

# Infants motor development in parental intervention during childcare: case series

*Desenvolvimento motor de bebês em intervenção parental durante a puericultura: série de casos*

*Desarrollo motor de bebés en intervención parental durante la puericultura: serie de casos*

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**ABSTRACT** | Child development should be promoted by the family with formal support from childcare services. This study aims to analyze the motor performance of infants submitted to parental intervention in childcare. This is an observational, longitudinal and descriptive case series study with 215 infants aged 0-18 months, who were cared for at a Primary Health Care Unit in a Brazilian Northeastern capital. The infants' motor performance was assessed by the Alberta infant motor scale and instructions were transmitted to parents according to the observed motor delay. We observed that 77.7% of the infants had their first appointment in their first semester of life, 57.6% had low risk and 76.7% had normal motor performance. Significant relationships between risk stratification and gestational age and between risk stratification and motor performance were found. The intervals between evaluations ranged from 7-252 days. A higher percentage of infants with motor delays was found in those who were taken to childcare after the third trimester of life. All infants who attended childcare and were identified with suspected delay or atypical development improved motor performance by the third evaluation. Infants who are taken to childcare early, for guidance on parental intervention, recover from motor development delay, but most families either do not attend childcare follow-up, or are long overdue for their appointment.

**Keywords** | Motor Activity; Postural Balance; Parental Intervention; Case Reports.

**RESUMO** | O desenvolvimento infantil deve ser promovido pela família com apoio formal na puericultura. O presente estudo analisou o desempenho motor de bebês submetidos à intervenção parental na puericultura. Foi realizado um estudo de série de casos, observacional, longitudinal e descritivo, com 215 bebês de 0-18 meses atendidos em uma Unidade de Atenção Primária em Saúde de uma capital do Nordeste brasileiro. O desempenho motor dos bebês foi avaliado pela *Alberta infant motor scale* e orientações foram transmitidas aos pais a depender do atraso motor observado. Observou-se que 77,7% dos bebês tiveram seu primeiro atendimento no primeiro semestre de vida, 57,6% apresentaram baixo risco e 76,7% desempenho motor normal. Houve relação significativa entre a estratificação de risco e a idade gestacional e entre a estratificação de risco e o desempenho motor. Os intervalos entre as avaliações variaram de 7-252 dias. A porcentagem de bebês com atrasos motores é maior para os que chegam à puericultura após o terceiro trimestre de vida. Todos os bebês identificados com suspeita de atraso ou como atípicos, que frequentaram a puericultura, melhoraram o desempenho motor até a terceira avaliação. Bebês que são levados precocemente à puericultura, para orientações sobre intervenção parental, recuperam o atraso do desenvolvimento motor, porém muitas famílias não comparecem ao seguimento da puericultura ou chegam tardiamente para atendimento.

**Descritores** | Atividade Motora; Desenvolvimento Infantil; Intervenção Parental; Relatos de Casos.

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**RESUMEN** | El desarrollo infantil debe ser promovido por la familia con apoyo formal en la puericultura. Este estudio analizó el desempeño motor de bebés sometidos a intervención parental en la puericultura. Se realizó un estudio de serie de casos, observacional, longitudinal y descriptivo, con 215 bebés de 0-18 meses de edad que recibían atención en una Unidad de Atención Primaria de Salud de una capital del Nordeste de Brasil. El desempeño motor de los bebés se evaluó mediante la escala motora infantil de Alberta y se suministró información a los padres cuando se observó retraso motor en los bebés. El 77,7% de los bebés recibieron su primer cuidado en el primer semestre de vida, el 57,6% tuvieron bajo riesgo, y el 76,7% presentaron un desempeño motor normal. Hubo una relación significativa entre la estratificación del riesgo y la

edad gestacional, así como entre la estratificación del riesgo y el desempeño motor. Los intervalos entre evaluaciones oscilaron de 7 a 252 días. El porcentaje de bebés con retrasos motores es mayor para los que llegan a la puericultura después del tercer trimestre de vida. Todos los bebés identificados con sospecha de retraso o como atípicos, que asistieron a la puericultura, tuvieron una mejora de su desempeño motor hasta la tercera evaluación. Los bebés que se llevan precozmente a la puericultura para orientación sobre la intervención parental recuperan el retraso en el desarrollo motor, pero muchas familias no asisten al seguimiento de la puericultura o llegan tardíamente en esta atención.

**Palabras clave** | Actividad Motora; Desarrollo Infantil; Intervención Parental; Informes de Casos.

## INTRODUCTION

Child development can be defined as a multidimensional and integral process that encompasses physical, motor, cognitive, and psychosocial development in the first years of life<sup>1</sup>. When the child is exposed to biological and/or environmental risk factors, they may experience developmental delays<sup>2</sup>.

Studies estimate that, in low- and middle-income countries, about 43% of children up to 5 years of age do not reach their development potential due to exposure to biological, psychosocial and environmental risks<sup>2,3</sup>. Some deficits installed in childhood can become complex problems over the years, culminating in a lack of personal, economic and social resources for their resolution, pointing to the need for early interventions<sup>4</sup>.

Monitoring child development in the first years of life is crucial for the promotion of health, prevention of diseases, and identification of neuropsychomotor delay<sup>5</sup>. Parental intervention (PI) is one of the practices used to improve a child's neurodevelopment, focusing on the child's nurturing and socialization processes, being provided by parents and caregivers<sup>6</sup> and based on the bioecological theory<sup>7</sup> that a child's development is influenced by their closest environment—their family.

In PI, parents are educated to promote an environment richer in stimuli for their children<sup>8</sup>, encouraging, for example, them to put infants on the ground for longer periods and stimulate the crawling position<sup>9</sup>; preliminary training and informational support to parents<sup>10</sup> resulted in positive outcomes for infants' motor development.

Recently, a study estimated that about 10% of children under the age of 6, in the state of Ceará, Brazil, presented delays in at least one domain of child development<sup>11</sup>. The authors suggest that integrated interventions that consider risk factors and poverty-related inequality can reduce the prevalence of children with developmental delays. It remains to be seen if practices aimed at the empowerment of the family can promote adequate motor development in children over time. This study aims to analyze the motor performance of infants submitted to PI in childcare.

## METHODOLOGY

This is an observational, longitudinal and descriptive case series study. The subjects were 215 infants, aged 0-18 months (109 girls), treated in the childcare division of a Primary Health Care Unit (UAPS) in Fortaleza, capital of the state of Ceará. The UAPS is located in the capital's Third Regional Executive Secretariat, comprising 17 neighborhoods characterized as economically underdeveloped when compared to the neighborhoods of other regional secretariats (0.38 HDI)<sup>12</sup>. Most of the infants had health risk stratification assessed by the physician or nurse of the Family Health Strategy, according to the city's clinical guidelines for childcare<sup>13</sup>. The stratification criteria were the following:

Low risk includes potentially risk-free children without prenatal complications; exclusive breastfeeding for up to 6 months of age; birth weight  $\geq 2.5$  kg; APGAR $\geq 8$  in the 5<sup>th</sup> minute; no specific known

pathologies, good family support; mother with more than 8 years of schooling, vaccination on time; newborn with neonatal screening performed.

Medium risk are children who present vulnerability determined by the presence of several negative factors, such as: Borderline preterm (37 weeks); mother positive with HIV, toxoplasmosis, syphilis, or hepatitis B, with child negative for these pathologies; child of mentally handicapped mother, or with mental illness or mild psychiatric disorders; maternal death; child of a mother under 20 years and more than three deliveries; history of deaths of children under five years of age in the child's direct family; manifestly unwanted child; child under 6 months of age who has not been exclusively breastfed; child of a mother with 3 to 7 years and 11 months of schooling; child of a mother under the age of 15 or over the age of 40, and/or single; child of a mother without family support; children living in a situation of risk and vulnerability; head of household without source of income; child of an indigenous mother; delayed vaccination; newborn without neonatal screening.

At high risk are children who are subject to health risk factors more intense and severe than those in the previous group.

The infants were included in the study consecutively and randomly, following the inclusion criteria of: authorization of parents via signing the informed consent form and existence of medical records at the UAPS; and the exclusion criteria of: presenting osteomyoarticular disorders or infections with fever, and participating in intervention programs.

The Alberta infant motor scale (AIMS) was used to evaluate the infants' motor performance<sup>14,15</sup>. AIMS is composed of 58 motor items organized in four subscales: prone(21), supine(9), sitting(12) and standing(16). The total is obtained by the sum of the subscales scores, ranging from 0-58. Tatami mats and toys were used during this evaluation. The evaluator was a physical therapist with specific training and 2 years of experience with AIMS. During the assessment, the examiner observed the child's movements in each of the positions, considering aspects such as the surface of the body used to sustain the weight, posture and antigravitational movements for 20-30 minutes.

At the end of the evaluation, the score was converted into percentiles of the child's motor performance, ranging from <5° to 90°. The infants' motor performance was classified as atypical when <5%; suspected delay, 10-25%;

or normal, 50-90%<sup>14</sup>. The studied population were children undergoing childcare and subject to psychosocial risks, therefore, we opted for the classification presented by Piper et al. (1992) for the Canadian population. Thus, atypical children could be transferred to the referral service and those with suspected delay followed up in childcare with parental intervention, aiming to minimize inadequate maternal practices that may contribute to developmental delay.

According to the motor evaluation results, the physical therapist performed interventions with the parents by guiding and demonstrating positions and games, thus establishing PI strategies to be performed at home. The suggested stimuli were: expand the experiences on the floor; provide stimuli with colored objects; ask the child to pick up an object while in crawling position; have the child walk laterally with support; provide stimuli from supine position to prone, from prone to sitting, from sitting to standing, from standing to lateral gait; and provide proprioceptive stimuli with objects of different textures and shapes, and different environments (sand, mattress, soil). The parents were instructed to return monthly to the UAPS for the evaluation and monitoring the infants' motor development.

Descriptive analysis of the data was performed with absolute and relative frequency of infants evaluated, age at the first evaluation, gestational age, risk stratification, motor performance and number of evaluations per infant. Mean and standard deviation of the score achieved by the infants in the AIMS and the interval between evaluations performed by the infants were described.

Pearson's chi-square ( $X^2$ ) test was used to relate the nominal and dichotomous variables: gestational age, risk stratification, and motor performance. Student's one-sample T-test was used to compare the mean motor performance in AIMS with the expected performance for the Brazilian population<sup>15</sup>. The significance level adopted was  $p < 0.05$ .

## RESULTS

Of the case series, 77.7% (n=167) of the infants had their first appointment in childcare between 0-179 days of life, 16.3%(n=35) between 180-359 days of life, and 6% (n=13) with more than 360 days of life. In this series of cases, 20.4% (n=44) did not present risk stratification

in their medical records, 57.6% (n=124) presented low risk, 2.7%(n=16) medium, and 19.0% (n=41) high.

Regarding gestational age, 13% (n=28) of the infants were classified as preterm (<37 weeks). There was a significant relationship between risk stratification and gestational age ( $X^2= 32.32$ ;  $p<0.001$ ); 53.5% (n=15) of preterm infants presented high risk, 7.1% (n=2) medium, 17.8% (n=5) low, and in 21.4% (n=6) risk stratification was not recorded. Additionally, 75% (n=21) of preterm infants presented normal motor performance, 14.3%(n=4) suspected delay and 10.7%(n=3) atypical development.

In the first evaluation, 76.7% (n=165) of the infants presented normal motor performance, 19.5% (n=42) suspected delay, and 3.7%(n=8) atypical (Figure1). There was a significant relationship between risk stratification and motor performance ( $X^2=17.62$ ;  $p=0.001$ ); 4.7% (n=2) of infants with suspected delay presented high risk, 9.5% (n=4) medium, 59.5% (n=25) low, and in the remaining infants, risk stratification was not recorded. On the other hand, among the infants with atypical motor performance: 37.5% (n=3) presented high risk, 25% (n=2) low risk, and in the remaining, risk stratification was not recorded.

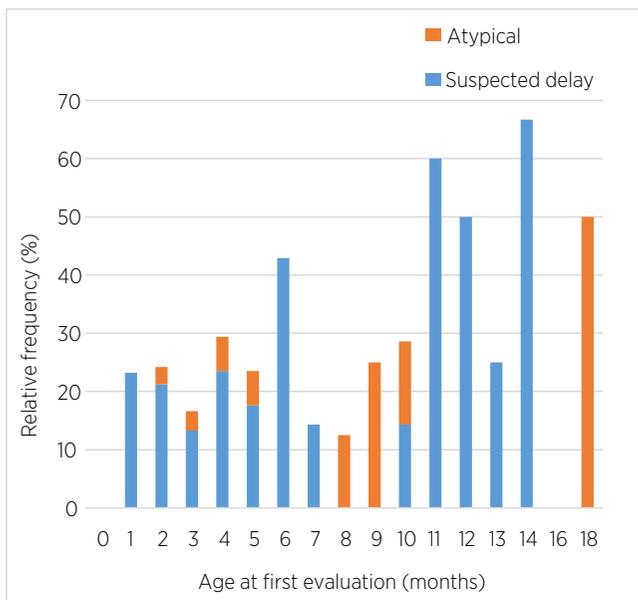


Figure 1. Percentage of infants with motor performance with suspected delay and atypical in the first evaluation

In total, 49.3% (n=106) of infants were evaluated only once, 22.3% (n=48) twice, 13.9% (n=30) three times, 6.5%(n=14) four times, and 7.9% (n=17) five times. The mean interval between the first and second evaluations was

64.7±36.5 (minimum 7 and maximum 277) days, between the second and third was 70.6±44.9 (minimum 15 and maximum 252) days, between the third and fourth was 64.1±33.7 (minimum 16 and maximum 187) days, and between the fourth and fifth was 56.0±31.5 (minimum 23 and maximum 191) days. Among the infants evaluated only once: 21.7% (n=23) presented motor performance with suspected delay and 2.8% (n=3) atypical. Figure 2 shows the number of infants subject to two or more AIMS evaluations in childcare and the classification of motor performance.

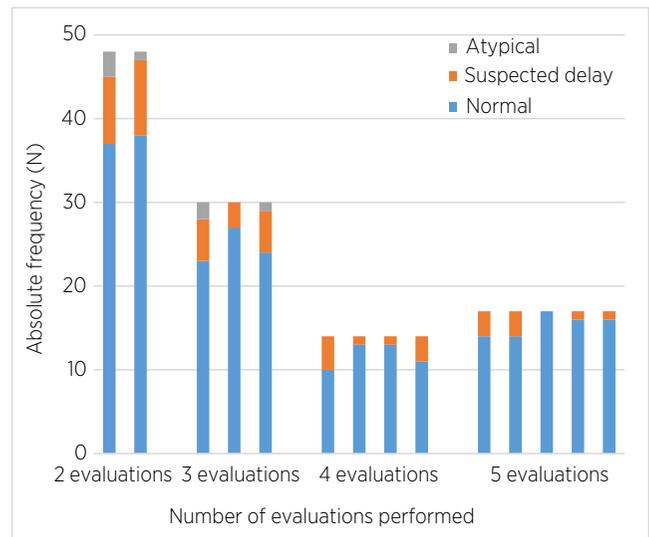


Figure 2. Number of infants with normal, suspected delay, and atypical motor performance, according to the amount of assessments in childcare

Among the infants identified with suspected delay or atypical motor performance in the first evaluation, 48% (n=24) returned to the UAPS, of which, 62.5%(n=15) improved motor performance in this second evaluation. Of the infants who still maintained motor performance with suspected delay or atypical development, in the second evaluation (n=9), only 44.4% (n=4) returned to treatment in the UAPS for the third evaluation, and all improved motor performance by this time.

When comparing the evaluated infants' AIMS scores from their first evaluation to the scores expected for the Brazilian population, we found that infants aged 1, 3, 5 and 7 months, treated in childcare, presented motor performance higher than expected for the Brazilian population. Infants aged 6, 9, 11, 12, 14 and 18 months presented lower values than those expected for the Brazilian population, but these differences were not significant (Table 1).

Table 1. Motor performance in AIMS of infants treated in childcare compared to the expected motor performance for the Brazilian population<sup>15</sup>

Age (months)	M±SD	Brazilian M±SD (difference)	T-test (p)
0-<1	4.9±1.0	4.3±1.2(0.5)	0.15
1-<2	6.9±1.4	5.7±1.3(1.2)	0.00
2-<3	9.4±2.3	8.8±2.4(0.6)	0.15
3-<4	13.2±2.7	11.5±3.4(1.6)	0.02
4-<5	16.8±3.8	15.0±3.9(1.7)	0.13
5-<6	25.2±5.9	19.4±5.5(5.7)	0.02
6-<7	21.7±3.3	23.9±7.6(1.4)	0.46
7-<8	38.7±5.6	30.4±6.5(8.2)	0.03
8-<9	39.3±7.2	35.7±8.9(3.5)	0.39
9-<10	34.3±8.8	39.6±8.6(5.3)	0.39
10-<11	48.1±5.9	44.1±8.1(3.9)	0.20
11-<12	47.2±5.0	48.9±5.4(1.7)	0.54
12-<13	48.3±4.4	53.4±3.5(5.1)	0.21
13-<14	55.7±3.1	54.5±3.5(1.0)	0.69
14-<15	54.5±2.0	56.0±3.1(1.5)	0.37
15-<16	-	57.0±2.0	-
16-<17	58.0±0.0	57.7±0.7(0.2)	-
17-<18	-	57.7±0.8	-
18-<19	36.0±22.0	57.8±0.4(21.8)	0.50

Source: M: Mean SD: standard deviation. \*not applicable (n=1).

## DISCUSSION

This study analyzed the motor performance of infants submitted to parental intervention (PI) in the childcare division of a UAPS in Fortaleza/CE. We observed that an increase in the number of infants with normal motor performance from the first to the second evaluation and from the second to the third, indicating the relevance of PI and follow-up in childcare for motor development. Nevertheless, we emphasize the difficulty in maintaining consistent care, considering that almost half of the sample did not return to continue childcare practices.

Moreover, about 22% of the infants attended their first childcare appointment only after their first semester of life, drawing attention to the possibility of delays already happening beforehand, without possible interventions being developed properly and in a timely manner for changes. This hypothesis was proposed in the data (Figure 1) that point to a higher frequency of infants identified with suspected delay or atypical motor performance when being evaluated for the first time, only after their first semester of life. Although we do not have results and studies that test this hypothesis, some studies have shown that infants submitted to PI before 6 months of life show improvements in motor performance<sup>10,16</sup>.

Regarding follow-up in childcare, some studies have shown that more than 90% of the northeastern children investigated attended childcare and about two-thirds of them had at least 7 follow-ups<sup>17,18</sup>. The prevalence of northeastern children with incomplete childcare was 53.6%<sup>19</sup>. When compared to other Brazilian regions, the Northeast exhibits factors that may be associated with the difficulty of monitoring, namely: the large geographic territory, population size, and the economic status of the region. Therefore, these children are more likely to not have complete follow-up<sup>19</sup>.

The early identification of motor development delays in childcare appointments allows for effective interventions. Early intervention may be able to improve the quality of life of families in socioeconomic risk and promote child development<sup>20</sup>. Child's experiences, especially in early childhood, are capable of producing permanent changes in their brain. A change in the environment seems to have rapid effects on the anatomy of the brain; and less than three weeks of exposure to a new and complex environment are enough to cause brain expansions<sup>21</sup>. Thus, severe deprivation is associated with negative changes in the volume and structure of the brain in adulthood, even when individuals exposed to this form of deprivation were later raised in families that provided favorable environments for the rest of childhood<sup>22</sup>.

One of the difficulties we found in maintaining an adequate follow-up in these infants' appointments were due to incomplete records. This is commonly justified by professionals due to the time spent filling out forms, directories, and justifications, which is even greater than that dedicated to patients<sup>23</sup>. These factors represent, not only limitations to this study, but also difficulties in the infants' follow-up, of which the main objective is to guide family members through the child's development. These guidelines regarding the importance of constant evaluation of children's growth and development represent, for managers and health teams, an opportune moment to propose strategies for health promotion and disease prevention<sup>23</sup>.

The infants in this series of cases did not present motor performance in AIMS different from what was expected for the Brazilian population<sup>15</sup>. Brazilian infants presented a motor performance index 34.6% below the performance of infants from other countries and this difference was reduced when they reached 15 months of age<sup>24</sup>. It is believed that the differences in motor performance are related to the cultural and social characteristics of the

population; and that changes in the environment can create or restrict possibilities for action. One study showed that a Brazilian sample presented low opportunities for environmental stimulation for motor development and that families with better economic levels presented more favorable opportunities<sup>25</sup>.

Risk stratification was related to gestational age and motor performance of infants. Thus, it is reinforced that environmental disadvantages, combined with biological factors, are capable of negatively influencing a child's development<sup>2</sup>. Knowledge about the risk factors that may lead to developmental delay are essential to implement resources to reduce its effects on the child and the family<sup>25</sup>.

This study presents limitations regarding incomplete medical records, family's lack of adherence to the program and their irregular attendance to childcare appointments, generating difficulties in monitoring and analyzing the effect of parental intervention on infant's motor development. We suggest that professionals and services of family care, in addition to continuing to stimulate follow-up in childcare, propose strategies to monitor information and PI that supersedes the need for the family to go to the health unit (e.g., through telecommunications and digital means).

## CONCLUSION

In this series of cases, the infants' motor performance was influenced by risk stratification, gestational age, and attendance and follow-up in childcare. The study advances the understanding that infants who are taken as soon as possible to childcare, for guidance on PI, can recover from any delay in their motor development. Despite this, most families either seek care late in the infant's life, or do not attend it at all. We suggest that family empowerment strategies promotion child development, such as guidelines for PI in various formats, should be used throughout the healthcare system.

## REFERENCES

- Papalia DE, Feldman RD. *Desenvolvimento humano*. São Paulo: Artmed; 2013.
- Lima MC, Eickmann SH, Lima ACV, Guerra MQ, Lira PIC, Huttly SRA, et al. Determinants of mental and motor development at 12 months in a low income population: a cohort study in northeast Brazil. *Acta Paediatr*. 2004;93(7):969-75. doi: 10.1111/j.1651-2227.2004.tb18257.x.
- Ferreira RC, Alves CRL, Guimarães MAP, Menezes KKP, Magalhães LC. Effects of early interventions focused on the family in the development of children born preterm and/or at social risk: a meta-analysis. *J Pediatr (Rio J)*. 2020;96(1):20-38. doi: 10.1016/j.jped.2019.05.002.
- Comitê Científico do Núcleo Ciência Pela Infância. Estudo nº 1: O impacto do desenvolvimento na primeira infância sobre a aprendizagem. São Paulo: Núcleo Ciência Pela Infância. 2014 [cited 2021 Jul. 29]. Available from: <https://bit.ly/3r1l7lk>
- Ministério da Saúde (BR). Secretaria de Atenção à Saúde (BR). Diretrizes de estimulação precoce: crianças de zero a 3 anos com atraso no desenvolvimento neuropsicomotor decorrente de microcefalia. Brasília, DF; 2016.
- Schmidt B, Staudt ACP, Wagner A. Intervenções para promoção de práticas parentais positivas: uma revisão integrativa. *Contextos Clin*. 2016;9(1):2-18. doi: 10.4013/ctc.2016.91.01.
- Bronfenbrenner U, Morris PA. The ecology of developmental processes. In: Damon W, editor. *Handbook of child psychology: theoretical models of human development*. 5th ed. Hoboken: Wiley; 1997. p. 993-1028.
- Pungello EP, Iruka IU, Dotterer AM, Mills-Koonce R, Reznick JS. The effects of socioeconomic status, race, and parenting on language development in early childhood. *Dev Psychol*. 2009;45(2):544. doi: 10.1037/a0013917.
- Silva PL, Santos DCC, Gonçalves VMG. Influência de práticas maternas no desenvolvimento motor de lactentes do 6º ao 12º mês de vida. *Braz J Phys Ther*. 2006;10(2):225-31. doi: 10.1590/S1413-35552006000200014.
- Sá FE, Nunes NP, Gondim E JL, Almeida AKF, Alencar AJC, Cardoso KVV. Intervenção parental melhora o desenvolvimento motor de lactentes de risco: série de casos. *Fisioter Pesqui*. 2017;24(1):15-21. doi: 10.1590/1809-2950/15828624012017.
- Correia LL, Rocha HAL, Sudfeld CR, Rocha SGM, Leite AJM, Campos JS, et al. Prevalence and socioeconomic determinants of development delay among children in Ceará, Brazil: A population-based study. *PloS one*. 2019;14(11):e0215343. doi: 10.1371/journal.pone.0215343.
- Fortaleza. Portal de Transparência de Fortaleza: Dados Abertos [Internet]. Fortaleza: Secretaria Municipal de Finanças; 2010 [cited 2021 Jul. 29]. Available from: <https://transparencia.fortaleza.ce.gov.br/>
- Fortaleza. Secretaria Municipal da Saúde de Fortaleza. Diretrizes Clínicas: Atenção à Criança [Internet]. Fortaleza: Secretaria Municipal da Saúde de Fortaleza; 2016 [cited 2021 Jul. 29]. Available from: <https://bit.ly/3j3X4kj>
- Piper MC, Pinnell LE, Darrah J, Maguire T, Byrne PJ. Construction and validation of the Alberta Infant Motor Scale (AIMS). *Can J Public Health*. 1992;83:46-50.
- Saccani R, Valentini NC, Pereira KR. New Brazilian developmental curves and reference values for the Alberta Infant Motor Scale. *Infant Behav Dev*. 2016;45:38-46. doi: 10.1016/j.infbeh.2016.09.002.
- Formiga CKMR, Pedrazzani ES, Tudella E. Desenvolvimento motor de lactentes pré-termo participantes de um programa de intervenção fisioterapêutica precoce. *Braz J Phys Ther*. 2004;8(3):239-45.
- Facchini LA, Piccini RX, Tomasi E, Thumé E, Silveira DS, Siqueira FV, et al. Desempenho do PSF no Sul e no Nordeste do Brasil:

- avaliação institucional e epidemiológica da Atenção Básica à Saúde. *Cien Saude Colet*. 2006;11(3):669-81. doi: 10.1590/S1413-81232006000300015.
18. Piccini RX, Facchini LA, Tomasi E, Thumé E, Silveira DS, Siqueira FV, et al. Efetividade da atenção pré-natal e de puericultura em unidades básicas de saúde do Sul e do Nordeste do Brasil. *Rev Bras Saude Mater Infant*. 2007;7(1):75-82. doi: 10.1590/S1519-38292007000100009.
  19. Santos AS, Duro SMS, Cade NV, Facchini LA, Tomasi E. Access to child care services in the Northeast and in the South Regions of Brazil. *Rev Bras Saude Mater Infant*. 2017;17(3):447-60. doi: 10.1590/1806-93042017000300003.
  20. Veldman SL, Santos R, Jones RA, Sousa-Sá E, Okely AD. Associations between gross motor skills and cognitive development in toddlers. *Early Hum Dev*. 2019;132:39-44. doi: 10.1016/j.earlhumdev.2019.04.005.
  21. Scholz J, Allemang-Grand R, Dazai J, Lerch JP. Environmental enrichment is associated with rapid volumetric brain changes in adult mice. *Neuroimage*. 2015;109:190-8. doi: 10.1016/j.neuroimage.2015.01.027
  22. Mackes NK, Golm D, Sarkar S, Kumsta R, Rutter M, Fairchild G, et al. Early childhood deprivation is associated with alterations in adult brain structure despite subsequent environmental enrichment. *Proc Natl Acad Sci U S A*. 2020;117(1):641-9. doi: 10.1073/pnas.1911264116.
  23. Silva ICA, Rebouças CBA, Lúcio IML, Bastos MLA. Consulta de enfermagem em puericultura: uma realidade de atendimento. *Rev Enferm UFPE on line*. 2014;8(4):966-73. doi: 10.5205/1981-8963-v8i4a9767p966-973-2014.
  24. Saccani R, Valentini NC. Análise transcultural do desenvolvimento motor de crianças brasileiras, gregas e canadenses avaliadas com a Alberta Infant Motor Scale. *Rev Paul Pediatr*. 2013;31(3):350-8. doi: 10.1590/S0103-05822013000300012.
  25. Defilipo EC, Frônio JS, Teixeira MTB, Leite ICG, Bastos RR, Vieira MT, et al. Oportunidades do ambiente domiciliar para o desenvolvimento motor. *Rev Saude Publica*. 2012;46(4):633-41. doi: 10.1590/S0034-89102012005000040.

The version of the article “**Infants motor development in parental intervention during childcare: case series**” published in **volume 28, number 2, 2021**, made available at first presented errors related to the author’s name and corresponding address.

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