



New Brazilian developmental curves and reference values for the Alberta infant motor scale



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ABSTRACT

Introduction: The lack of Brazilian norms restrains the use of the Alberta Infant Motor Scale (AIMS) to precisely categorize infant motor development and discriminate infants with motor difficulties from typically developing infants.

Objective: This study investigated reference values for the AIMS for Brazilian infants.

Methods: Descriptive, cross-sectional study of infants from birth-to-18 months old. Trained professionals assessed infants in daycares, homes, and governmental health centers.

Results: Results showed increases in raw scores across age groups from 0- to 15-months of age. The stability of raw scores was observed after 16 months of age. Brazilian infants demonstrated lower scores in specific ages compared to the Canadian sample.

Conclusions: Canadian and Brazilian children showed differences in motor performance scores across age and norms were established for Brazilian infants. This study highlights the importance to establish reference values for AIMS of infants across cultures.

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1. Introduction

Different trajectories of motor development are observed across childhood as a result of biological (Van Haastert, de Vries, Helders, & Jongmans, 2006; Walker et al., 2007) and environmental risk factors such as low birth weight (Van Haastert et al., 2006; Walker et al., 2007), family low income, parents' lack of formal education (Walker et al., 2007) and unsuitable maternal practices (Bartlett & Kneale-Fanning, 2003; Clark & Metcalfe, 2002; Hamadani et al., 2010). Appropriate assessments are necessary in order to identify motor delays in children (American Academy of Pediatrics, 2001; Blackman, 2002). Across different cultures, researchers and health professionals need validated motor assessments within established norms to assess infants, to trust the outcomes, and to provide appropriate services for infants in need of intervention (Formiga & Linhares, 2011; Syrengelas et al., 2010; Sacconi & Valentini, 2012; Spittle, Doyle, & Boyd, 2008).

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The Alberta Infant Motor Scale (AIMS) is an observational assessment for gross motor skills of infants from birth to 18 months. The AIMS was developed and validated in Canada and norms were established in a Canadian sample of infants. The AIMS has been employed in research and clinical practice (Piper, Pinnell, Darrah, Maguire, & Byrne, 1992; Pin, Valle, Eldridge, & Galea, 2010; Pin, Eldridge, & Galea, 2010; Prins, Von Lindern, Van Dijk, & Versteegh, 2010; Spittle et al., 2009) in several countries, with adaptations in regard to the cultural, ethnical and socioeconomic diversity (Formiga & Linhares, 2011; Syrengelas et al., 2010; Saccani & Valentini, 2012; Spittle et al., 2008; Fleuren, Smit, Stijnen, & Hartman, 2007; Jeng, Yau, Chen, & Hsiao, 2000; Uesugui, Tokuhisa, & Shimada, 2008; Valentini & Saccani, 2012). Although the AIMS have been tested for validity in Brazil (Valentini & Saccani, 2012), Japan (Uesugui et al., 2008), and China (Jeng et al., 2000), and preliminary results are also provided in the Netherlands (Fleuren et al., 2007), norms are not yet established outside Canada. To date, the norms used around the world are still the ones established in Canada more than twenty years ago (Piper & Darrah, 1994).

Considering that sociocultural differences impact infant development, the utilization of Canadian norms to other populations convey potential bias; leading to ambiguous categorization of infant performance (Netelenbos, 2005; Yun & Ulrich, 2002). Categorization of individuals' behavior must be grounded in the developmental curves of a representative population (Pasquali, 2001). It is also important to notice that norms should be reviewed over time (Pasquali, 2001), since in two decades several changes that affect infants' development have occurred (e.g. families' socioeconomic status, parental roles, maternal practices, access to childcare). Furthermore, the AIMS seem to present limitations in detecting delays for American (Liao & Campbell, 2004) and Brazilian (Saccani & Valentini, 2010) infants; stressing the need to address the scales' lack of discrimination in specific age-groups and the need to establish reference values in other cultures (Fleuren et al., 2007; Formiga & Linhares, 2011; Jeng et al., 2000; Syrengelas et al., 2010; Valentini & Saccani, 2012). The lack of Brazilian norms constrain the use of the AIMS to precisely categorize and discriminate infants' typical and atypical (Liao & Campbell, 2004; Saccani & Valentini, 2012).

Specifically, a previous study in Brazil has provided preliminary comparisons between Canadian and Brazilian samples (Saccani & Valentini, 2012). However, limitations were observed concerning the representativeness (South of Brazil) of the sample; different curves for boys and girls although similarities in performance were observed; and, the lack of reference of extreme values. In the present study, concerning the cultural diversity of a continental country, such as Brazil, we expanded the current knowledge by assessing infants within the five main geographic regions of Brazil. Therefore, our first and second objectives were to assess the motor development of Brazilian infants with a representative sample and compare the Brazilian scores with the Canadian norms to provide Brazilian norms. In addition, since a previous study (Saccani & Valentini, 2012) showed similarities between boys' and girls' scores and the lack of reference for extreme values, we also aimed to establish a unified motor development curve from birth to independent walking with percentiles for categorization of motor performances ranging from 1 to 99.

2. Methods

2.1. Participants

The original Canadian AIMS study (Piper & Darrah, 1994) and information concerning the Brazilian infant population (gestational age, sex, family socioeconomic status and geographic location of the infants' homes – urban and rural regions) provided by the Brazilian Institute of Geography and Statistics (IBGE) (IBGE, 2014) were used as a reference to the selection of the study sample. In addition, the PEPI program (Programs for Epidemiologists) version 4.0 was used for sample size estimation. Approximately 1160 children were estimated as necessary to compose a representative sample to determine new norms for AIMS in Brazil within a confidence interval of 95% and 4% of margin of error. In order to anticipate for missing data, approximately 35 extra children in each age group were included.

Consequently, our study was conducted with 1455 infants from birth to 18 months (728 girls and 727 boys) representative of the five main geographic regions in Brazil (North, Northeast, Central-West, South-East, and South) (IBGE, 2014); 21 states and 29 cities. Assessments of infants were conducted during three years. The Brazilian Government partially funded this study. Families and infants were recruited through newspaper and Internet advertisements. The researchers also directly contacted the board of educations and health center administrators at the state and city levels. The researchers followed-up with administrators that accepted to participate in the present study; further, approval was obtained from administrators of day cares and health units. The infants were assessed individually at families' homes, day care centers, and government health centers. Infants with a history of osteomioarticular affections (bone, muscle and joints alterations, fractures, peripheral nerve injury, infections) or any other severe neuropathology were excluded from the study. Infants' families lived in large cities and/or metropolitan areas (67.7%) and medium and/or small provincial towns (32.3%). Families' socioeconomic status was representative of the income distribution within Brazil (IBGE, 2014); infants came from families from upper and upper middle classes (11.4%); middle class (22.78%); working class (37.30%); lower economic class (28.52%). From the total sample, 1231 were full-term infants and 224 premature infants (<37 gestational weeks). Age correction was adopted for the premature infants. Written informed consent was obtained from the custodial caregiver(s) of each infant. The University Institutional Research Review Board approved the research. Table 1 provides sample size distribution for Brazilian and Canadian infants by age groups and sex.

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