensive, and low-burden way to measure postural alignment in children with CP. There are no other clinical measures for children with CP that demonstrate detailed content validity and item construction to assess total body segment alignment across any postural position while also allowing differentiation between left and right sides of the body. Current assessments, such as the PPAS,[13,14] have only focused on one of these elements. This study has shown the CABA encompasses important components of body alignment assessment. With 19 items matched to a high level of agreement to assess body alignment across sitting, standing, and lying positions, the CABA allows degrees in postural misalignment to be measured and demarcation between sides of the body to be clinically assessed. As the intent of the CABA is to succinctly measure overall body alignment, it cannot be broken down into subscales associated with aspects of postural control (eg, trunk stability), but should have a direct implementation on therapy interventions.

Limitations of the CABA

We acknowledge that assumptions were made in developing the assessment. These include assuming therapists would understand and be familiar with the terminology and posture categorization. The sample size used to validate this was small.

The response rate of 13% could be viewed as low, however this was not unexpected. The APCP covers a wide field of expertise across pediatrics, inclusive of CP, and it is highly likely that some members have limited or no involvement with CP or posture as part of their practice and therefore would not have responded to the study request. Currently, the CABA only demonstrates content validity; further psychometric properties require investigation. Future studies examining construct validity of the CABA against a sample of children with CP of various functional abilities would determine whether the items represent a valid construct to that of CP. Reliability, both inter- and intrarater, of the CABA use with clinicians also needs to be completed. An examination of the CABA's responsiveness and sensitivity to change in children with CP after posture management interventions focusing on improving postural alignment would be beneficial prior to the assessment being used as an outcome measure. At present, how to interpret the CABA raw scores is unknown and additional studies in children developing typically and those with CP are needed to develop scoring cut-offs and norms for this scale. This will be explored in further investigations as part of the development process of this assessment. Finally, research on the measure in children with other medical diagnoses to neurological disabilities is warranted. The analysis of the construct validity, reliability, and responsiveness in children with CP is in progress.

CONCLUSION

Preliminary investigation of this new assessment of posture and alignment is promising. The first steps of identifying valid items to include in the assessment of total body alignment have been taken and content validity and clinical utility have been explored. Further studies to assess the psychometrics of CABA, including construct validity reliability and responsiveness, should be undertaken.

The CABA has potential to provide clinicians and researchers with a viable and practical measure of postural alignment for children with CP. Content validity of the CABA is supported for the domain of body alignment in children with CP. Further research examining construct validity against all Gross Motor Function Classification System levels of children with CP, interrater and intrarater reliability, and responsiveness to change in postural alignment of the CABA in the context of effective interventions is already being undertaken. This research is needed prior to use of the CABA as an evaluative measure in clinical practice.

What This Adds to the Evidence

The CABA has potential to offer clinicians and researchers a clinically practicable measure of postural alignment for children with CP. The development of a measurement tool to assess total body alignment in children with CP will expand the options for physical therapists to document baseline posture and reassess changes following surgical or therapeutic interventions.

REFERENCES

1. Dusing SC, Harbourne RT. Variability in postural control during infancy: implications for development, assessment, and intervention. *Phys Ther*. 2010;90(12):1838-1849.
2. Pavao SL, dos Santos AN, Woollacott MH, Rocha NACF. Assessment of postural control in children with cerebral palsy: a review. *Res Dev Disabil*. 2013;34(5):1367-1375.
3. Van Balen LC, Dijkstra L, Bos AF, Van DH, Hadders-Algra M. Development of postural adjustments during reaching in infants at risk for cerebral palsy from 4 to 18 months. *Dev Med Child Neurol*. 2015;57(7):668-676.
4. Hadders-Algra M. Variation and variability: key words in human motor development. *Phys Ther*. 2010;90(12):1823.
5. Pollock AS, Durward BR, Rowe PJ, Paul JP. What is balance? *Clin Rehabil*. 2000;14(4):402-406.
6. Shumway-Cook A, Woollacott MH, eds. *Motor Control: Translating Research Into Clinical Practice*. 5th ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2017.
7. Carlberg EB, Hadders-Algra M. Postural dysfunction in children with cerebral palsy: some implications for therapeutic guidance. *Neural Plast*. 2005;12(2/3):221-228.
8. White E. Wheelchair users and postural seating: a clinical approach. *Br J Occup Ther*. 1999;62(7):333-334.
9. Pope PM. *Severe and Complex Neurological Disability: Management of the Physical Condition*. Edinburgh, Scotland: Elsevier Butterworth-Heinemann; 2007.
10. Rosenbaum P, Paneth N, Leviton A, Goldstein M, Bax M. A report: the definition and classification of cerebral palsy April 2006. *Dev Med Child Neurol*. 2007;49:8-14.
11. Scrutton D. Position as a cause of deformity in children with cerebral palsy (1976). *Dev Med Child Neurol*. 2008;50(6):404-404.
12. Porter D, Michael S, Kirkwood C. Is there a relationship between preferred posture and positioning in early life and the direction of

subsequent asymmetrical postural deformity in nonambulant people with cerebral palsy? *Child Care Health Dev*. 2008;34(5):635-641.
13. Rodby-Bousquet E, Persson-Bunke M, Czuba T. Psychometric evaluation of the posture and postural ability scale for children with cerebral palsy. *Clin Rehabil*. 2016;30(7):697-704.
14. Rodby-Bousquet E, Ágústsson A, Jónsdóttir G, Czuba T, Johansson A, Hägglund G. Interrater reliability and construct validity of the posture and postural ability scale in adults with cerebral palsy in supine, prone, sitting and standing positions. *Clin Rehabil*. 2014;28(1):82-90.
15. Pountney TE, Cheek L, Green E, Mulcahy C, Nelham R. Content and criterion validation of the Chailey Levels of Ability. *Phys Ther*. 1999;85(8):410-416.
16. Field DA, Roxborough LA. Responsiveness of the seated postural control measure and the level of sitting scale in children with neuromotor disorders. *Disabil Rehabil Assist Technol*. 2011;6(6):473-482.
17. Fife SE, Roxborough LA, Armstrong RW, Harris SR, Gregson JL, Field D. Development of a clinical measure of postural control for assessment of adaptive seating in children with neuromotor disabilities. *Phys Ther*. 1991;71(12):981-993.
18. Bartlett D, Purdie B. Testing of the spinal alignment and range of motion measure: a discriminative measure of posture and flexibility for children with cerebral palsy. *Dev Med Child Neurol*. 2005;47(11):739-743.
19. Goldsmith J, Goldsmith L. Goldsmith indices of body symmetry: protecting body shape. *Eur Seating Symp*. 2009:122-124.
20. Goldsmith E, Golding RM, Garstang RA, MacRae AW. A technique to measure windswept deformity. *Phys Ther*. 1992;78(4):235-242.
21. Fleiss JL, Levin B, Paik MC. *Statistical Methods for Rates and Proportions*. 3rd ed. Hoboken, NJ: John Wiley & Sons; 2003.
22. Crocker L, Algina J. *Introduction to Classical & Modern Test Theory*. Mason, OH: Cengage Learning; 2006:527.
23. Fawcett L. *Principles of Assessment and Outcome Measure for Occupational Therapists and Physical Therapists. Therory, Skills and Application*. West Sussex, England: John Wiley & Sons, Ltd; 2007:467.

CLINICAL BOTTOM LINE

Commentary on "Development and Content Validity of the Clinical Assessment of Body Alignment for Children With Cerebral Palsy"

"How could I apply this information?"

The long-term goal of the authors is to create a systematic and practical measure of body alignment for children with cerebral palsy. Body alignment is an important aspect of postural control and is of particular interest in children with cerebral palsy and other neuromotor disorders. Children with cerebral palsy typically have difficulty acquiring upright postures, can develop postural deformities, and may often be physically inactive. Clinical assessment of body alignment (CABA) can be classified within the "body functions and structures" component of the International Classification of Functioning, Disability and Health: Children and Youth Version. CABA items measure body alignment of the main segments of the body, as the authors demonstrate with clinical expert opinions (content validity), and have an overall clinical utility. However, the level of congruence among clinicians on the proposed clinical utility is poor. Therefore, the current version of CABA should not be used to evaluate interventions that target postural alignment.

"What should I be mindful about when applying this information?"

CABA may be promising but is at a very early stage of development. Use of CABA would be inadequate because of the lack of a standardized manual that guides clinicians in understanding the use of this test. Adding diagrams with precise degree intervals for each body segment under examination would facilitate its clinical applicability, systematize the scoring criteria, and improve testing precision. As the authors indicate, the absence of CABA *construct validity*, an objective analysis to determine whether CABA measures body alignment and *reliability*, as well as level of agreement among or within the same testers, impedes its clinical application.

Victor Santamaria, PT, MS, PhD
Mechanical Engineering Department
Columbia University
New York City, New York

Jaya Rachwani, PT, MS, PhD
Department of Physical Therapy
Hunter College
City University of New York
New York City, New York

The authors declare no conflicts of interest.

DOI: 10.1097/PEP.0000000000000699