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The Reliability and Validity of the Alberta Infant Motor Scale in Japan

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Abstract. [Purpose] To investigate the reliability and validity of the Alberta Infant Motor Scale (AIMS) in Japan, and to determine whether the AIMS score obtained by pediatric physical therapists with different levels of experience differed. [Subjects] The subjects who were assessed were 40 healthy infants (23 males, 17 females) whose parents gave their written consent to participation in this study. [Methods] 40 healthy children were videotaped and evaluated using the AIMS by three physical therapists who were providing physical therapy for the children on weekdays and three physical therapists who were providing physical therapy for the children once per week. The AIMS and the Kyoto Scale of Psychological Development (KSPD) were administered to confirm criterion-related validity. [Results] Reliability of the AIMS was good to high (ICC = .86~.99), and the correlation between the AIMS and the KSPD was high (r = .97~.98). Physical therapists with little experience in pediatric physical therapy could perform an assessment. [Conclusion] Both the reliability and the validity of the AIMS were high. Level of pediatric expertise did not affect a rater's reliability.
Key words: Reliability, Validity, Alberta Infant Motor Scale

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INTRODUCTION

Recently, in rehabilitation, evidence-based medicine (EBM) is being increasingly required. Thus, in pediatric physical therapy, standardized assessment tools are being introduced to facilitate the development of EBM. However, there are difficulties in assessing patients 1 year of age and younger, since the characteristic findings of cerebral palsy are not often present[1]. Furthermore, unless they have multiple disabilities, it is difficult to diagnose neonates or infants who are only a few weeks old as having cerebral palsy[2]. In addition, it is commonly thought that there is no gold standard for the diagnosis of cerebral palsy[3]. In Japan, a few developmental assessment scales created by developmental psychologists, such as the Kyoto Scale of Psychological Development 2001[4] and the Tsumori-Inage development scale[5], are used. Another scale, the Denver-II[6], is used worldwide and has been introduced to Japan. Although it is widely used around the world, the accuracy of Denver-II in concurrently identifying typical children has been questioned, especially compared to other standardized developmental assessments[7].

The Alberta Infant Motor Scale[8] (AIMS) is a standardized assessment tool of motor development[9, 10]. AIMS has been found to be an excellent motor development tool[11–15]. However, Coster reported that previous AIMS studies had

included samples that were stratified by age and gender, but the patients' race and maternal socioeconomic characteristics were not considered[16]. Therefore, it is difficult to compare the results of these studies with those of infants from other countries. Furthermore, Jeng et al. reported that AIMS was developed based solely on samples of children resident in Alberta, Canada[14]. Thus, it is unknown whether the AIMS is appropriate for infants with different societal and ethnic backgrounds.

When a foreign method is being considered for introduction to another country, its reliability and validity must be assessed[17]. The reliability of AIMS in Japan has been previously reported, but there was bias in the selection of subjects for that study, and the validity of the AIMS requires further determination[18]. While the developers of AIMS have indicated that the AIMS may be particularly valuable to therapists who are less experienced and who have not had the opportunity to observe normally developing infants[8], the ratings of pediatric physical therapists with different levels of expertise have not previously been compared. Thus, the purpose of this study was to investigate the reliability and validity of AIMS in Japan, and to compare the AIMS ratings of pediatric physicals therapists with different levels of experience working at institutions for disabled children or multiple disabled children.

METHODS

Alberta Infant Motor Scale (AIMS)

AIMS was developed by a physician and a physical therapist in Canada in 1994. It has been reported to be useful for the early detection of problems in infants, and to distinguish between healthy and disabled children[8]. The standard samples included 2,202 infants who were born in the Canadian province of Alberta. The items were chosen by 291 people who belonged to the pediatric section of the Canadian Physical Therapists Association and six international infant motor development specialists. The AIMS was intentionally designed to be an observational assessment tool, thereby requiring minimal handling of the infant by the rater. The rater can complete the assessment in 20 to 30 minutes. The subjects are infants from birth to the age of independent walking, and their gross motor maturity is evaluated. The AIMS score sheet consists of drawings of infant posture and movement that must be observed in order for an infant to get credit for the items. There are a total of 58 items, and they are divided into four postures: prone position (21 items); supine position (9 items); sitting position (12 items); and standing position (16 items). Each item is scored in a binary fashion: "observed" or "not observed". A total score is then determined by adding together the number of items below that of the least mature observed items and the number of all observed items. Then, the total number is converted to a percentile rank and compared with established normative ranks.

Kyoto Scale of Psychological Development 2001

The Kyoto Scale of Psychological Development 2001 (KSPD) was created by the Kyoto City Child Hospital in 1980, and has been subsequently revised. It is the main developmental test used in western Japan, and is used to assess disabled children at public health centers. It was based on Gesell's developmental diagnosis and refers to the assessment items of the Binet test. KSPD's purpose is to examine children's general developmental progress and delay, the presence of balance, and other findings over a wide range of mental development. The age of the subjects ranges from neonate to adult. The key feature of KSPD is that the assessment tools appear to the children to be like play, so spontaneous and natural actions can be easily observed. The assessment time is 30 to 40 minutes. Up to January, 2002, 63 training courses for beginners had been carried out. KSPD consists of 328 items in three fields: posture and movement; recognition and adaptation; and language and society. There are a total of 47 items in the field of posture and movement that can be applied to subjects from birth to 18 months of age, which is the age range for AIMS.

Subjects

The subjects who were assessed were 40 healthy infants (23 males, 17 females) whose parents gave their written consent to participation in this study (Table 1). The infants were recruited mainly from five childcare centers in Ibaragi City and Takatsuki City, Osaka, Japan. Their ages ranged from 22 days to 16 months 27 days (average age 8 ± 4 months). Six physical therapists (raters A, B, C, D, E, and F) served as the AIMS raters. Raters A, B, and C were

physical therapists who worked in a rehabilitation center for multiple disabled children and provided pediatric physical therapy only once per week (the non-expert PTs). On the other hand, Three raters, D, E, and F, worked in a day care center for disabled children and provided pediatric physical therapy every weekday (the expert PTs). None of the raters had any prior experience in the administration of AIMS. Healthy infants who did not show the four postures required were excluded.

Videotape recordings of the subjects were carried out individually in an appropriate room in the participating child care centers. Before recording, a table and toys required for the assessment were prepared and put in the room. The childcare specialists were asked not to touch the objects because this was an observational assessment. Moreover, so that the subjects would comfortably adopt the four postures within a short time, the childcare specialists were asked to involve the children in appropriate tasks. If it took too much time to record the subject's performance, or the subjects developed a bad mood, the recording was stopped according to the AIMS method, and the remainder of the assessment was recorded within a week.

The raters of AIMS were 6 physical therapists who had 3 to 6 years of experience in the evaluation and treatment of pediatric patients; however, they had no prior experience in the administrations of AIMS. Three worked in a daycare center for disabled children and the other three were physical therapists who worked in a center for multiple disabled children. All raters had a 5-hour training course dealing with the theories of motor development and the administration and scoring of AIMS. The content was taken from the AIMS text: "Administration guidelines" "Prone subscale" "Supine subscale" "Sitting subscale" and "Standing subscale" of the "Motor Assessment for the Developing Infant"[8].

To assess interrater reliability, the raters all saw the same videotapes of the subjects in the room. To determine intrarater reliability, we followed the method of Jeng et al.[14]; one month after the first assessment, the raters watched and rated the same videotapes again. To assess criterion-related validity, AIMS was compared with KSPD. The KSPD rater a childcare specialist who was working with disabled children. The KSPD rater had attended the intermediate KSPD course and had evaluated more than 100 cases.

Table 1. Characteristics of subjects included in reliability and validity

Subjects	Sex	Age (MD)	Gestational age (wk)
1	male	2M10D	37
2	male	2M10D	37
3	female	3M	more than 38
4	male	2M20D	more than 38
5	male	2M11D	more than 38
6	female	4M10D	37
7	male	5M16D	more than 38
8	male	8M6D	more than 38
9	female	10M19D	more than 38
10	female	11M6D	more than 38
11	female	16M2D	more than 38
12	male	9M11D	more than 38
13	male	11M8D	more than 38
14	male	11M5D	more than 38
15	male	11M13D	more than 38
16	female	7M17D	more than 38
17	male	14M9D	more than 38
18	female	16M27D	more than 38
19	male	13M16D	more than 38
20	male	10M	37
21	male	16M27D	more than 38
22	female	6M6D	more than 38
23	male	5M11D	34
24	female	13M6D	more than 38
25	male	9M12D	more than 38
26	female	8M23D	more than 38
27	male	8M17D	34
28	male	12M14D	more than 38
29	male	5M2D	37
30	female	4M4D	more than 38
31	female	7M11D	more than 38
32	male	6M12D	more than 38
33	female	8M30D	more than 38
34	male	1M14D	more than 38
35	female	22D	more than 38
36	male	5M3D	more than 38
37	male	4M27D	more than 38
38	female	1M7D	more than 38
39	female	5M	more than 38
40	female	7M21D	more than 38

MD: represent month and day.

Intrarater and interrater reliability were examined using the Intraclass Correlation Coefficient (ICC) and the Standard Error of Measurement (SEM). The ICC provides an estimate of the degree of agreement between observed test scores. The scoring of the AIMS was assessed using ICC and SEM according to Shrout[19]. Intrarater reliability and interrater reliability were determined based on these results.

Table 2. AIMS and KSPD scores for subjects aged 0–7 month: 6 raters of AIMS and one rater of KSPD

		AIMS							
Subjects	KSPD	Rater A	Rater B	Rater C	Rater D	Rater E	Rater F	Rater A (second)	Rater D (second)
1	13	8	9	9	9	9	8	9	9
2	13	8	9	8	12	9	9	11	10
3	15	12	11	13	11	10	14	13	13
4	15	13	13	13	13	12	10	15	13
5	13	8	7	8	10	7	7	7	8
6	19	16	20	20	18	17	18	18	18
7	20	15	15	14	14	15	14	16	15
16	33	34	37	37	31	37	33	34	33
22	21	16	22	21	19	18	19	19	21
23	16	10	10	10	10	10	10	12	12
29	18	10	11	11	11	12	12	12	12
30	20	13	15	13	15	16	14	14	17
31	34	36	36	35	35	37	38	36	38
32	28	28	28	28	25	25	28	29	25
34	7	7	8	8	7	6	6	6	7
35	7	6	4	5	5	5	5	6	5
36	22	19	21	20	18	18	18	20	18
37	21	25	27	27	24	23	22	27	27
38	7	4	4	4	3	4	4	3	3
39	29	27	27	28	28	30	31	27	27
40	42	48	49	49	48	50	49	48	48
mean	19.7	17.3	18.2	18.1	17.4	17.6	17.6	18.2	18.04
SD	9.3	11.6	12.1	12.0	11.1	12.2	12.0	11.5	11.5

The SEM was calculated using $SD\sqrt{1-r}$ where r is the reliability coefficient. Criterion-related validity was determined based on the Pearson correlation coefficient between the AIMS and KSPD. The software used for the statistical analysis was SPSS11.5 J.

RESULTS

Scores for all subjects by 6 AIMS raters and one KSPD rater are shown in Table 2 and Table 3. For interrater reliability, the ICC was ≥ .94 and the SEM was ≤ 1.47 for the six AIMS raters. For the interrater reliability of the expert PTs, the ICC was ≥ .93 and the SEM was ≤ 1.62. For the interrater reliability of the non-expert PTs, the ICC was ≥ .89 and the SEM was ≤ 1.60 (Table 4). It was impossible to analyze the results of infants 8 months of age or older in the supine position, because the scores were almost the same for the ICC. For the intrarater reliability of the non-expert PT, rater A, the ICC was ≥ .86 and the SEM was ≤ 1.77. For the intrarater reliability of the expert PT, rater D, the ICC was ≥ .93 and the SEM was ≤ 1.31 (Table 5). The correlation between KSPD and AIMS for the six raters was high (r = .97~ .98).

DISCUSSION

Watkins et al. have reported that an ICC ≥ .90 indicates a high reliability, .75–.90 indicates good reliability, .50–.75 indicates moderate reliability, and ≤ .50 indicates poor reliability[20]. In the present study, the ICC for the six AIMS raters was .94, which means that the interrater reliability was high. The intrarater reliability of the non-expert PT, rater A, was good-high (ICC ≥ .86), while the intrarater reliability of the expert PT, rater D, was high (ICC ≥ .93). Meyer reported that a correlation coefficient r ≥ .8 indicates a high correlation, r = .6–.8 indicates a good correlation, r = .4–.6 indicates a moderate correlation, and r ≤ .4 indicates a poor correlation[21]. In the present study, r was ≥ .97 for the 6 AIMS raters, which means that the correlation was high.

There are differences between some AIMS and KSPD items. The items of AIMS, except for "standing with support 1" "standing with support 2" and "standing with support 3" require only observation for "weight bearing" "posture" and "anti-gravity" However, KSPD includes some items

Table 3. AIMS and KSPD score for subjects aged of 8 month or older: 6 raters of AIMS and one rater KSPD

		AIMS							
Subjects	KSPD	Rater A	Rater B	Rater C	Rater D	Rater E	Rater F	Rater A (second)	Rater D (second)
8	42	35	33	33	31	31	30	37	31
9	42	52	46	51	51	51	48	52	50
10	44	58	55	54	53	53	52	53	51
11	59	58	58	58	58	58	58	58	58
12	42	51	52	52	49	49	50	52	49
13	44	53	52	53	50	50	53	53	50
14	44	53	53	53	51	51	53	53	49
15	43	52	52	52	51	51	50	52	50
17	44	53	53	53	50	50	53	53	50
18	59	58	57	58	58	58	58	58	58
19	54	58	58	58	56	56	58	58	58
20	42	49	49	51	50	50	48	51	48
21	59	58	58	58	56	56	58	58	57
24	59	58	58	58	57	57	58	50	55
25	35	38	38	39	34	34	35	32	37
26	36	35	36	39	36	36	37	35	30
27	28	27	31	31	26	26	31	27	26
28	43	52	50	52	49	49	45	52	49
33	30	27	27	28	26	26	26	27	26
mean	44.7	48.7	48.2	49.0	46.9	46.9	47.4	47.9	46.4
SD	9.4	10.7	10.1	9.8	10.7	10.7	10.5	10.6	10.8

that require rater participation, such as "standing with holding onto something" "suspension in the abdominal position" "taking a cloth off the head" "going up and down the stairs" and "walking with aids".

To score AIMS, one item is given one point. In KSPD, one item is given one point in infants less than 1 year of age; in infants ≥ 1 year of age, one item is given 5 points. Nevertheless, many items of AIMS and KSPD are similar. Thus, even though the tools were developed in populations with different racial backgrounds, the results of the present study show that they have high correlation.

Monson et al. reported that The Peabody Gross Motor Scale and The Bayley Scale of Infant Development (second edition) can be used as criterion-related validity measures of AIMS for healthy children; the correlations coefficients were r = .99 for The Peabody Gross Motor Scale and AIMS, and r = .97 for The Bayley Scale of Infant Development (second edition) and AIMS[22]. In the present study, the correlation coefficient between KSPD and AIMS ranged from 0.97 to 0.98, which is similar to the previous studies; r ≥ .8 indicates a high correlation. KSPD is a standardized developmental examination that was developed in Japan and is widely used in public health centers and other settings in western Japan. The present study shows that AIMS had high validity when used for healthy Japanese children.

In the report by Piper et al. studying healthy children, the ICCs for the intrarater reliability and the interrater reliability were both .99[10]. In the report by Jeng et al. dealing with premature babies, the ICCs for the intrarater reliability and interrater reliability ranged from 0.97 to 0.99, and the SEMs ranged from 0.13 to 1.24[14]. In the present study, the ICC for the interrater reliability of the six raters was ≥ .94. The SEM for the interrater reliability of the six raters was ≤ 1.47. The ICC values for both intrarater reliability and interrater reliability were similar to those of Piper et al.[10] and Jeng et al.[14]; the SEMs for both intrarater reliability and interrater reliability were between 1.0 and 2.0.

For the interrater reliability of the non-expert PTs, raters A, B, and C, the ICC ranged from 0.89 to 0.99. For the intrarater reliability of the non-expert PT, rater A, the SEM was ≤ 1.77. The SEM of the expert PT, rater D, was ≤ 1.31. Therefore, even a rater with little experience in pediatric physical therapy can rate AIMS similar to an expert PT. In the report by Jeng et al.[14], the lowest reliability

Table 4. Scorings by Raters A, B, C, D, E, F, and interrater reliability as determined by SEM and ICC

Age group and subscale	non -expert PTs					expert PTs					6 Raters	
	Rater A	Rater B	Rater C	SEM	ICC	Rater D	Rater E	Rater F	SEM	ICC	SEM	ICC
0–7 mo (n=21)												
Prone	6.0 ± 4.7	6.8 ± 5.0	6.4 ± 4.9	0.77	0.97	6.7 ± 4.8	6.6 ± 5.3	6.6 ± 5.1	0.90	0.96	0.88	0.96
Supine	5.2 ± 2.7	5.2 ± 2.8	5.7 ± 2.8	0.70	0.93	5.2 ± 2.6	5.1 ± 2.7	5.0 ± 2.7	0.48	0.96	0.58	0.95
Sitting	3.7 ± 3.3	3.7 ± 3.3	3.3 ± 3.4	0.57	0.97	2.9 ± 2.9	3.4 ± 3.4	3.6 ± 3.4	0.66	0.95	0.66	0.95
Standing	2.7 ± 2.0	2.5 ± 1.8	2.7 ± 2.0	0.30	0.97	2.7 ± 1.8	2.5 ± 2.0	2.3 ± 1.9	0.44	0.94	0.37	0.96
Total	17.3 ± 11.6	18.2 ± 12.1	18.1 ± 12.0	0.65	0.99	17.4 ± 11.1	17.6 ± 12.2	17.6 ± 12.0	1.26	0.98	1.31	0.98
8 mo or older (n=19)												
Prone	18.3 ± 4.7	18.3 ± 4.4	18.7 ± 4.3	1.08	0.95	17.1 ± 4.5	18.0 ± 4.3	18.5 ± 4.6	1.15	0.93	1.06	0.94
Supine	9.0 ± 0.0	8.9 ± 0.3	9.0 ± 0.0	*	*	8.6 ± 0.5	8.9 ± 0.3	8.9 ± 0.2	*	*	*	*
Sitting	11.2 ± 1.4	11.3 ± 1.4	11.4 ± 1.4	0.33	0.94	11.3 ± 1.4	11.1 ± 1.6	11.4 ± 1.3	0.29	0.95	0.29	0.95
Standing	10.2 ± 5.1	9.7 ± 4.9	9.5 ± 5.1	1.60	0.89	9.9 ± 5.0	9.3 ± 5.1	10.0 ± 5.1	0.76	0.97	1.15	0.94
Total	48.7 ± 10.7	48.2 ± 10.1	49.0 ± 9.8	1.29	0.98	46.7 ± 10.7	47.4 ± 10.5	48.8 ± 10.4	1.62	0.97	1.47	0.97

ICC: intraclass correlation coefficient. SEM: standard error of measurement.
*not possible to compute.
The subscale and total scores are presented as mean ± SD. The units for scoring and SEM are points.
non -expert PTs: physical therapists who provided pediatric physical therapy only once per week.
expert PTs: physical therapists who provided pediatric physical therapy every weekday.

Table 5. Repeated scores by A and D, and Intrarater reliability as determined by ICC and SEM

Age group and subscale		Rater A (the non-expert PT)				Rater D (the expert PT)			
		First scoring	Second scoring	SEM	ICC	First scoring	Second scoring	SEM	ICC
0–7 mo (n=21)	Prone	6.0 ± 4.7	6.7 ± 4.7	0.77	0.97	6.7 ± 4.8	6.7 ± 4.6	0.71	0.97
	Supine	5.2 ± 2.7	5.4 ± 2.7	0.37	0.98	5.2 ± 2.6	5.1 ± 2.6	0.34	0.98
	Sitting	3.7 ± 3.3	3.4 ± 3.4	0.43	0.98	2.9 ± 2.9	3.5 ± 3.4	0.76	0.94
	Standing	2.7 ± 2.0	2.8 ± 2.0	0.40	0.95	2.7 ± 1.8	2.7 ± 2.0	0.26	0.98
	Total	17.3 ± 11.6	18.2 ± 11.5	1.04	0.99	17.4 ± 11.1	18.0 ± 11.5	1.06	0.99
8 mo or older (n=19)	Prone	18.3 ± 4.7	17.6 ± 5.3	1.63	0.86	17.1 ± 4.5	16.7 ± 4.5	1.12	0.93
	Supine	9.0 ± 0	9.0 ± 0	*	*	8.6 ± 0.5	8.6 ± 0.5	*	*
	Sitting	11.2 ± 1.4	11.4 ± 1.5	0.50	0.86	11.3 ± 1.4	11.3 ± 1.4	0.36	0.98
	Standing	10.2 ± 5.1	10.0 ± 4.9	0.66	0.98	9.9 ± 5	9.9 ± 5	0.08	0.99
	Total	48.7 ± 10.7	47.9 ± 10.6	1.77	0.96	46.7 ± 10.7	46.4 ± 10.8	1.31	0.98

ICC: intraclass correlation coefficient. SEM: standard error of measurement.
*not possible to compute.
The subscale and total scores presented as mean ± SD. The units for scoring and SEM are points.
non -expert PTs: physical therapists who provided pediatric physical therapy only once per week.
expert PTs: physical therapists who provided pediatric physical therapy every weekday.

(ICC = .73) was obtained for the interrater reliability of the "Standing subscale" in infants from 0 to 3 months of age of preterm infants in Taiwan. However, in the present study, there were only 8 infants from 0 to 3 months of age and their scores agreed approximately.

The limitations of the present study include the fact that the raters assessed the subjects by watching videotapes; thus, they did not participate in inducing the postures or in facilitating the performance of particular activities by the subjects. There is the possibility that ICC was higher than if the cases were evaluated directly by the raters themselves. Although three physical therapists had little experience in pediatric physical therapy, they could properly rate the children after taking the 5-hour AIMS course. In addition to proving the reliability and the validity of AIMS, this report confirms that AIMS is a simple assessment tool, as previously claimed[23]. Since the assessment can be

made on the basis of videotapes, subjects can be assessed without needing to choose a place and time.

In conclusion, both the reliability and the validity of AIMS were high, and, level of pediatric expertise did not affect a rater's reliability.

REFERENCES

1) Nelson KB, Ellenberg J: The asymptomatic newborn at risk of cerebral palsy. Am J Child, 1987, 41: 1333–1335.
2) Akiyama A, Hukuda M, kinosita S, et al.: The developmental disability of the cerebral feature. Rigaku Ryoho Journal, 1999, 33: 665–673 (in Japanese).
3) Barbosa VM, Campbell SK, Sheftel D, et al.: Longitudinal performance of infant with cerebral palsy on the test of motor performance and on the alberta infant motor scale. Phys Occup Ther Pediatr, 2003, 23: 7–29.
4) Ikuzawa M, Iwachidou S, Oogami R, et al.: The guide of Kyoto scale of psychological development. Ikuzawa M, Matusita Y, Nagase A (eds.), Kyoto: Kyoto Kokusai Shakaifukushi Center, 2001.
5) Tsumori M, Inage K, Isobe K: Tsumori-Inage development scale. Tokyo: Dainihon Shutsupan, 1965.
6) Frankenburg WK, Dodds J, Archer P, et al.: The Denver-II: a major revision and restandardization of the Denver developmental screening test. Pediatirics, 1992, 89: 91–97.
7) Lee LLS, Harris SR: Psychometric properties and standardization samples of four screening tests for infants and young children: a review. Pediatr Phys Ther, 2005, 17(2): 140–147.
8) Piper MC, Darrah J: Motor assesment for the developing infant. Philadelphia: W.b. saunders, 1994.
9) Bartlett DJ, Fanning JEK: Use of alberta infant motor scale to characterize the motor development of infant born preterm at eight months corrected age. Phys Occup Ther Pediatr, 2003, 23: 31–45.
10) Piper MC, Darrah J, Watt MJ: Assement of gross motor skills of at-risk infats: predictive validity of the alberta infant motor scale. Dev Med Child Neurol, 1998, 40: 485–491.
11) Restiffe AP, Gherpelli JL: Comparison of chronological and corrected ages in the gross motor assessment of low-risk preterm infants during the first year of life. Arq Neuropsiquiatr, 2006, 64(2B): 418–425.
12) Majnemer A, Snider L: A comparison of developmental assessmental assessment of the newborn and young infant. Ment Retard Dev Disabil Res Rev, 2005, 11: 68–73.
13) Van Haaster IC, De Vries LS, Helders PJ, et al.: Early gross motor development of preterm infants according to the Alberta Infant Motor Scale. J Pediatr, 2006, 149(5): 617–622.
14) Jeng SF, Yau KIT, Chen LC, et al.: Alberta infant motor scale: reliability and validity when used on preterm infant in Taiwan. Pysical Therapy, 2000, 80: 168–177.
15) Fleuren KM, Smit LS, Stijinen T, et al.: New reference values for the Alberta Infant Motor Scale need to be established. Acta Paediatr, 2007, 96: 424–427.
16) Coster AJ: Critique of the Alberta infant motor scale. Phys Occup Ther Pediatr, 1995, 15: 53–64.
17) Russel D, Rosenbaum P, Gowland C, et al.: Gross motor function measure manual. Riu M, Kondo I (eds.) Tokyo: Ishiyaku Publisher, 2000.
18) Uesugi M, Takada S, Tokuhisa K, et al.: Reliability of video-media neurological assessment using Alberta Infant Motor Scale. Rigakuryoho Kagaku, 2006, 21: 137–141 (in Japanese).
19) Shrout PE, Fleiss JI: Intraclass correlations:use in assessing rater reliability. Psychol, 1979, 86: 420–428.
20) Watkins MP, Portney LG: Foundations of clinical reseach: applications to practice. East Norwalk: Conn Appleton and Lange, 1993, pp53–67.
21) Meyer CR: Measurement in physical education. New York: NY, Ronald Press Co, 1979.
22) Monson RM, Deitz J, Kartin D: The relationship between awake positioning and motor performance among infants who slept supine. Pediatr Phys Ther, 2003, 15(4): 196–203.
23) Uesugi M, Takada S, Shimada T: Introduction of Alberta Infant Motor Scale. Rigakuryoho Kagaku, 2005, 3: 295–306 (in Japanese).