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# Reference curves for the Brazilian Alberta Infant Motor Scale: percentiles for clinical description and follow-up over time

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**Abstract**

**Objectives:** To compare Alberta Infant Motor Scale scores for Brazilian infants with the Canadian norm and to construct sex-specific reference curves and percentiles for motor development for a Brazilian population.

**Methods:** This study recruited 795 children aged 0 to 18 months from a number of different towns in Brazil. Infants were assessed by an experienced researcher in a silent room using the Alberta Infant Motor Scale. Sex-specific percentiles (P5, P10, P25, P50, P75 and P90) were calculated and analyzed for each age in months from 0 to 18 months.

**Results:** No significant differences ($p > 0.05$) between boys and girls were observed for the majority of ages. The exception was 14 months, where the girls scored higher for overall motor performance ($p = 0.015$) and had a higher development percentile (0.021). It was observed that the development curves demonstrated a tendency to nonlinear development in both sexes and for both typical and atypical children. Variation in motor acquisition was minimal at the extremes of the age range: during the first two months of life and from 15 months onwards.

**Conclusions:** Although the Alberta Infant Motor Scale is widely used in both research and clinical practice, it has certain limitations in terms of behavioral differentiation before 2 months and after 15 months. This reduced sensitivity at the extremes of the age range may be related to the number of motor items assessed at these ages and their difficulty. It is suggested that other screening instruments be employed for children over the age of 15 months.

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## Introduction

Early identification of motor dysfunction in children is a challenge for professionals working in preventative programs,[1-3] particularly those working with the Brazilian population for whom there is a lack of validated and standardized instruments. A number of different scales have been used for this purpose.[4] However, the use of instruments without regard for the necessary cultural adaptations can lead to erroneous characterization of motor development.[5] The results of instruments that have been standardized in their country of origin may suffer interference after adaptation to other locations and from a range of socioeconomic, ethnic and cultural factors.[5]

The Alberta Infant Motor Scale (AIMS) is an observational instrument for measuring gross motor function which assesses antigravity musculature control in four different positions.[6] It is used in research, clinical practice and

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intervention activities.[4] The AIMS has been used to identify developmental delays or abnormalities, to monitor children's development, to detect subtle changes and to assess the efficacy of interventions.[4,6] In response to the widespread use of AIMS, researchers from different countries have proposed adaptations of the instrument to respond to the cultural and socioeconomic diversity of different populations.[7-14]

The AIMS was recently validated for the Brazilian population, resulting in a Brazilian version, entitled Escala Motora Infantil de Alberta. The validation study reported that the adapted version possessed content, criterion and construct validity, reaffirming the AIMS' potential for scientific research and clinical use.[14] However, that study did not propose specific references for normality to be used in the analysis of the motor performance of Brazilian children. Therefore, although the scale has been validated, the norms used for performance and their respective reference values for describing motor acquisition and dysfunction in research are still the Canadian standards. It is therefore essential that motor performance curves be constructed from normative parameters that can be used for the comparison of Brazilian children. An individual's score in a given test is only meaningful when compared with the results of a representative group drawn from the same population.[5,6,9,14] Therefore, the objectives of this study were to compare data from Brazilian children with the Canadian standard and to develop sex-specific motor development reference curves and calculate percentiles for use with the Brazilian population.

## Methods

### *Study design and participants*

First, health and education departments were contacted. After the study had been approved, the parents and/or legal guardians of children (0 to 18 months) at institutions that agreed to take part (n = 150) were contacted. Children (n = 795) were recruited consecutively over a 3-year data collection period from infant schools, basic healthcare centers and institutions in the state of Rio Grande do Sul that did not take part in intervention programs. The following exclusion criteria were applied: conditions affecting the bones, muscles and joints, such as fractures, peripheral nerve injuries, musculoskeletal infections, and others. The study was approved by the Research Ethics Committee and only children whose guardians signed free and informed consent forms took part.

The age group was chosen in accordance with the protocol for the original instrument.[6] The sample size calculation was performed using Programs for Epidemiologists version 4.0, for a 95% confidence level, a 50% proportion of responses and a 4% margin of error, which resulted in a minimum of 600 children. The number of participants was then increased until a minimum of 30 children were recruited for each month of age (Table 1). Data from a census conducted by the Brazilian Institute of Geography and Statistics (Instituto Brasileiro de Geografia e Estatística, IBGE)[15] were used to ensure that the sample had a representative distribution in terms of sex, gestational age at birth in weeks, geographical location (representation of provincial towns and the state capital) and social classes. A similar proportion of preterm to full term children as used in the original Canadian study[6] was also adopted for this study. The resulting sample comprised 407 girls and 388 boys (658 full term and 137 preterms), from provincial towns (five) and from the state capital and from different socioeconomic classes. Family income varied from R$ 200.00 to R$ 7,000.00 per month, with a mean of R$ 1,351.00 (standard deviation = R$ 1,255) and a median of R$ 700.00 (P25 = R$ 600.00; P75 = R$ 1,725.00). A statistical comparison of the IBGE census data[15] and the sample confirmed that the population of this study was adequately representative (Chi square = 0.50; p = 0.48). Outliers were identified using box-plots (with cutoff points at 10% from the maximum and minimum values) and 23 children were excluded on this basis. Table 1 lists the sample characteristics by months of age, in terms of sex, percentage prematurity, gestational age and socioeconomic status.

### *Instruments and procedures*

The Brazilian version of the AIMS was the subject of this study. Its validation is described in another paper.[14] The results of that validation demonstrated the following: 1) content validity for clarity ($\alpha$ = 66.7 to $\alpha$ = 92.8) and relevance (greater than 0.98); 2) reliable test/retest indices, with stability over time and robust reliability for total scores ($\alpha$ = 0.88) and for the four different positions ($\alpha_{prone}$ = 0.86; $\alpha_{supine}$ = 0.89; $\alpha_{sitting}$ = 0.80; and $\alpha_{standing}$ = 0.85); and discriminatory capacity (-4.842; p < 0.001).[14] The AIMS is made up of 58 motor criteria in four subscales, describing the development of spontaneous movements and motor abilities of children aged 0 to 18 months in the prone (21), supine (9), sitting (12) and standing (16) positions. The overall score is obtained by summing the scores for each of the subscales and is then converted into a percentile. Percentiles are grouped into motor development categories: when the percentile is below 5%, the child is judged to have abnormal motor performance; from 5% to 25%, motor performance is suspect; and above 25%, motor performance is considered normal.[6]

Tests lasted an average of 20 minutes, were conducted in a calm environment at the institutions from which children were recruited and were filmed for later analysis. During assessment of the films, three independent assessors examined the child's free movement, focusing on aspects such as the body surface that was bearing weight, posture and antigravity movements. The rate of agreement between examiners was high (intraclass correlation coefficients from $\alpha$ = 0.86 to $\alpha$ = 0.99). Friedman and Wilcoxon tests did not

**Table 1 -** Sample characteristics by age in months

| Age | Sex | | Family income | Gestational age (weeks) | | | |
|---|---|---|---|---|---|---|---|
| | | | | Preterms | | Full term | |
| Months (n) | M | F | Mean R$ (SD) | n (%) | Mean (SD) | n (%) | Mean (SD) |
| 0 (33) | 16 | 17 | 550.00 (240) | 5 (15.2) | 28.6 (7.2) | 28 (84.8) | 38.7 (1.03) |
| 1 (35) | 18 | 17 | 2,250.00 (354) | 6 (17.1) | 30.83 (3) | 29 (82.9) | 39.05 (1.02) |
| 2 (35) | 18 | 17 | 2,310.00 (1,741) | 11 (32.4) | 33.41 (1.8) | 23 (67.6) | 39 (1.36) |
| 3 (31) | 18 | 13 | 1,512.50 (985) | 12 (38.7) | 31.47 (3.8) | 19 (61.3) | 39 (1) |
| 4 (44) | 21 | 23 | 1,334.21 (684) | 23 (50) | 33.54 (3.1) | 23 (50) | 39 (1.27) |
| 5 (49) | 25 | 24 | 1,019.41 (514) | 18 (36.7) | 33.12 (3.7) | 31 (63.3) | 38.94 (1.2) |
| 6 (42) | 22 | 20 | 1,998.66 (1,646) | 18 (43.9) | 30.98 (3.4) | 23 (56.1) | 38.56 (1.3) |
| 7 (52) | 24 | 28 | 885.29 (876) | 18 (35.3) | 34.23 (1.7) | 33 (64.7) | 39.17 (1.7) |
| 8 (47) | 30 | 17 | 932.50 (505) | 12 (25) | 34.14 (2.3) | 36 (75) | 38.93 (1.1) |
| 9 (43) | 20 | 23 | 2,365.00 (1,641) | 4 (9.3) | 36.67 (0.6) | 39 (90.7) | 39.39 (1.7) |
| 10 (45) | 19 | 26 | 1,116.25 (1,063) | 1 (2.1) | 28 (0) | 46 (97.9) | 39.82 (1.2) |
| 11 (48) | 21 | 27 | 1,658.61 (1,868) | 4 (8) | 33 (3.2) | 46 (92) | 39.45 (2) |
| 12 (35) | 14 | 21 | 934.00 (688) | 3 (8.6) | 30.67 (3.0) | 32 (91.4) | 39.13 (1.3) |
| 13 (54) | 29 | 25 | 840.71 (460) | 0 | - | 52 (100) | 39 (1.2) |
| 14 (44) | 25 | 19 | 1,594.58 (1,877) | 2 (4.3) | 36 (0) | 44 (95.7) | 39 (1.5) |
| 15 (41) | 22 | 19 | 857.50 (556) | 0 | – | 40 (100) | 39.33 (1.4) |
| 16 (46) | 25 | 21 | 1,817.22 (2,066) | 0 | – | 46 (100) | 38.56 (3) |
| 17 (33) | 23 | 10 | 1,399.60 (957) | 0 | – | 33 (100) | 38.44 (1.1) |
| 18 (38) | 17 | 21 | 1,723.57 (1,848) | 0 | – | 38 (100) | 39.07 (1.1) |

M = male; F = female; n = number of children; SD = standard deviation.

detect significant differences between the three assessors' results ($p > 0.05$).

A questionnaire was given to each child's parents and/or legal guardians in order to provide a basis for characterization of the sample and for pairing groups. The questionnaire covered the following: date of birth, sex, type of delivery, gestational age at birth in weeks, 5 minute Apgar score, birth weight, length at birth, head circumference and monthly family income.

### *Data analysis*

Analyses were conducted using Excel XP and SPSS version 17.0. The raw AIMS scores were described as means, medians, standard deviations, minimum and maximum values and percentiles (5, 10, 25, 50, 75 and 90%) by sex and for each age in months from 0 to 18 months. Student's *t* test for independent samples was used to compare sex and one-sample *t* test was use to compare countries. The significance level was set at 5% ($p \leq 0.05$).

## Results

Table 2 shows the means for the Brazilian children's raw scores and the reference values from the Canadian population. Motor behaviors were similar for newborn children and for 7, 8, 14, 16 and 17 months of age. At all other ages significant differences were detected. The Brazilian children's motor acquisition scores were lower that the Canadian norm at all ages except 18 months.

When percentiles and raw scores were broken down by sex, no significant differences ($p > 0.05$) between boys and girls were detected, with the exception of 14 months, where the girls had better performance in terms of total score ($p = 0.015$) and percentile ($p = 0.021$).

Table 3 lists the new AIMS references values for use with Brazilian children. The new norms are based on the development path of Brazilian children and provide cutoff points (P5, P10, P25, P50, P75 and P90) and means and standard deviations for raw scores by age and sex. The mean and median (P50) were similar at all ages. It was also

**Table 2 -** Mean motor performance (raw scores) and comparisons for a Brazilian and a Canadian population, by age in months

| Age (months) | Brazil M score ± SD | Canada M score ± SD | Independent *t* test | p |
|---|---|---|---|---|
| 0 | 4.33±1.34 | 4.55±1.35 | -0.93 | 0.36 |
| 1 | 6.20±1.30 | 7.3±1.95 | -5.0 | < 0.0001* |
| 2 | 8.43±1.91 | 9.8±2.45 | -4.23 | < 0.0001* |
| 3 | 11.2±2.93 | 12.6±3.3 | -2.67 | 0.012* |
| 4 | 14.9±3.50 | 17.85±4.14 | -5.57 | < 0.0001* |
| 5 | 18.0±5.75 | 23.2±4.75 | -6.35 | < 0.0001* |
| 6 | 22.6±6.38 | 28.3±5.55 | -5.75 | < 0.0001* |
| 7 | 30.7±5.54 | 32.25±6.85 | -2.08 | 0.43 |
| 8 | 36.8±7.66 | 39.75±8.7 | -2.614 | 0.12 |
| 9 | 40.8±8.66 | 45.45±7.45 | -3.49 | 0.001* |
| 10 | 43.4±8.15 | 49.3±5.9 | -4.85 | < 0.0001* |
| 11 | 49.3±4.84 | 51.25±7.1 | -2.77 | 0.008* |
| 12 | 53.4±3.39 | 55.55±4.5 | -3.81 | 0.01* |
| 13 | 54.0±3.92 | 55.6±5.05 | -2.93 | 0.005* |
| 14 | 56.3±2.92 | 56.85±1.95 | -1.36 | 0.18 |
| 15 | 56.9±2.00 | 57.8±0.4 | -2.79 | 0.008* |
| 16 | 57.8±0.58 | 57.8±0.5 | 0.051 | 0.96 |
| 17 | 57.8±0.88 | 57.85±0.35 | -0.21 | 0.84 |
| 18 | 57.9±0.48 | 57.7±0.65 | 2.187 | 0.035* |

M = mean; SD = standard deviation.
* Statistical significance.
Student's *t* test for one-sample.

observed that there is little behavioral differentiation from 15 months of age onwards and little variation in acquisition at the extremes of the age range. Standard deviations were low for the first 2 months of life and from 15 months onwards, indicating a low capacity for differentiating between typical, suspect and atypical behaviors. Also of note is the fact that many of the cutoff points were the same at these ages, which is not the case for 3 to 13 months of age. The results for males and females were similar, since there was homogeneity in different age groups and minimal differentiation between children's motor acquisitions from 14/15 months of age onwards. Furthermore, the 17-month-old children all had similar behavior and no differences in motor acquisitions were detected in this age group. Analysis of percentiles by age (P5, P10, P25, P50, P75, P90) detected little difference between children with high and low performance scores for the first months and from 14 and 15 months onwards among the girls and boys respectively.

Figure 1 illustrates the sample's performance in the form of percentile curves. With reference to some of the cutoff points (P5, P10 and P25), it will be observed that motor acquisition was nonlinear. After approximately 15 months of age, plateaus appear in curves for both sexes. Once more, the low degree of variability at the age extremes is notable, particularly from 15 months of age onwards and up to the second month of life. For both sexes, greater variability occurred from 3 to 13 months of age.

## Discussion

This is the first study designed to produce standardized AIMS scores for the Brazilian infant population. Previous studies[7,14] have not established reference norms based on the developmental path of Brazilian children. It should be pointed out that the validation process, which has been completed for Brazil,[14] and the establishment of norms are distinct objectives. When an instrument possesses validity for a specific population, new norms should be established that best represent that population,[5,6,9,17,18] and that was the objective of this study.

There have been no Brazilian studies that have standardized AIMS using full term and preterm children aged 0 to 18 months and, internationally, there have been just two studies, one in Holland and the other in Greece.[5,17] Fleuren et al.,[5] assessed 100 children and concluded that new percentiles should be defined for Holland because the motor performance scores they observed were below the Canadian standard. In contrast, Syrengelas et al.[17] conducted a study with 424 full term Greek babies and found that their development path was similar to that of the Canadian children, demonstrating that the AIMS reference values could be used without loss of important clinical information. In Brazil, Formiga et al.[18] described development curves for preterm babies (n = 308) and highlighted the need

**Table 3 -** AIMS reference values for motor performance of Brazilian children (raw scores and percentiles), by age and by sex

| | | Motor performance | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Age (months)** | **Sex** | **Mean ± SD** | **Min. – Max.** | **P5** | **P10** | **P25** | **P50** | **P75** | **P90** |
| 0 | M | 4.75±1.39 | 3 – 8 | 3 | 3 | 3 | 5 | 6 | 7 |
| | F | 3.94±1.20 | 3 – 6 | 3 | 3 | 3 | 3 | 5 | 6 |
| 1 | M | 6.22±1.17 | 5 – 9 | 5 | 5 | 5 | 6 | 7 | 8 |
| | F | 6.18±1.47 | 4 – 9 | 4 | 4 | 5 | 6 | 8 | 8 |
| 2 | M | 8.83±2.07 | 6 – 13 | 6 | 6 | 8 | 9 | 10 | 11 |
| | F | 8.00±1.70 | 6 – 11 | 6 | 6 | 7 | 8 | 10 | 10 |
| 3 | M | 11.2±3.10 | 6 – 16 | 6 | 7 | 9 | 11 | 14 | 15 |
| | F | 11.2±2.79 | 7 – 15 | 7 | 7 | 9 | 12 | 14 | 15 |
| 4 | M | 15.8±4.31 | 8 – 23 | 8 | 10 | 13 | 15 | 19 | 22 |
| | F | 14.1±2.37 | 10 – 19 | 10 | 11 | 13 | 14 | 16 | 18 |
| 5 | M | 17.2±6.18 | 7 – 29 | 8 | 9 | 12 | 18 | 23 | 26 |
| | F | 18.8±5.29 | 10 – 29 | 11 | 12 | 15 | 18 | 23 | 27 |
| 6 | M | 22.2±6.44 | 11 – 35 | 11 | 13 | 16 | 23 | 27 | 31 |
| | F | 23.2±6.44 | 10 – 35 | 10 | 12 | 19 | 23 | 27 | 34 |
| 7 | M | 31.2±4.11 | 23 – 41 | 24 | 26 | 29 | 32 | 34 | 37 |
| | F | 30.2±6.57 | 18 – 42 | 19 | 21 | 24 | 32 | 35 | 40 |
| 8 | M | 37.9±8.59 | 21 – 52 | 23 | 26 | 31 | 37 | 45 | 50 |
| | F | 34.9±5.36 | 25 – 43 | 25 | 25 | 31 | 35 | 38 | 43 |
| 9 | M | 38.6±10.1 | 21 – 52 | 21 | 22 | 30 | 40 | 49 | 50 |
| | F | 42.8±6.88 | 28 – 51 | 29 | 32 | 37 | 43 | 49 | 51 |
| 10 | M | 43.6±8.80 | 29 – 53 | 29 | 30 | 33 | 49 | 51 | 52 |
| | F | 43.3±7.82 | 28 – 53 | 29 | 32 | 37 | 45 | 50 | 53 |
| 11 | M | 49.6±3.56 | 43 – 57 | 43 | 45 | 47 | 50 | 52 | 53 |
| | F | 49.1±5.70 | 35 – 58 | 35 | 40 | 45 | 50 | 53 | 55 |
| 12 | M | 52.7±3.95 | 47 – 58 | 47 | 48 | 50 | 53 | 58 | 58 |
| | F | 53.8±2.98 | 48 – 58 | 48 | 50 | 52 | 54 | 57 | 58 |
| 13 | M | 53.7±4.24 | 44 – 58 | 45 | 48 | 51 | 54 | 58 | 58 |
| | F | 54.4±3.56 | 46 – 58 | 47 | 50 | 52 | 54 | 58 | 58 |
| 14 | M | 55.4±3.42 | 46 – 58 | 47 | 51 | 53 | 57 | 58 | 58 |
| | F | 57.3±1.61 | 53 – 58 | 53 | 53 | 58 | 58 | 58 | 58 |
| 15 | M | 57.3±1.45 | 52 – 58 | 52 | 55 | 57 | 58 | 58 | 58 |
| | F | 56.5±2.48 | 51 – 58 | 51 | 52 | 54 | 58 | 58 | 58 |
| 16 | M | 57.8±0.47 | 56 – 58 | 56 | 57 | 58 | 58 | 58 | 58 |
| | F | 57.8±0.70 | 55 – 58 | 5 | 57 | 58 | 58 | 58 | 58 |
| 17 | M | 57.7±1.05 | 53 – 58 | 54 | 57 | 58 | 58 | 58 | 58 |
| | F | 58.0±0.00 | 58 – 58 | 58 | 58 | 58 | 58 | 58 | 58 |
| 18 | M | 57.8±0.53 | 56 – 58 | 56 | 57 | 58 | 58 | 58 | 58 |
| | F | 57.9±0.44 | 56 – 58 | 56 | 58 | 58 | 58 | 58 | 58 |

AIMS = Alberta Infant Motor Scale; SD = standard deviation; M = males; F = females.
Descriptive analysis: mean, standard deviation, minimum, maximum and percentiles (5, 10, 25, 50, 75 and 90%).

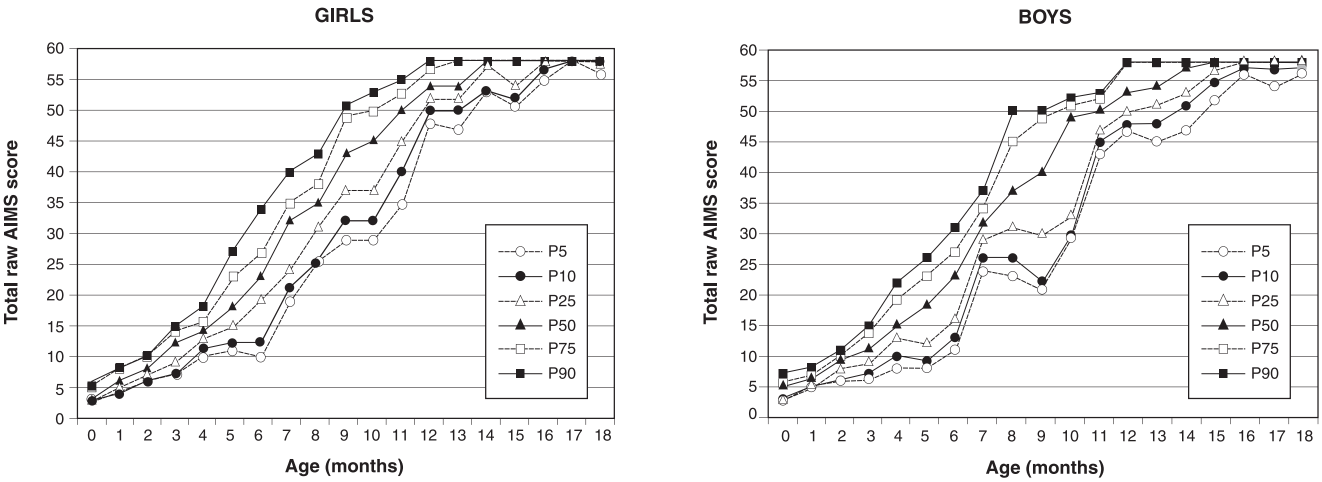


**Figure 1 -** Illustration of the reference curves constructed by plotting the 5th, 10th, 25th, 50th, 75th and 90th perecntiles for the test sample

for national parameters to be created and adopted after observing that the motor performance of preterm Brazilian children was inferior to the Canadian norm.[18] This is in contrast to another Brazilian study that identified similarities in the behavior of Brazilian and Canadian babies.[19]

This study was designed to analyze a sample that adequately represents the population, including equivalent numbers of male and female children and a similar distribution of subjects from the provinces and the city, as is the case in the IBGE data,[15] use of similar parameters as the Canadian norm in terms of the participation of preterm and full term children and use of corrected age.[6] All age groups were covered adequately, avoiding any possibility of sample size bias. Since the results demonstrated that the Brazilian children's scores were lower (both raw and percentiles) than the Canadian norm, which indicates different development paths, new norms were established with an adequate and reliable categorization of the motor performance of the Brazilian infant population.

It should be pointed out that the properties of any assessment instrument will suffer interference from adaptation to a different scenario and from different socioeconomic, ethnic and cultural factors.[5,9] Prior research has already demonstrated that the motor performance of Brazilian children in this age group is inferior to results that have been observed in other countries[7,18,20] and is probably determined by multiple factors that involve increased daily exposure to biological and contextual risk factors.[21,22]

Biological risks (low birth weight, prematurity and malnutrition, for example)[21-23] and social, economic and cultural risks such as: 1) parents with little formal education[22]; 2) low spending power[21,22]; 3) maternal habits of carrying children and putting them in cots or pushchairs[24-26]; 4) a limited variety of stimulation at home, including toys that are appropriate for development[24,27,28]; and 5) a large number of children cared for by a single adult,[22] all affect the acquisition of motor abilities and potentiate motor development delays.

More specifically, several researchers have pointed out that the when the supine position predominates when awake and when playing[24,29] and also when asleep[25,26] this tends to decelerate acquisition of straightening reactions and postural adjustments.[24,29] Publicity campaigns[30] have encouraged mothers to adopt the supine position for their children, which may result in restrictions to postural development. In Holland, similar government campaigns have been considered important mediators of poor motor performance among children assessed using AIMS.[5] Future research that investigates maternal practices could contribute to an understanding of the different infant motor development paths in different cultures.

With regard to sex, it was observed that Brazilian girls and boys have a similar motor acquisition pattern up to 13 months. The significantly superior motor performance at 14 months of age of the girls, when compared with the boys, contrasts with previous studies.[6,7,31] This result is intriguing since previous Brazilian studies with similar age groups, one with a population from Rio Grande do Sul state[7] and another from the Northeast of Brazil,[31] did not observe differences between the sexes. Differences between sexes could be the result of expectations in terms of what is considered most appropriate for each sex.[32] As age increases, disparities in motor abilities accentuate[32] and from two years of age onwards different social and motor behaviors can be observed.[33] The results of this study suggest that these differences may occur even earlier.

The results of this study underscore the adequacy of AIMS for assessing the motor performance of babies aged 3 to 14 months. However, it was observed that the instrument has limited capacity for differentiating motor behaviors at the extremes of the age range, up to 2 months of age and after 15 months, since the percentiles at several cutoff points varied little or even remained equal. This reduced differentiation can also be seen in the Canadian reference values,[6] since plateaus have been reported in the development curves after 15 months of age and few motor acquisitions are seen during the first 2 months,[6] which is similar to the results reported here.

The motor performance of this sample followed a nonlinear pattern of motor acquisition, which has been reported in previous studies[18,20]; but these differences do not necessarily indicate motor delay, since the scale's degree of difficulty appears to change at different ages. These results lead us to question the low number of items included and also which of these items are actually capable of determining and differentiating motor performance in children over 15 months, since a large proportion of the sample easily performed all of the items at this age. Previous studies have also pointed to the limited sensitivity of AIMS and questioned its applicability at the extremes of the age range.[8,9] For example, Liao et al.[8] pointed out how few of the items were capable of differentiating infants with advanced development and the discontinuity in intensity of the levels of difficulty at different ages. It is suggested that the scale be treated with caution for infants over 15 months old and younger than two months and that supplementary instruments also be used, in order to provide a clear picture of children's motor development categories.

The scientific and clinical relevance of this study increases in line with the use of AIMS in Brazil and is based on the clear necessity for using national references to describe children's motor acquisitions and disorders. Using norms that are not Brazilian and have not been validated for our population restricts health professionals' activities. Although this sample was an adequate representation of the infant population of Rio Grande do Sul, there are limitations to the extent to which it can be generalized for the entire Brazilian infant population.

In order to achieve a wide-ranging characterization of Brazilian motor development, future studies must be conducted that include all regions, with a stratified sample of the whole country, which may reveal intercultural variations. It is recommended that the parameters developed in this study only be used with populations with similar socioeconomic characteristics. It is worth reiterating the importance of research designed to standardize AIMS scores, particularly in South America, where sociocultural characteristics are different from those in North America.

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