



**Original Article:**

**Reliability of Alberta Infant Motor Scale Using Recorded Video Observations Among the Preterm Infants in India: A Reliability Study**

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**Citation**

Veena KS, Shyamilee S, Padmanabhan K, Sudhakar S, Aravind S, Samuel AJ, Aranha VP. Reliability of Alberta Infant Motor Scale Using Recorded Video Observations Among the Preterm Infants in India: A Reliability Study. *Online J Health Allied Scs.* 2017;16(3):3. Available at URL: <http://www.ojhas.org/issue63/2017-3-3.html>

Submitted: Aug 29, 2017; Accepted: Sep 30, 2017; Published: Oct 30, 2017

**Abstract:** Background: Assessment of motor function is a vital characteristic of infant development. Alberta Infant Motor scale (AIMS) is considered to be one of the tool available for screening the developmental delays, but this scale was formulated by using western samples. Every country has its own ethnic and cultural background and various differences are observed in the culture and ethnicity. Therefore, there is a need to obtain reliability for the use of AIMS in south Indian population. Purpose: To find the intra-rater and inter-rater reliability of Alberta Infant Motor Scale (AIMS) on pre-term infants using the recorded video observations in Indian population. Method: 30 preterm infants in three age groups, 0-3 months (10 infants), 4-7 months (10 infants), 8-18 months (10 infants) were recruited for this reliability study. The AIMS was administered to the preterm infants and the performance was videotaped. The performance was then rescored by the same therapist, immediately from the video and on another two consecutive months to estimate intra-rater reliability using ICC (3,1), two-way mixed effects model. For reporting inter-rater reliability, AIMS was scored by three different raters, using ICC (2,k) two-way random effects model and by two other therapists to examine the inter and intra-rater reliability. Results: The two-way mixed effects model for intra-rater reliability of AIMS, ICC (3,1) = 0.99 and for reporting inter-rater reliability of AIMS by two-way random effects model, ICC (2,k) = 0.96. Conclusion: AIMS has excellent intra and inter-rater reliability using recorded video observations among the preterm infants in India.

**Key Words:** Infant Development; Preterm Birth; Reliability of Results; Reproducibility of Findings

**Introduction:**

Premature newborn infants are at greater risk of delayed neuropsychological development than those born at full term.[1,2] Recent methods for the identification and treatment of premature newborn infant with motor dysfunction have put emphasis on assessment and intervention within first year of

life.[3,4] Physical therapists are often the primary evaluators and care providers in the early identification of these infants and are usually responsible for selecting an infant motor assessment that is clinically practical and psychometrically sound.[2]

Physical therapists often relied on testing reflexes and on motor milestone to evaluate infants with motor delays in the 1970's and 1980's.[5] These assessments were based on the concept that evolves from reflexive state to a voluntary state in a sequential manner as the nervous system matures.[6] Although assessment of reflexes and motor milestones may provide useful information about neurological integrity of an infant, increasing the evidence that indicates neural maturation explanation alone does not account for complex features of motor development.[5,6] Rather motor behavior may emerge as a function in task specific context which is often referred as dynamic system.[6] Therefore, assessment of infant motor behaviors should be based on multiple factors (eg: neural maturation, muscle force, biomechanical leverages, emotional state, cognitive awareness, constraints of tasks and physical environment) that influence motor outcome.[7]

The AIMS incorporates the neuromaturational concepts and the dynamic system theory and is used to measure gross motor maturation of infants from birth to the age of independent walking.[8] 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.[9]

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 drawing of 58 infant posture and movement that must be observed 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".[8,10] A total score is then determined by adding together the number of items below that of least mature

observed items and number of all observed items. The items of the AIMS focuses on variables such as weight bearing, postural alignment, and antigravity movement that contribute to motor skills. The scoring system entails a dichotomous choice for each test item, scored as observed or not observed and this provides information in identifying the missing components of motor task and formulating intervention strategies.[8,10]

The AIMS is a standardized and an excellent assessment tool of motor development.[8] However, the previous AIMS studies had included samples that were stratified by age and gender but the infants race and maternal socioeconomic characteristics were not considered.[10–13] Therefore it is difficult to compare the result of these studies with those of infants from other countries. Thus it is unknown whether AIMS is appropriate for infants with different social and ethnic background. When foreign method is being considered to introduce the test in other countries, its reliability must be assessed. Thus the purpose of this study was to investigate the reliability of AIMS among preterm infant in Indian population.

**Materials and Methods**

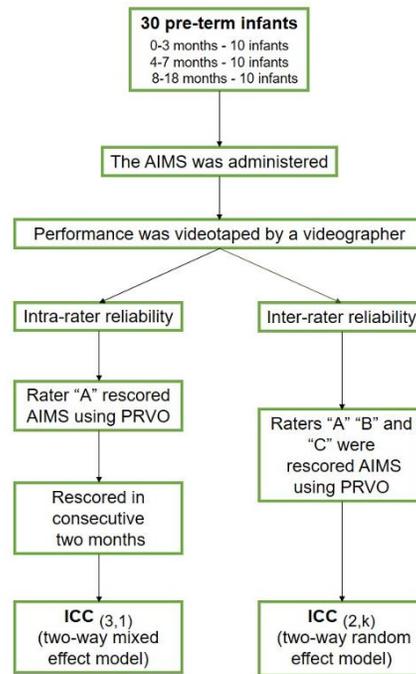
The study protocol was approved by the university research and ethics committee (ACS/2016/42) and the study was done strictly in accordance with the guidelines of Helsinki declaration, revised 2013.[14] A total of 30 preterm infants, in three age groups, corrected ages of 0-3 months, 4-7 months, 8-18 months, were recruited by the stratified sampling to participate in this reliability study. Preterm infants were recruited adjusting their corrected age. Signed informed consent was obtained from the parent of the participating children.

**Alberta Infant Motor Scale (AIMS)**

The AIMS consists of 58 items that are organized into 4 subscales – prone (21 items), supine (9 items), sitting (12 items) and standing (16 items). For each test item, the examiner must identify and observe 3 key descriptors – weight bearing, posture and anti-gravity movement. The total 58 items and one score for each item totaling 58.[8]

**Intra- and interrater reliability**

In this reliability study, the AIMS was administered to the infants by a qualified pediatric physical therapist (rater A) having three years of training in using AIMS, and the infant performance was videotaped by a videographer throughout the examination. To examine intrarater reliability, rater A scored the infant motor performance from the pre-recorded video observations (PRVO) and rescored from PRVO on 2 consecutive months. This time interval was considered long enough to minimize the memory bias of the rater. To determine interrater reliability by two equally qualified pediatric physical therapists (raters B and C) having three years of training in AIMS observed PRVO and independently scored the performance of the pre-term infants. Because of our use of a videotape, each rater did not have to handle the child. This eliminated one potential source of error. In general practice, differences in the handling skill between the therapists will lead to lower reliability. PRVO has excellent interrater and intrarater reliability of ICC = 0.99.[15] The blueprint of the study is displayed in Figure 1.



**Figure 1: Blueprint of the reliability study**

**Data analysis**

The collected data were tabulated and analyzed using both descriptive and inferential statistics. For test retest reliability,[16] an ICC (3,1) (two-way mixed effect model) was used and for inter-rater analysis, an ICC (2,k) (two-way random effect model) was used in accordance with Shrout and Fleiss. According to them ICC interpretation <0.4 - poor, 0.4 to <0.75 - moderate, 0.75 to <0.9 - good, =0.9 - excellent.[17] The data was analysed using statistical software, statistical package for social science (SPSS), IBM SPSS version 22.0 (Armonk, NY: IBM Corp.). The p-value =0.05 was considered to be statistically significant.

**Results**

Thirty preterm infants were recruited for the study. Among them 15 were male and remaining 15 were females. The demographic characteristic of the preterm infants recruited were displayed in Table 1. The intra-rater and interrater reliability for AIMS were elaborated in Table 2 and Table 3 respectively. Both intra-rater and interrater observation has excellent reliability as, ICC > 0.9 from Table 2 and 3.

**Table 1: Demographic data of preterm neonates among the three age groups**

Age groups	Sample size	Male/Female	Age (wk) Mean±SD (Range)	AIMS score (Range)
Birth – 3 months	10	5/5	7.3 ± 4.6; (3.2-11.8)	1-5
4-7 months	10	5/5	21.6 ± 6.2; (14.9-27.5)	15-28
8-18 months	10	5/5	56.8 ± 10.7; (38.1-70.4)	30-58
Total	30	15/15	28.6 ± 19.9; (3.2-70.4)	1-58

**Abbreviations:** AIMS-Alberta Infant Motor Scale; SD-Standard Deviation

**Table 2: Alberta Infant Motor Scale (AIMS) scores from pre-recorded video observation on three different sessions by the single investigator with Intraclass correlation coefficient by two-way mixed effect model ICC (3,1)**

Session	Prone (2 items)	Supine (9 items)	Sitting (12 items)	Standing (16 items)	Total (58 items)
1	1-21	1-9	0-12	1-16	3-58
2	1-20	1-9	1-12	0-16	3-58
3	1-21	1-9	1-12	0-16	3-58
ICC (3,1)	0.98	0.99	0.97	0.93	0.97

**Abbreviation:** ICC (3,1) - Intraclass correlation coefficient by two-way mixed effect model

**Table 3: Alberta Infant Motor Scale (AIMS) scores from pre-recorded video observation by three different raters with Intraclass correlation coefficient by two-way random effect model ICC (2,k)**

Rater	Prone (2 items)	Supine (9 items)	Sitting (12 items)	Standing (16 items)	Total (58 items)
1	1-21	1-9	0-12	0-16	3-58
2	1-20	0-9	1-12	1-16	3-58
3	0-21	1-9	1-12	0-16	3-58
ICC (2,k)	0.93	0.96	0.97	0.94	0.95

**Abbreviation:** ICC (2,k) - Intraclass correlation coefficient by two-way random effect model

### Discussion

Our results showed high levels of intrarater and interrater reliability (ICC = 0.95) for the total scores of the AIMS when used on preterm infants from birth to 18 months. The difficulty in assessing the early standing movements in preterm infants may also contribute to the lower reliability for standing scorings. According to the item descriptions of the AIMS, the major components for the acquisition of early standing movements are postural stability and mobility of the neck, trunk, shoulders, lower extremities in various movement planes. The younger infants exhibited such a narrow range of scores that their standing performance was rated as “supported standing” on the scale. The small variability among the subjects for standing scores may thus attenuate correlation coefficient values in younger age groups.[10]

The AIMS is a well-designed assessment that offers the opportunity for clinicians to assess infants, current motor skills without unnecessary stress caused by excessive handling.[8,18,19] This helps to determine eligibility for early intervention services. Its scoring system is simple and the determination of the percentile ranking based on the total raw scores offers clinicians the ability to provide guidance to the families of infants with potential motor dysfunction.[20]

The reliability testing showed different interclass coefficient correlation, Taiwan showed high inter and intrarater reliability with ICC=0.95 across all age groups, Japan showed good reliability with ICC=0.83, Norwalk, USA, showed good to high reliability with ICC=0.86.[9] In the present study, the ICC for the intra and inter rater reliability was 0.99 therefore even a rater with minimal experience in pediatric physical therapy can rate AIMS similar to an expert physical therapist. In addition to proving the reliability, this report confirms that AIMS is a simple assessment tool as previously claimed. Since the assessment can be made on the basis of videotapes, subjects can be assessed without needing to choose a place and time. Therefore, both inter and intrarater reliability of AIMS were excellent and level of pediatric expertise did not affect the raters reliability.[15] This study will be the first among the

kind in establishing reliability among the preterm infants in India.

### Conclusion

There exists excellent degrees of intrarater and interrater reliability for the AIMS when applied on preterm infants in India aged from birth to 18 months by using recorded video observations. Our results indicate that AIMS provides reliable measurements that can be used for the evaluation of the current motor function of preterm infants in Indian population.

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