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Movement Assessment of Children (MAC): Validity, Reliability, Stability and Sensitivity to Change in Typically Developing Children

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Abstract

Aim—The purpose of this study was to establish the validity, reliability, stability and sensitivity to change of the family-centered Movement Assessment of Children (MAC) in typically developing infants/toddlers from 2 months (1 month 16 days) to 2 years (24months 15 days) of age.

Background—Assessment of infant/toddler motor development is critical so that infants and toddlers who are at-risk for developmental delay or whose functional motor development is delayed can be monitored and receive therapy to improve their developmental outcomes. Infants/toddlers are thought to be more responsive during the MAC assessment because parents and siblings participate and elicit responses.

Methods—Two hundred seventy six children and 405 assessments contributed to the establishment of age-related parameters for typically developing infants and toddlers on the MAC. The MAC assesses 3 core domains of functional movement (head control, upper extremities and hands, pelvis and lower extremities), and generates a core total score. Four explanatory domains serve to alert examiners to factors that may impact atypical development (general observations, special senses, primitive reflexes/reactions, muscle tone). Construct validity of functional motor development was examined using the relationship between incremental increases in scores and increases in participants' ages. Subsamples were used to establish inter-rater reliability, test-retest reliability, stability, and sensitivity to change.

Results—Construct validity was established and inter-rater reliability ICCs for the core items and core total ranged from 0.83 to 0.99. Percent agreement for the explanatory items ranged from 0.72 to 0.96. Stability within age grouping was consistent from baseline to 6 months post-baseline, and sensitivity to change from baseline to 6 months was significant for all core items and the total score.

Conclusion—The MAC has proven to be a well-constructed assessment of infant and toddler functional motor development. It is a family-centered and efficient tool that can be used to assess and follow-up of infants and toddlers from 2 months to 2 years.

Keywords

movement; motor skills; child development; motor function; functional motor development

The recent focus on family-centered care emphasizes the active involvement of the child and the family in all phases of care – assessment, goal setting, and intervention, with the end result being better outcomes (American Hospital Association, 2013). Consistent with this emphasis, the Movement Assessment of Children (MAC; Chandler, Andrews, Williams, 2012), a companion tool of The Movement Assessment of Infants (MAI) (Chandler, Andrews & Swanson, 1980), was designed to fill a gap in current pediatric functional motor development tools. Whereas the MAI is used to assess newborns to 12 month old infants, the MAC extends to 24 months. The MAC has the same functional categories as the MAI, however, formatting of the items and sections on reflexes and tone have been simplified. Therefore, the MAC is easier to administer in a clinical setting and is an efficient observational tool that is family-centered. If the child must be held or moved by an adult, the parent is asked to follow the model that the examiner provides with a doll. Thus, the child is being held by a familiar adult, and responds more naturally than when being moved by an unfamiliar examiner. Parents and siblings are used to entice the child to demonstrate functional movements (e.g., grasping a toy held by the sibling; crawling to a parent). Item selection for the MAC was based on observations of typically developing infants/toddlers at play and while being handled by parents. Thus, items are familiar and typical for infants/toddlers.

The Movement Assessment of Children (MAC), is a criterion-referenced and norm-referenced tool for infants/toddlers from 2 months to 2 years of age, with three core domains (head control, movement of the upper extremities and hands, movement of the pelvis and lower extremities). The MAC also includes four explanatory domains with items that may signal possible factors associated with variance or delays in functional motor development. The four additional domains are general observation (the child's behavioral state and autonomic nervous system stability), muscle tone, primitive reflexes/reactions, and special senses (visual motor abilities which include visual following and peripheral vision as well as responses to sound). The MAC has proven to be a well-constructed assessment of infant and toddler functional motor development. It is a family-centered and efficient tool that can be used to assess and follow-up typically and atypically developing infants and toddlers from 2 months to 2 years.

Follow-up assessments are used to document functional motor development over time, to monitor functional movement status in children at-risk for movement disorders and to monitor changes in response to therapy. Thus, a child may meet all the age-related motor development milestones associated with typically developing children, by age group, over time. Likewise, a child may demonstrate a trajectory of functional movements below, but consistently parallel to children in their age ranges, over time. Children may demonstrate a

trajectory that indicates an increasing gap in functional movements, over time, and some children may demonstrate a mix of age-appropriate and atypical functional movements for their age ranges. Each pattern would require a review of possible factors associated with decrements in functional movement, as well as a different treatment plan from therapists and the medical team.

The MAC differs from other infant/child motor assessments in several ways: population, age range, role of the examiner/family members, and administration time. The MAC is designed for typically developing and at-risk infants/toddlers 2 months to 2 years, whereas the Alberta Infant Motor Scale (AIMS; Fleuren et al., 2007; Liao & Campbell, 2004; Piper & Darrah, 1994) is for typically developing and at-risk children birth to walking or 18 months. The Meade Movement Checklist (MMCL; Meade, 2009; Meade et al., 2009) is for at-risk infants at 4 months of age. The Test of Infant Motor Performance (TIMP; Campbell & Hedeker, 2001; Campbell et al., 2002) is for infants at 32 weeks post-conception to 4 months postterm. The Gross Motor Function Measure (GMFM-88/66; Hielkema et al., 2013; Ko & Kim, 2013; Russell et al., 2000) is for children with cerebral palsy from 5 months to 15 years, and the Bayley Scales of Infant and Toddler Development – Version III (BSITD-III; Alyward, 2013; Bayley, 2006; Johnson, Moore & Marlow, 2014) is for typically developing and at-risk children 1 month to 42 months. Both the MAC and the MMCL require active participation of a family member (MAC, parents and siblings; MMCL, parent); the Bayley III occasionally requires the parent to hold the child, and the other tools are examiner administered. For assessments that mirror the age range of the MAC, the MAC is efficient in that it takes only 20-30 minutes to administer the 7 domains, 52 items and 159 criteria; the AIMS takes approximately 30 minutes to administer 58 items; the GMFM-88 takes 45-60 minutes to administer 88 items-- the GMFM-66 less time; and the Bayley III takes 30-90 minutes to administer up to 138 items, depending on the age of the child.

The objective of this study was to establish the validity, reliability, stability and sensitivity to change of the MAC in typically developing children from 2 months to 2 years of age.

Method

Participants

Inclusion criteria were children between the ages of 1 month 16 days and 24 months 15 days on the day of testing, born between 37 and 43 weeks gestation, with no prenatal or neonatal complications, with no major complicating medical conditions, with no concerns about the child's development, and a mother who had an uncomplicated pregnancy and was under the care of a physician during the pregnancy. Children were excluded if they did not meet the inclusion criteria.

Instrument

The purpose of the MAC is to assess motor development, by age, and signal possible factors associated with variance or delays in functional motor development. The seven domains of the MAC include (1) General Observations (child's behavioral state and autonomic nervous system stability); (2) Special Senses (motor control of vision and responses to sound); (3)

Head Control (head control in 5 distinct positions); (4) Upper Extremities and Hands (gross motor and fine motor control with and without objects); (5) Pelvis and Lower Extremities (trunk, pelvis and lower extremities, including activities such as rolling, coming to sit, crawling, coming to stand, cruising, walking, running, balance seen in kicking); (6) Primitive Reflexes/Reactions (integration of 5 primitive reflexes/reactions); and (7) Muscle Tone (tone of the upper and lower extremities and trunk). The MAC is also unique in that parents and siblings are used to elicit functional movements of the infant/child, thus minimizing handling by an unfamiliar therapist.

Each item describes an age appropriate functional movement (e.g., “child brings hands to anterior surface of knees or feet rather than midline” and several decremental indicators of developmental delay (e.g., child does not bring hands to midline or mouth). The initial assessment takes approximately 20-30 minutes, and follow-up assessments take only 5 – 10 minutes.

Scoring the Movement Assessment of Children (MAC)

Each domain of the MAC is rated by observing the child for a specific aspect of motor control, and then selecting the criterion that best matches the child's performance from an ordinal scale (the higher the score, the better the performance). Head Control, Upper Extremities and Hands, and Pelvis and Lower Extremities are the core domains of the MAC. General Observations, Special Senses, Primitive Reflexes/Reactions and Muscle Tone are domains that may help to explain deviations from age parameters. The number of items and criteria to observe and rate vary by domain. Core domains are: (1) Head Control, 5 items, 14 criteria; (2) Upper Extremities and Hands, 13 items, 41 criteria; and (3) Pelvis and Lower Extremities, 21 items, 72 criteria. Explanatory domains are: (4) General Observations, 2 items, 4 criteria (5) Special Senses, 3 items, 9 criteria; (6) Primitive Reflexes/Reactions, 5 items, 10 criteria, and (7) Muscle Tone, 3 items, 9 criteria. Each domain of the MAC is scored separately by adding the criterion ratings for each item in a domain. Additionally, the MAC yields a core total score for the core domains of Head Control, Upper Extremities and Hands, and Pelvis and Lower Extremities.

Procedure

The Colorado Multiple Institutional Review Board approved the study (Protocol 06-0325). Flyers written for parents/guardians and approved by the IRB of The Children's Hospital (TCH) were distributed to physicians, other health care professionals at each of the four TCH therapy clinics, day care centers and churches in Denver County, Colorado.

The flyer explained the purpose and inclusion/exclusion criteria of the study. Parents were to affirm that they and the child's pediatrician agreed that the children met the inclusion and exclusion criteria for the study. Interested parents/guardians called a dedicated number to ask questions and to make an appointment to have their child assessed. Parents/guardians were informed at that time that there was an informed consent form to be reviewed and signed and that the assessment would be video recorded, with a copy of the recording sent to the parent/guardian after the assessment was scored.

Each child received a 1-hour appointment. The informed consent was reviewed and signed by parents and assessor. The children were then assessed on the MAC while recording the assessment on videotape. The parents/guardians were allowed to bring other family members, including siblings, thus facilitating the assessment. Videotapes were used to assess inter-rater reliability, and a copy of the videotape was given to the family.

Statistical analysis

All statistical analyses were performed using Statistical Packages for the Social Sciences (SPSS, v. 22) software. Prior to conducting analyses, data were screened to ensure appropriate assumptions were met.

Descriptive parameters of typically developing infants/toddlers, from 2 months to 24 months (means and standard deviations) for MAC core items were generated by age and gender. Race was calculated based on percentage of the total sample.

Construct validity was assessed by correlating MAC scores with age. Because age and motor development are positively related, we hypothesized that as age increased, MAC scores would increase. Spearman's correlations were computed using data from 275 children to represent the validity coefficient.

The inter-rater reliability sample consisted of assessments of 25 children. Five pediatric physical therapists, trained on the MAC, were each given five videotaped assessments to view and score. Their scores were compared with the scores provided by the original assessor. The inter-rater reliability coefficient was computed for the core domains using the intra-class correlation coefficient (ICC). The MAC core domains are based on larger numbers of evaluative criteria and provide more variable scores within and between raters. We used the ICC (3,2) as an index to reflect the magnitude of agreement between raters for Core domains ICCs of .80 or higher were considered excellent reliability (Nunnally & Bernstein, 1994). The explanatory domains of the MAC are based on fewer evaluative criteria and provide discrete scores with little to no variability within and between raters. The ICC was not the best representation of agreement for the explanatory domains, because very little variability in ratings can cause ICC values to become unstable. To account for the discrete nature of the explanatory scores, we used the percent agreement as the measure of agreement (Portney & Watkins, 2009). The test-retest reliability sample consisted of 35 children, tested twice within a two-week period. Thirty-five children were chosen because it was an adequate number for the ICC, and reduced the testing burden on families. The test-retest coefficient was computed using the ICC as a measure of agreement between the two time periods.

To test the ability of the MAC to measure developmental change over time we used the subsample of 78 children who were tested and retested approximately 6 months apart. Attempts were made to include children from each age range. Using this subsample, the stability of the MAC was assessed using a two-part process. First, children's scores at baseline were classified into two groups: within one standard deviation of the mean (68.26%) or not within one standard deviation of the mean (31.74%); below or above one standard deviation. This process was repeated with 6-month scores, with the expectation that

children would remain in the respective range for the next developmental increment. Next, the McNemar chi-square test was performed with 78 children to determine if scores remained within the normal range for the six-month developmental increment. The McNemar chi-square test was used to account for correlated data due to repeated measures (Portney & Watkins, 2009).

Change over time was defined as the difference in scores from the baseline assessment to the 6-month assessment. It was expected that there would be a significant difference in scores, thus showing that the MAC could detect functional motor development in typically developing children. To evaluate change over time, Wilcoxon-signed ranks tests were performed using data from the 78 children. The Wilcoxon test is the non-parametric equivalent of the paired-samples t-test. Both account for dependency in data that are collected from the same sample at two time points (Portney & Watkins, 2009).

Results

The participants in the study were typically developing infants and toddlers between the ages of 1 month 16 days and 24 months 15 days. The children were recruited from Denver County, Colorado. A total of 276 children and 405 assessments contributed to the establishment of age-related parameters for typically developing infants and toddlers. The mismatch between number of participants and number of assessments reflects the fact that some children also participated in the test-retest/stability subsamples and thus had more than one assessment over time. All infants and toddlers met the inclusion criteria. The sample was primarily White (74.3%) or Hispanic (14.7%), with 4.5% Asian, 1.5% Black, and less than 1% Native American or Hawaiian.

Means and standard deviations for the MAC core items and core item totals, by age and gender are shown in Table 1. There were no ceiling or floor effects for the core domains (note: head control matures at approximately 7 months and was therefore constant after 11 months).

Correlations between the core domains and age showed that as age increased, motor development increased. The magnitudes of the correlations with age were strong: head control ($r = .66, p < .001$), upper extremity ($r = .92, p < .001$), lower extremity ($r = .97, p < .001$) and grand total ($r = .98, p < .001$).

Inter-rater and test-retest reliability coefficients are displayed in Table 2. Inter-rater reliability ICC coefficients ranged from .833 (head control) to .978 (upper extremity), showing excellent reliability between raters. The percent agreement for the explanatory domains ranged from 72% (special senses) to 100% (general observations). Test-retest reliability coefficients (ICCs) for the core domains ranged from .919 (head control) to .989 (pelvis and lower extremities) and .993 for the grand total, indicating that MAC scores remained stable over time.

Another measure of stability was the proportion of children who were within one standard deviation of the mean at baseline and remained within one standard deviation of their developmental increment 6 months later, and the proportion who were not within one

standard deviation of the mean at baseline were not within one standard deviation of the mean for the next developmental increment at 6 months. No changes in proportions occurred over time across core domains: head control ($\chi^2 = 0.1$, $p = .73$), upper extremity ($\chi^2 = 0.1$, $p = .76$); lower extremity ($\chi^2 = 3.5$, $p = .06$) and total motor function ($\chi^2 = 2.1$, $p = .15$).

Results of the change over time analyses indicated that there were significant increases in head control ($Z = -3.310$, $p = .001$), upper extremity ($Z = -6.855$, $p < .001$), lower extremity ($Z = -7.610$, $p < .001$) and total motor function ($Z = -7.375$, $p < .001$). These findings confirmed our hypothesis that the MAC would be sensitive to developmental changes in functional motor development in typically developing children, over time.

Discussion

The objective of this study was to establish construct validity, inter-rater reliability, test-retest reliability, stability, and sensitivity to change of typically developing infants/toddlers from 2 months to 2 years of age. It also was to provide norms for these children by one-month intervals from 2 months to 24 months. All assessments mentioned previously in this article are valid and reliable assessments of infants and/or toddler motor development; however, the MAC has several important differences in regard to administration, content, and psychometrics.

Having a brief and family center assessment for infants and toddlers is essential. The administration of the MAC involves the family helping with the assessment -- an important strength of this assessment. Infants and toddlers are often wary of strangers, including practitioners, so the MAC uses the parents and siblings to carry out any hand-on movement of the children. The practitioner uses a doll to demonstrate to the parent how the infant/toddler is to be held, and the practitioner observes and scores each item. Siblings are also included to help elicit movements from the infant/toddler, because this is a natural phenomenon in the family. An infant having fun and feeling secure appears to add to the accuracy of the assessment.

The MAC content consists of three core functional domains of head control, upper extremity and hand movements, and pelvis and lower extremity movements of typically developing children, by 1-month intervals, from 2 months to 2 years. Importantly, the motor development domains provide a window to the health of the central nervous system (Fleuren et al., 2007). The insight gained by MAC norms into the function or dysfunction of the 3 core functional motor domains suggests a direction for further assessment for the healthcare team.

In addition the MAC content includes potential explanatory domains that are known to impact infant/toddler motor development assessments (general observations, special senses, primitive reflexes/reactions, and muscle tone). If the core domains are scored within typical development parameters, the explanatory domains should also be scored as typical. This relationship was confirmed in the data from this study. Delayed or atypical performance on the core functional motor items may be explained because infants cannot be calmed, have visual impairments, have not integrated age-related primitive reflexes/reactions, or have

high/low muscle tone. In other words, the four explanatory domains can help the healthcare team in identifying potential factors contributing to atypical motor development.

As well as documenting a child's current motor status, a brief and valid assessment is essential to monitor the functional motor development of a child receiving interventions. At follow-ups, MAC items that were outside typical parameters can quickly be assessed for change to determine if children are improving, falling behind, or simply progressing at their own pace with intervention. The MAC also allows practitioners to track children's functional motor development by comparing MAC scores to the MAC norms. All children in the study were tested post "back to sleep campaign." Therefore, MAC norms may not coincide with parameters from other tests that included children tested before this campaign (Davis et al., 1998; Fleuren et al., 2007; Majnemer & Bar, 2005).

This study demonstrates strong psychometrics of construct validity, inter-rater reliability, test retest reliability, stability, and sensitivity to change of the MAC, with typically developing infants/toddlers from 2 months to 2 years of age (calculated as 1 month 16 days to 24 months 15 days). It also provides norms for each 1-month interval. Moreover, the psychometrics of the MAC involved measuring its stability in two ways. While stability is usually measured using test-retest reliability, we supplemented this with a within/outside age group parameter analysis. We wanted to see if those children within and outside of their mean age parameters would remain within or outside their age parameters 6 months later. While test-retest reliability assessed all 35 children within each core domain, the within groups assessment evaluated the 78 children in 1 month age clusters at baseline and again 6 months later. The MAC was found to be stable over time using both methods. One core domain, head control, had a slightly lower test-retest coefficient than the other core domains. This can be attributed to lower variability from a lesser number of items within the head control domain and because head control became a constant in children 10 months and older.

The fact that all the children were from Denver County is a limitation of the study. Although the largest proportion of the children were White, the proportions of White, Hispanic, Asian, Black, and Native American matched the Denver County proportions. In the future, efforts will be made to increase the proportion of non-Whites and children from different cultures. This could provide valuable information for adjusting the norm parameters of the MAC. Additionally, larger samples, studies that include children with known disabilities, and establishing the predictive validity of the tool for older children will add important evidence to the body of knowledge.

In conclusion, the MAC has proven to be a well-constructed assessment of infant and toddler functional motor development. In addition to the three critical core domains of infant/toddler movement, the MAC also includes four potential explanatory domains to reference when scores are not within typical parameters. It is a family-centered and efficient tool that can be used to assess and follow-up typically and atypically developing infants and toddlers from 2 months to 2 years.

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Table 1

Movement Assessment of Children core and core total means, by age and gender Head Control (Maximum score = 14)

Age in Months	Female	n	Male	n
2	7.91 ± 3.09	11	8.27 ± 1.95	11
3	11.67 ± 1.00	9	10.67 ± 3.05	3
4	13.00 ± 0.93	8	12.33 ± 1.41	9
5	13.60 ± 0.52	10	13.64 ± 0.51	11
6	13.90 ± 0.32	10	13.40 ± 0.90	5
7	13.90 ± 0.32	10	14.00 *	2
8	13.73 ± 0.91	11	14.00 *	6
9	13.91 ± 0.30	11	14.00 *	5
10	13.92 ± 0.08	13	14.00 *	9
11 and up	14.00 *	125	14.00 *	111

Upper Extremities and Hands (Maximum score = 41)				
Age in Months	Female	n	Male	n
2	1.91 ± 0.30	11	2.27 ± 1.27	11
3	4.75 ± 2.66	8	2.33 ± 1.15	3
4	9.00 ± 3.37	10	8.44 ± 3.61	9
5	13.78 ± 4.06	9	16.91 ± 3.01	11
6	18.60 ± 4.25	10	25.00 ± 8.54	5
7	23.70 ± 1.25	10	27.00 *	2
8	25.82 ± 3.37	11	26.33 ± 1.75	6
9	28.91 ± 1.92	11	25.80 ± 1.92	5
10	29.31 ± 1.36	13	29.56 ± 3.25	9
11	30.80 ± 1.75	10	29.40 ± 1.52	5
12	30.36 ± 2.62	11	31.13 ± 1.55	8
13	32.40 ± 3.53	10	33.00 ± 2.45	7
14	32.88 ± 2.47	17	32.46 ± 2.37	13
15	33.71 ± 1.11	7	33.67 ± 2.25	6
16	33.73 ± 2.61	11	31.63 ± 2.62	8
17	32.50 ± 2.35	6	34.00 ± 1.76	12
18	36.25 ± 2.22	4	35.83 ± 2.76	12
19	35.71 ± 2.75	7	35.25 ± 3.20	4
20	36.50 ± 4.09	10	35.38 ± 2.77	8
21	36.11 ± 2.20	9	36.40 ± 3.21	5
22	38.00 ± 2.65	3	35.89 ± 2.97	9
23	38.20 ± 2.44	10	37.43 ± 3.51	7
24	36.40 ± 3.13	5	37.00 ± 2.90	6

Pelvis and Lower Extremity (Maximum score = 72)

Age in Months	Female	n	Male	n
2	6.55 ± 2.16	11	6.73 ± 1.85	11
3	9.00 ± 1.23	9	7.67 ± 1.53	3
4	9.80 ± 1.39	10	9.11 ± 2.21	9
5	12.50 ± 1.72	10	13.27 ± 1.74	11
6	13.44 ± 3.17	9	15.00 ± 2.45	5
7	19.50 ± 4.33	10	25.50 ± 6.36	2
8	23.36 ± 5.94	11	24.83 ± 6.05	6
9	31.00 ± 5.35	11	33.60 ± 5.68	5
10	32.00 ± 5.87	13	30.75 ± 8.55	8
11	32.90 ± 6.66	10	41.80 ± 5.45	5
12	40.00 ± 5.17	9	40.75 ± 4.64	8
13	43.60 ± 4.03	10	45.65 ± 5.89	6
14	47.79 ± 4.25	14	47.89 ± 3.62	9
15	48.88 ± 4.97	8	48.83 ± 3.12	6
16	52.91 ± 2.95	11	52.13 ± 2.10	8
17	55.50 ± 2.07	6	51.36 ± 4.37	11
18	53.20 ± 3.03	5	54.64 ± 2.01	11
19	54.33 ± 2.39	9	52.67 ± 3.79	3
20	55.90 ± 2.89	10	57.88 ± 1.85	8
21	56.63 ± 2.50	8	56.80 ± 3.27	5
22	59.50 ± 2.12	2	56.75 ± 2.92	8
23	57.50 ± 2.07	10	59.63 ± 4.69	8
24	61.75 ± 4.86	4	61.40 ± 5.88	5

Totals for core items, by age and gender (Maximum Score = 127)

Age in Months	Female	n	Male	n
2	16.36 ± 3.47	11	17.27 ± 3.77	11
3	25.63 ± 4.17	8	20.67 ± 2.89	3
4	31.38 ± 3.25	8	29.89 ± 5.47	9
5	40.00 ± 4.50	9	43.82 ± 4.49	11
6	45.22 ± 6.32	9	53.40 ± 10.67	5
7	57.10 ± 5.20	10	66.50 ± 6.36	2
8	62.91 ± 8.49	11	65.17 ± 7.31	6
9	73.82 ± 6.29	11	73.40 ± 5.55	5
10	75.23 ± 6.35	13	75.00 ± 8.86	8
11	77.00 ± 7.00	9	85.20 ± 4.38	5
12	84.22 ± 7.28	9	85.88 ± 4.88	8
13	90.00 ± 4.47	10	92.83 ± 5.74	6
14	94.64 ± 3.88	14	94.56 ± 4.13	9
15	96.14 ± 5.43	7	96.50 ± 4.37	6
16	100.55 ± 4.89	11	97.75 ± 4.06	8
17	102.00 ± 1.41	4	99.18 ± 3.76	11

Totals for core items, by age and gender (Maximum Score = 127)

Age in Months	Female	n	Male	n
18	103.75 ± 5.56	4	104.55 ± 2.81	11
19	104.00 ± 3.27	7	101.00 ± 4.36	3
20	106.40 ± 3.84	10	107.25 ± 3.41	8
21	106.17 ± 4.62	6	107.20 ± 5.40	5
22	112.00 ± 1.41	2	106.50 ± 4.28	8
23	109.70 ± 3.68	10	111.00 ± 7.48	7
24	111.50 ± 5.20	4	112.00 ± 8.63	5

*
Constant within category

Table 2

Test-Retest and Inter-Rater Reliability

	Inter-Rater	Test-Retest
CORE DOMAINS	ICC	ICC
Head Control	.833	.919
Upper Extremity	.978	.978
Lower Extremity	.996	.989
Grand Total	.995	.993
EXPLANATORY DOMAINS	Percent Agreement	
General Observations		
Special Senses		72
Primitive Reflexes/Reactions		88
Muscle Tone		96