

Longitudinal Observation of Healthy Children's Motor Development Using the Alberta Infant Motor Scale

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Abstract. [Purpose] To clarify the motor development of healthy infants, we conducted a longitudinal observation survey of healthy Japanese infants. [Subjects] Healthy infants participated in this study (9 males and 5 females age 5–13 months old, birth weight: 2,474–3,964 g). Infants belonged to three daycare centers. [Method] An examiner visited the infants at a daycare center monthly, and examined their motor development using the Alberta Infant Motor Scale (AIMS). [Results] Eleven infants, out of 14, showed higher AIMS than the average at some ages in months and lower AIMS than the average at some ages. [Conclusion] The longitudinal survey confirmed that infants have certain periods when they become capable of new movements and other periods when their development stagnates. It also confirmed that the supine sleep position has no influence on infants' motor development acquisition. This suggests that the impact of physiological motor development must be considered when infants receiving PT become capable of new movement. **Key words:** AIMS, Motor development, Reevaluation based on longitudinal observation

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INTRODUCTION

There are four assumptions about infants' development¹⁾. Movement progresses from primitive, mass movement reflex patterns to voluntary, controlled movement²⁾. Motor development progresses in the cephalocaudal direction³⁾. Movement is first controlled proximally and then distally⁴⁾. The sequence of motor development is consistent for each infant¹⁾. However, an infant's motor development differs depending on various factors. For instance, there is influence on the infant's motor development due to the difference between the prone position and the supine position^{2–7)}. Also, reports using AIMS have indicated that there is a racial factor in the motor development of infants with different racial ancestry, such as Brazilian, Dutch, and American, Japanese and so on in Manila^{8–14)}. The motor development of infants varies and there are the following concerns in the provision of physical therapy to improve the mobility of handicapped children. Physical therapists offer physical therapy to handicapped children. However, even when handicapped children acquire improved mobility, there is doubt as to whether it is by normal development or due to therapeutic gain. Therefore, to clarify the motor development of healthy infants, we conducted a longitudinal observation survey of healthy Japanese infants.

SUBJECTS AND METHODS

The study objectives, significance, methods, and privacy protection were explained to the caregivers of the subjects in writing, and each participant's parent or guardian provided informed written consent to participation. Nine healthy male infants and 5 healthy female infants (5–13 months old) participated in this study (Table 1). Infants belonged to three daycare centers. Data was collected for approximately 8 months, from May 12, 2009 to December 22, 2009. An examiner visited the subject infants at a daycare center monthly, and examined their motor development using the Alberta Infant Motor Scale (AIMS) from the textbook, Motor Assessment of the Developing Infant. The examiner was a physical therapist with twenty years of experience, and a high level of familiarity with AIMS. If a subject was absent from the daycare center or not well, the examiner visited the daycare center again within one week or did not examine the subject for the month. When a subject became capable of walking independently, which equates to a full AIMS score, the examination for that subject was considered complete. The sleeping posture of subjects was investigated by questionnaire. The Alberta Infant Motor Scale¹⁾ (AIMS) is a standardized assessment tool of motor development^{15,16)}. The AIMS has been found to be an excellent motor tool^{17–21)}. The rater can complete the

Table 1. Characteristics of subjects

case	birth weight (g)	sex	gestational age	age at test	test times	sleep position
1	2474	male	38	8M17D	4	prone
2	3264	female	40	9M6D	6	prone
3	2935	female	40	9M19D	4	prone
4	3148	male	40	8M16D	5	prone
5	3114	male	41	9M28D	6	both
6	3120	female	40	13M4D	5	supine
7	2584	female	40	10M6D	5	prone
8	3090	male	40	10M11D	6	prone
9	2450	female	37	5M8D	8	supine
10	3098	male	40	10M16D	6	prone
11	3964	male	41	7M	5	supine
12	2940	male	40	11M28D	3	supine
13	2755	female	37	8M15D	4	supine
14	3325	male	39	10M6D	3	prone

MD: represent month and day.

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. 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. The deviations were calculated by subtracting the average AIMS score by age (in months) of 2,202 infants examined in Alberta, Canada, from each subject’s AIMS scores by age (in months), and the transitions and fluctuations were examined. This study was approved by Research Ethics Committee of the Kobe International University (G2009-005).

RESULTS

Figure 1 shows that one infant consistently showed higher AIMS scores than the average at all ages. Two infants consistently showed lower AIMS scores than the average at all ages. Eleven infants, out of 14, showed higher AIMS scores than the average at some ages and lower AIMS scores than the average at some ages. Case 2 showed the largest AIMS score fluctuation, and the difference between the minimum and maximum deviations was 21.9. Case 14 showed the smallest AIMS score fluctuation, and the difference between the minimum and maximum deviations was 3.7. There were 8 children who slept in the prone position. Only 1 subject out of 8 had a higher than average of AIMS scores.

DISCUSSION

It has been believed that infant motor development has some general rules including from head to foot, from central to peripheral, sequential, from gross to fine movement, and

steady pace development. The results of recent studies, however, contradict many of these rules. Few reports are available concerning motor development maturation rates, and when handicapped infants become capable of new movement, it is unclear whether it is the result of physical therapy or natural development. In this study, the AIMS score deviations of subject infants were both positive and negative depending on their ages. The fluctuation of the difference between the minimum and maximum deviations was large, from 3.7 to 21.9. These results confirm that motor development maturation rates vary even among healthy infants. Infant motor development is influenced by the sleeping position, such as the prone or supine position²⁻⁷⁾. Delayed motor milestones on the Denver Development Screening test were reported for infants of cultures who traditionally place their infants to sleep in the supine position⁶⁾. Similarly, it is reported that infants acquire the motor development faster if they sleep in the prone position^{3,4,7)}. Dudek-Shriber et al. reported that having an understanding of how much time infants spend in the prone position while awake is important for occupational and physical therapists since positioning has been consistently emphasized as being essential for functional performance²⁾. In this study, Case 7 who slept in the prone position had higher than average AIMS score, whereas other cases who slept in the prone position did not. Therefore, the tendency for sleeping posture to influence the movement was not shown in the present study. Darrah et al. reported that many subjects whose ages were 13 months or older had higher percentile ranks of AIMS, because they had acquired independent walking at that age²²⁾. Cases 6 and 8 did not have average AIMS scores until 13 months of age and Case 7 did not have an average AIMS scores until 16 months of age. Darrah reported that infants received a low score from 5.5 to 9.5 months of age because they were neither pulling to themselves upright nor crawling or creeping²²⁾. The infants have shown fell below AIMS score average from 8 to 12 months of age in the present study. A limitation of this study was that the subjects of this study were children who attended a day-care center. Therefore, the subjects were not

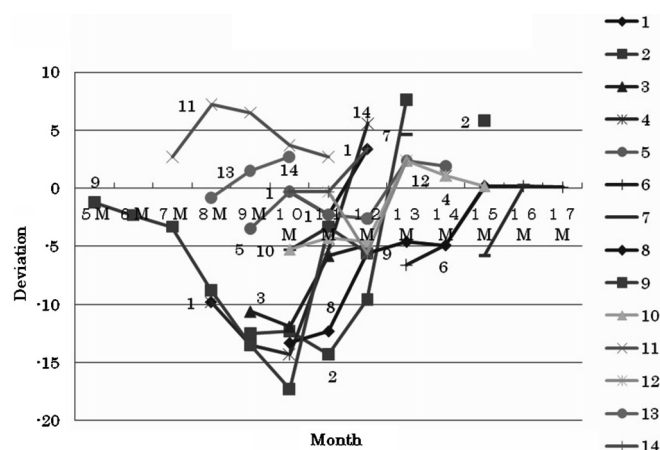


Fig. 1. Deviation from AIMS score average.

examined until they were 5 months old, and were observed for only 8 months or less. Also the observation period and the age when the observation started varied depending on the subject. However, this study confirmed to some extent, that infant motor development varies. In the future, more subjects should be observed, the observation period should be extended, the observation should be started when infants are younger, and the examinations should be conducted more frequently. This study confirmed that infants have certain periods when they become capable of new movements and other periods when their development stagnates. This suggests that the impact of physiological motor development must be considered when infants receiving physical therapy become capable of new movement.

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