

# Functional performance of children with cerebral palsy from high and low socioeconomic status

*Desempenho funcional de crianças com paralisia cerebral de níveis socioeconômicos alto e baixo*

*Desempeño funcional de niños con parálisis cerebral de niveles socioeconómicos alto y bajo*

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## ABSTRACT

**Objective:** To investigate the influence of socioeconomic status on the functional performance of children with cerebral palsy.

**Methods:** Cross-sectional quantitative study of 49 children diagnosed with cerebral palsy from a convenience sample. Children of both genders aged three to seven and a half years were studied. They were classified according to the level of severity of cerebral palsy based on the Gross Motor Function Classification System. Participants were organized in two groups considering their high or low socioeconomic status, according to the Brazilian Economic Classification Criteria. Functional performance was assessed by the Pediatric Evaluation of Disability Inventory. The Student's *t*-test was applied for independent samples in order to compare means between groups.

**Results:** Socioeconomic status did not affect functional performance of children with mild cerebral palsy. Those with moderate cerebral palsy and low socioeconomic status presented lower social function scores ( $p=0.027$ ) than those with high socioeconomic status. Children with severe cerebral palsy with low socioeconomic status presented worse performance in self-care skills ( $p=0.021$ ) and mobility ( $p=0.005$ ). These children were more dependent regarding mobility ( $p=0.015$ ) than those with high socioeconomic status.

**Conclusions:** Socioeconomic status may influence the development process of children with cerebral palsy and

must be considered as a risk factor in educational and health practices aimed at this population.

**Key-words:** cerebral palsy; social class; child development; child.

## RESUMO

**Objetivo:** Investigar a influência do nível socioeconômico sobre o desempenho funcional de crianças com paralisia cerebral.

**Métodos:** Estudo transversal com abordagem quantitativa. Foram selecionadas 49 crianças com diagnóstico clínico de paralisia cerebral de uma amostra de conveniência, com idades de três a sete anos e meio, de ambos os sexos, classificadas de acordo com o nível de gravidade da paralisia cerebral, com base no Sistema de Classificação da Função Motora Grosseira. Os participantes foram distribuídos em dois grupos de níveis socioeconômicos, alto e baixo, de acordo com o Critério de Classificação Econômica do Brasil. O desempenho funcional foi avaliado com o Inventário de Avaliação Pediátrica de Incapacidade. Foi aplicado o teste *t* de Student para amostras independentes a fim de comparar as médias entre os grupos.

**Resultados:** O nível socioeconômico não afetou o desempenho funcional de crianças com paralisia cerebral leve. Crianças com paralisia cerebral moderada de classe econômica baixa apresentaram escores da função social inferiores

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( $p=0,027$ ) aos daquelas de classe alta. Crianças com paralisia cerebral grave de nível socioeconômico baixo apresentaram desempenho inferior nas habilidades de autocuidado ( $p=0,021$ ) e mobilidade ( $p=0,005$ ). Essas crianças foram mais dependentes em relação à mobilidade ( $p=0,015$ ) do que as de nível socioeconômico alto.

**Conclusões:** O nível socioeconômico pode exercer influência no desenvolvimento da criança com paralisia cerebral, devendo ser fator de risco considerado nas ações educacionais e de saúde voltadas a essa população.

**Palavras-chave:** paralisia cerebral; classe social; desenvolvimento infantil; criança.

## RESUMEN

**Objetivo:** Investigar la influencia del nivel socioeconómico sobre el desempeño funcional de niños con parálisis cerebral.

**Métodos:** Estudio transversal, con acercamiento cuantitativo. Se seleccionaron 49 niños con diagnóstico clínico de parálisis cerebral de una muestra de conveniencia, con edades entre tres y siete años y medio, de ambos sexos, clasificadas conforme al nivel de gravedad de parálisis cerebral, con base en el Sistema de Clasificación de la Función Motora Grosera. Los participantes fueron distribuidos en dos grupos de niveles socioeconómicos, alto y bajo, conforme al Criterio de Clasificación Económica de Brasil. El desempeño funcional fue evaluado con el Inventario de Evaluación Pediátrica de Discapacidad. Se aplicó la prueba  $t$  de Student para muestras independientes a fin de comparar los promedios entre los grupos.

**Resultados:** El nivel socioeconómico no afectó el desempeño funcional de niños con parálisis cerebral liviana. Niños con parálisis cerebral moderada de clase económica baja presentaron escores de la función social inferiores ( $p=0,027$ ) a los de niños de clase alta. Niños con parálisis cerebral grave de nivel socioeconómico bajo presentaron desempeño inferior en las habilidades de autocuidado ( $p=0,021$ ) y movilidad ( $p=0,005$ ). Esos niños fueron más dependientes respecto a la movilidad ( $p=0,015$ ) que los de nivel socioeconómico alto.

**Conclusiones:** El nivel socioeconómico puede ejercer influencia en el desarrollo del niño con parálisis cerebral, debiendo ser factor de riesgo considerado en las acciones educacionales y de salud dirigidas a esa población.

**Palabras clave:** parálisis cerebral; clase social; desarrollo infantil; niño.

## Introduction

Child development is composed of several interdependent domains (sensorimotor, cognitive and socio-emotional), which can be influenced by biological (gestational age and birth weight), environmental (economic status and parents' education), and hereditary factors, which can be affected by adverse or favorable situations<sup>(1)</sup>. When these factors bring negative consequences to the child's development, they are called risk factors. Among these are family characteristics, which can pose a greater risk to the healthy development of children<sup>(2,3)</sup>.

Motor development is a process of change in behavior as a result of the interaction of heredity with the environment. In this process, it is considered that the environment causes a stimulatory effect that interacts with human biology, producing the behavior<sup>(4)</sup>. For De Barros *et al*<sup>(5)</sup>, the early identification of possible risk situations that may affect the course of development is important to prevent damage throughout life.

Some studies show the relationship between low socioeconomic status and developmental impairment of children<sup>(1,6-8)</sup>. They suggest that the low socioeconomic status (SES) may increase the child's biological vulnerability, leading to unfavorable outcomes in development. Unfortunately, the population that accumulates risk factors that may affect the development is, almost always, the most disadvantaged, increasing, thereby, the chances of developmental delay.

The caregiver's education and the family income are basic elements to determine the child's health, because they are indicators of available resources, and knowledge or behavior in relation to health and well-being of children<sup>(9)</sup>.

SES may impact on the well-being of children with cerebral palsy (CP), with distinction between high and low levels of economic classes in relation to functional abilities and independence. According to Schenker *et al*<sup>(10)</sup>, the development of motor skills of children with CP presents a characteristic delay. Therefore, basic motor skills can be acquired later in childhood, generating a difference of years of delay, compared with healthy children regarding gross motor skills. In this sense, the functional manifestations of children with CP should be evaluated, once the functional performance is influenced not only by the intrinsic properties of the child, but also by the specific demands of the task and the characteristics of the environment in which it interacts<sup>(11,12)</sup>.

The relationship between SES and CP is not yet clear, however, it is believed that this association may suggest

etiologiical factors and ways for prevention<sup>(13)</sup>, as well as impairments to motor development. Knowledge of the CP motor performance, from the analysis of the socioeconomic context, may represent an important tool for decision making in resource management and in the planning of services for these children. Based on the literature, the present study aimed to investigate possible relations between the functional performance of children with CP with different degrees of commitment and the family's SES.

## Method

This was a cross-sectional descriptive study of public and private institutions in the metropolitan area of Vale do Aço, in the state of Minas Gerais. The research project was previously approved by the Research Ethics Committee of Universidade Presbiteriana Mackenzie under no. 1134/04/2009, meeting the requirements of the Resolution 196/96 of the National Health Council's team. The informed consent term was obtained from the legal guardian of the participants, after taking part in the study voluntarily. Data collection was performed at the institution/clinic where the child was assisted in a private room.

Inclusion criteria were: children with clinical diagnosis of any kind of CP and non-evolutionary chronic encephalopathy (NECE), from both sexes, with chronological age between 3 to 7 and a half years; classified between levels I, II, III, IV and V in the System of Classification of the Gross Motor Function. For children under anticonvulsants, the study included those without seizures for at least 3 months. The study excluded subjects with congenital malformation unrelated to CP, severe sensory deficit, and chromosomal diseases, children submitted to the surgery of the musculoskeletal system and/or the application of botulin toxin type A in less than 6 months.

Participated in this study the primary caregiver of the child, responsible for the well-being, health and care; who would have to live or spend most of the day with the child (at least part-time) and provide daily care for at least 6 months. No sample size calculation was performed, because the aim was to collect data on children with CP who were in rehabilitation and public and private institutions that met the inclusion criteria to participate in the research. Therefore, we used convenience sampling and 49 children with CP were selected.

A form was used to identify data that included the child (age, date of birth, birth weight, names of father and mother,

gestational age, presence of neonatal complications and epilepsy, school attendance) and the caregiver (age, degree of kinship with the child, address, telephone number, marital status, education level and occupation). Children were classified by the same evaluator according to the severity of CP, based on the GMFCS<sup>(14-16)</sup>. This instrument stratifies children with CP at levels I, II, III, IV and V. Patients were grouped into three levels of involvement, according to studies that have also used these systems<sup>(16,17)</sup>. The children classified in levels I and II were considered mild; level III, moderate; and those in levels IV and V, severe. Participants were also divided into two groups according to the economic class of the family (high and low), according to the Economic Classification Criterion of Brazil<sup>(18)</sup>. Socioeconomic categories range from A (very high) to E (very low), and the remaining are intermediate categories (B, C, D). For the study it was found that categories A and B belonged to the high SES, and categories C, D and E, to the low, according to the classification adopted by Mancini *et al*<sup>(19)</sup>. The final distribution of the groups was as follows: children from high SES (mild, moderate and severe CP) and children from low SES (mild, moderate and severe CP).

The Brazilian version of the Pediatric Evaluation of Disability Inventory (PEDI) was applied to analyze functional performance. This test is divided into three distinct parts, that inform about three areas of functional performance. This study used only parts I and II; the third part, about changes in the environment, was not performed. The first part documents the functional skills of the child in the following scales: self-care, mobility and social function. Each item receives score 1 if the child is able to perform the activity, or 0 if it is not able to perform it. The total scores on each scale of this part results in a total gross score for each of the three areas of functional skills. The second part of the PEDI quantifies the help provided by the caregiver to the child to accomplish tasks of: self-care, mobility and social function. In this part of the test, the assistance is evaluated on an ordinal scale, including categories: 0 (total assistance), 1 (maximum assistance), 2 (moderate assistance), 3 (minimal assistance), 4 (supervision) and 5 (independent). The test manual provides specific criteria for scoring each item. In this study we used the raw data from the PEDI<sup>(20)</sup>.

Data were analyzed using descriptive and inferential statistics. To perform statistical analysis, the software Statistical Package for the Social Sciences for Windows (SPSS), version 11.0 was used. Quantitative variables were described by mean and standard deviation. To verify normality of the data, we

applied the Kolmogorov-Smirnov test, accepting  $p > 0.05$ . Quantitative variables were presented by absolute and relative frequencies. Descriptive analyzes comparing groups (mild, moderate and severe CP) were performed with analysis of variance (ANOVA) for quantitative (age) and chi-square test for categorical variables (gender and SES). Multivariate analysis was used to investigate the effects of interaction between SES and the severity of CP in functional performance (three CP severities with two SES), assuming an alpha of 5%. Student's

$t$  test for independent samples was applied to compare means between groups. The level of significance was set at 5.

## Results

The 49 children were distributed according to social class and severity of CP into six distinct groups: Group 1 (n=8), for those who had mild CP and families in social classes A and B (high SES); Group 2 (n=8), mild CP from families that

**Table 1** - Descriptive analysis of severity groups of children with cerebral palsy

| Variables        | Groups   |          |          | p-value |
|------------------|----------|----------|----------|---------|
|                  | Mild     | Moderate | Severe   |         |
| Age (years)      |          |          |          |         |
| Mean±SD          | 5.1±1.5  | 5.3±1.4  | 5.0±1.4  | 0.037   |
| Sex              |          |          |          |         |
| Male             | 7        | 8        | 9        | 0.886   |
| Female           | 9        | 9        | 7        |         |
| SES              |          |          |          |         |
| High             | 8        | 7        | 5        | 0.199   |
| Low              | 8        | 10       | 11       |         |
| Age of caregiver | 30.4±6.7 | 33.4±6.8 | 35.1±9.0 | 0.423   |

SES: socio-economic status; SD: standard deviation

**Table 2** - Comparison of functional skills and caregiver assistance for children with mild, moderate and severe cerebral palsy, of low and high economic class

| Groups          |             |    | Socio-economic Level |            | p-value |
|-----------------|-------------|----|----------------------|------------|---------|
|                 |             |    | High                 | Low        |         |
| Self-care       | Mild CP     | FS | 51.2±12.2            | 44.2±17.7  | 0.376   |
|                 |             | CA | 26.2±8.2             | 21.4±13.3  | 0.392   |
|                 | Moderate CP | FS | 44.9±15.8            | 36.2±17.95 | 0.312   |
|                 |             | CA | 23.4±7.7             | 14.7±12.5  | 0.124   |
|                 | Severe CP   | FS | 20.2±6.8             | 8.1±11.3   | 0.021   |
|                 |             | CA | 4.4±4.9              | 2.3±4.5    | 0.407   |
| Mobility        | Mild CP     | FS | 44.1±6.6             | 47.1±10.8  | 0.516   |
|                 |             | CA | 26.6±3.6             | 27.2±5.3   | 0.788   |
|                 | Moderate CP | FS | 31.4±11.0            | 25.3±11.2  | 0.280   |
|                 |             | CA | 22.1±5.7             | 16.9±7.7   | 0.149   |
|                 | Severe CP   | FS | 6.6±1.7              | 2.9±2.6    | 0.005   |
|                 |             | CA | 2.0±1.9              | 0.3±0.6    | 0.014   |
| Social function | Mild CP     | FS | 40.0±10.4            | 32.5±16.0  | 0.288   |
|                 |             | CA | 20.7±3.4             | 17.0±6.4   | 0.167   |
|                 | Moderate CP | FS | 42.9±13.1            | 29.6±16.2  | 0.094   |
|                 |             | CA | 21.1±5.7             | 11.4±9.3   | 0.027   |
|                 | Severe CP   | FS | 22.4±19.5            | 8.4±10.9   | 0.194   |
|                 |             | CA | 10.8±10.4            | 3.6±5.9    | 0.098   |

FS: functional skills; CA: caregiver assistance

belonged to classes C, D and E (low SES); Group 3 (n=7), moderate CP from families in social classes A and B (high SES); Group 4 (n=10), moderate CP with families from classes C, D and E (low SSE); Group 5 (n=5), severe CP belonging to families from classes A and B (high SES); and Group 6 (n=11), severe CP with families from socioeconomic classes C, D and E (low SSE). It was possible to observe that Group 5 had a reduced number of children, which was due to the fact that there were few children with severe CP from high SES and that met the criteria for participation in this study.

Table 1 presents descriptive information on children, such as: age, sex, family SES, age and education of the caregiver. In total, 20 children belonged to high SES and 29 belonged to low SES.

In multivariate analysis there was no interaction effect between severity of CP and SES ( $p=0.141$ ),  $t$  test was used to compare the functional performance of the children surveyed between the upper and lower economic classes. Regarding the functional skills of children with mild CP (Table 2), we compared the high and low socioeconomic classes, however, there were no significant differences between these groups. It was observed that the groups showed equivalent performance in caregiver assistance in self-care ( $p=0.392$ ), mobility ( $p=0.788$ ) and social function ( $p=0.167$ ), i.e., no significant difference was observed in such areas in both SES.

The functional skills of children with moderate CP were also equivalent in low and high SES, i.e., no significant differences were found. However, caregiver assistance in participants of low social class had scores for social function ( $p=0.027$ ) significantly lower than those of upper class, i.e.,

children of high SES showed more independence in social function than those of low SES.

For functional skills of self-care ( $p=0.021$ ) and mobility ( $p=0.005$ ) in children with severe CP, when groups of high and low SES were compared, significant differences were observed, with lower performance in self-care and mobility skills in children of low socioeconomic class. When checking the independence in mobility ( $p=0.014$ ), low SES children receive more help from their caregivers than those of high SES, however, no difference was observed in the independence of self-care ( $p=0.407$ ) and social function ( $p=0.098$ ), indicating that in both groups (high and low SES) children need equivalent assistance.

Table 3 shows the comparison between high and low socioeconomic status in functional skills and caregiver assistance, regardless of severity of the condition. In relation to self-care, differences were found in functional ability (0.027) and independence (0.032) of children, i.e., individuals of low SES underperformed when compared to those of high SES. The same occurred regarding social function, in which the participation of low SES children in social activities was lower than those of high SES. However, there were no significant differences in mobility between the two classes.

## Discussion

According to data obtained in the present study, the SES of children with mild CP does not seem to affect their functional performance. Seeking clarity on issues like this, Andrade *et al*<sup>(21)</sup> reported that in the process of rehabilitation of the child, the SES of the family may be a barrier or a facilitator, i.e., in this process of acquisitions of new skills this may be a deciding factor. To Bracco *et al*<sup>(22)</sup>, the low SES may cause an inactive behavior of children, related to restricted alternatives for leisure and culture. On the other hand, Malina and Bouchard<sup>(23)</sup> verified that children with low SSE live in an environment with more freedom of movement, with more opportunities to experience a varied motor repertoire.

Regarding the social function of individuals analyzed, children with varied involvement (mild, moderate and severe) showed similar performance. However, when analyzing caregiver assistance on the same basis, those with moderate CP and low SES were more dependent than children with high SES, indicating that despite presenting the necessary skills, they continued to receive help from their caregivers. The socialization of these children depends on the family

**Table 3** - General comparison of functional skills and caregiver assistance between high and low socioeconomic classes

| Groups          | Socio-economic level |           | p-value |
|-----------------|----------------------|-----------|---------|
|                 | High                 | Low       |         |
| Self-care*      |                      |           |         |
| FS              | 41.2±17.5            | 27.8±22.0 | 0.027   |
| CA              | 19.8±11.6            | 11.8±12.9 | 0.032   |
| Mobility        |                      |           |         |
| FS              | 30.3±16.8            | 22.8±20.0 | 0.177   |
| CA              | 18.9±11.0            | 13.4±12.4 | 0.119   |
| Social Function |                      |           |         |
| FS              | 36.6±15.7            | 22.4±17.7 | 0.006   |
| CA              | 18.4±7.6             | 10.0±9.02 | 0.001   |

\*mean±standard deviation; FS: functional skills; CA: caregiver assistance

playing the role of mediator between the child and society<sup>(24)</sup>, providing adequate support, when needed, for the individual to join the group in which he was born, acquiring its characteristic habits and values.

Families from distinct SES may have different expectations about the independent performance of children with CP. Therefore, there may be a difference in the amount of aid that caregivers provide to these children. The excessive aid makes the child more dependent, even if it presents conditions to perform certain tasks. To better elucidate such questions, Bradley and Corwyn<sup>(25)</sup> reported that, in the family environment, the child could receive appropriate assistance to cope with risks to their development. In this case, the excessive aid of the caregiver could become a risk for the development, as well as an overload to the caregiver. Camargo *et al*<sup>(26)</sup>, in a study on caregivers of children with CP, found a greater overload among those who were in unfavorable socioeconomic conditions, i.e., the lower the SES, the greater the caregiver's burden.

The risk of belonging to an economically disadvantaged family seems to affect more children with severe CP, i.e., with greater biological risk. This occurred mainly in mobility, in which both the ability and independence were lower in children with low SES. Regarding self-care, although these children have lower ability than high SES children, the caregiver assistance on the same task was similar in both economic classes. This seems to indicate that when it comes to children with severe conditions, families of high socioeconomic status are more overprotective than those of low SES. The excessive aid by the caregiver can occur for several reasons; one of them is that the caregiver underestimates the child's ability to perform activities and ultimately accomplishes the tasks, creating greater dependence. Shonkoff and Meisels<sup>(27)</sup> argue that caregivers of children with more severe sequelae, such as in the case of severe CP, exert a dominant role for a long period in the interaction between caregiver and child.

In general comparison of functional performance, without considering motor impairment, it was observed that families of high socioeconomic class provide more opportunities for the development of functional self-care than those of low socioeconomic class. This finding corroborates the study by Halpern *et al*<sup>(7)</sup>, which found that children from low SES families were twice as likely to present a delay in their neurodevelopment compared to those with higher SES. A study by Dowding and Barry<sup>(28)</sup>, proved that the social class affected the most severe cases of CP.

Mancini *et al*<sup>(19)</sup> mentioned that "the high SES of families is related to certain favorable conditions, such as greater parental education, greater access to information, and greater purchasing power." With the increase in family income, parents become more able to pay attention and invest in their children, following the guidance of health and education professionals<sup>(29)</sup>. On the other hand, people with unfavorable socioeconomic conditions, expressed through maternal/paternal unemployment and unavailability of consumer goods, have children with delayed development<sup>(30)</sup>. One must consider the different contexts to which these children are exposed to standardize the assessment of functionality, taking into account environmental factors, because the SES is the most important environmental reason that may contribute to the rehabilitation process<sup>(21)</sup>. Because of the multifactorial and dynamic nature of child development and poverty, the attempt to compare data from study results that explain the association between these two elements is complex<sup>(30)</sup>, and the methodology used to evaluate both the SES and child development is not uniform among the various studies<sup>(1,5,6,8,30-32)</sup>.

The results presented contribute to a better understanding of the development of children with CP, especially those who are in different socioeconomic conditions. However, some limitations were found, since the sample was reduced and restricted to children with CP attending rehabilitation programs in specialized institutions. Moreover, there was the difficulty of finding children in the region with severe CP of high SES, resulting in a reduced number of members in this group.

It is suggested from this study that the SES can influence the severity of the disease and the development of children with cerebral palsy, so it should be considered as a risk factor in educational and health actions aimed at this population. Longitudinal studies could contribute to more accurate information, bringing prospects of greater impact on public policy, with proposals aimed at prevention and rehabilitation sectors in Brazil.

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