

# The association of GMFCS levels with education, type of motion, pain, and employability in adults with cerebral palsy

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## ABSTRACT

Adults with cerebral palsy (CP) have experienced premature aging associated with function decline. And despite improvements in health care, studies show that these individuals have fewer opportunities to have some kind of education and employment, in addition to presenting complaints of pain and alterations in their ability to walk. **Objective:** The aim of this study was to check the association of GMFCS levels with the parameters of employability, education, level of ambulation, and pain in adults with CP. **Method:** 671 medical records were selected to analyze the correlations among the variables mentioned above. **Result:** It was noticed that those with the more severe levels of CP have fewer chances to get any level of education and employment, in addition to presenting a worse gait. **Conclusion:** No association was found between levels of GMFCS and the parameter for pain.

**Keywords:** Cerebral Palsy, Mobility Limitation, Pain, Employment, Educational Status

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## INTRODUCTION

Cerebral Palsy (CP) is the result of an injury to an immature developing brain that leads to a movement and posture disorder.<sup>1</sup> The motor alteration in CP generally is accompanied by sensory, perceptive, cognitive, communicative, and behavioral disorders.<sup>2</sup>

An increase in the life span of this population has been verified in developed countries such as the United States.<sup>3,4</sup> A characterization of adults with CP was made in a Brazilian city, in which an increase in life span was observed within a specific institution that could be associated with more attention being given to their health.<sup>5-7</sup> However, there are no epidemiological studies in the literature that verify this increase in Brazil.

The early aging that begins in the second decade of life of these individuals may occasion their functional decline. This decline is reported by 35% of the adult sufferers of CP as causing greater difficulties in their daily life activities (DLAs).<sup>8,9</sup>

Considering that osteomuscular sequelae change throughout life, it is possible that they are the cause of the functional decrease in adults with CP. In recent years, studies have described a progressive appearance of alterations such as orthopedic deformities,<sup>10,11</sup> weakness and reduction of muscle flexibility,<sup>12,13</sup> osteoporosis,<sup>14,15</sup> fatigue,<sup>16,17</sup> and pain.<sup>17,18</sup> A moderate to severe impact on their daily activities has been reported by 33% of the individuals who presented pain.<sup>19</sup> In addition, there are reports of progressive limitations for functional activities such as gait.<sup>8,17,20,21</sup> Opheim et al.<sup>17</sup> verified, in an adult population with CP, that the gait reduction is also related to environmental factors such as access to social services and to the community itself.

According to Liptak,<sup>22</sup> being an adult involves completing your studies, getting a job, being independent in your DLAs, and relating to other people. Donkervoort et al.<sup>8</sup> reported that adults with CP show less success in employment, education, independence in their DLAs, and relationships when compared to individuals with no disability. In the same study, the authors concluded that the level of education and of function, as classified by the Gross Motor Function Classification System (GMFCS), are factors that determine functionality; however, other factors should be considered such as socioeconomic factors, for example.

## OBJECTIVE

To verify the association of GMFCS levels with the parameters of employability, education level, gait level, and pain complaints in adults with CP.

## METHOD

This is a transversal study, made through the survey of data in the electronic records of CP patients, being treated in a rehabilitation center. The inclusion criteria were being 18 years or older and having received medical consultation between July, 2008 and April, 2011. The Ethics and Research Committee (ERC) approved this work under protocol N<sup>o</sup> 01/2011.

The characterization of the sample was made with data referring to age, gender, and clinical and topographical distribution. A form was prepared and filled in, according to the information contained in the electronic records, verifying the following topics: pain, education, employment, gait level, and GMFCS level, with the first three items reported by the patients and/or caregivers during medical consultation.

Education level was classified as: illiterate, junior high, high school, trade school, and college as reported by the patients.

For the pain item, no quantifying scale was used, only the patient's and/or caregiver's report during the medical consultation and described in the patient's record.

The GMFCS<sup>23,24</sup> was used to classify the motor level. The distinctions between the levels of motor function were based on functional limitations and on the need for assisted technology, with level I being the least affected level and level V, the most affected. Although the established age bracket was of those less than 18 years of age, studies demonstrate the stability of GMFCS in adults with CP.<sup>25</sup>

The gait was classified with the Functional Gait Assessment (FGA) that has five categories: FGA0 (does not walk); FGA1 (therapeutic gait); FGA2 (at-home gait); FGA3 (restricted community gait); FGA4 (community gait); and FGA5 (normal gait).<sup>26</sup> The Functional Gait Assessment was validated by Viosca et al.<sup>26</sup> for neurological patients and has no validation in Brazil, although it is used in the institution.

The statistical analysis was made through the association between the GMFCS levels for pain, education, employment, and gait level. The statistical test was the Chi-square, with a

confidence interval of 95%. The SPSS V16, Minitab 15, and Excel Office 2007 softwares were used for the statistical analysis.

## RESULTS

For this study, 671 medical records were evaluated, with the sample age varying between 18 and 64 years, with a mean of 26.14 ( $\pm 7.59$ ) years, of whom 51.41% were male. The clinical characterization can be seen in Table 1.

It can be seen that levels I, II, and III present a greater chance of reaching some level of education, while level V has a 69% chance of being illiterate (Table 2).

As for employment, it was seen that the GMFCS level I has a 31% chance of getting employment. In contrast, individuals at the GMFCS level V have a 99% chance of remaining without employment.

Regarding gait, it was seen that individuals at the GMFCS level I have a 98% chance of showing an independent community gait, contrary to individuals at the GMFCS level V, who have a 98% chance of being non-ambulatory. As for pain, no association with the GMFCS levels ( $p = 0.702$ ) was observed.

## DISCUSSION

The GMFCS is considered one of the most often used to determine the gross motor function in relation to voluntary movement, especially seating, transferences, and mobility of the patient with CP.<sup>23,24</sup> McCormick et al.,<sup>25</sup> in their study on the application of the GMFCS in adults, concluded that if an individual with CP has a functional gait during childhood, without the need of aids to move (GMFCS Levels I and II), the probability of maintaining the same functional status when becoming an adult is 88%. In addition, walking can become more difficult and less efficient due to physiological alterations such as contractures in development, reduced muscle strength, joint degeneration, or even an increase in body weight.<sup>26</sup>

Jahnsen et al.<sup>27</sup> reported that those with levels III, IV, and V presented greater risk of worsening their clinical presentation, which would lead to a reduction in functionality. Supplementing that study, Sandström et al.<sup>28</sup> concluded that one third of the individuals analyzed showed an important reduction in the functional level (gait ability) with some of them possibly being reclassified from GMFCS I to II in adulthood.

**Table 1.** Clinical Characterization of the Sample

Topographical Distribution	n (%)
Hemiparesis	313 (46.64%)
Diparesis	131 (19.52%)
Tetraparesis	16 (2.38%)
Other	87 (12.65%)
With no topographical specification	124 (18.47%)
Clinical Distribution	
Spastic	505 (75.26%)
Dyskinetic	84 (12.51%)
Mixed	77 (11.47%)
Other	5 (0.74%)

**Table 2.** Distribution and Association of GMFCS levels with education, employment, and gait level

		GMFCS					Total
		I	II	III	IV	V	
Education	Junior high	23%	34%*	25%	23%	21%	25%
	High school	45%	39%	47%*	35%	8%	33%
	Trade school	2%	2%	6%	0%	0%	2%
	College	15%*	9%	10%	1%	1%	7%
	Illiterate	15%	17%	12%	41%	69%*	33%
Employment	No	69%	75%	82%	98%	99%*	85%
	Yes	31%*	25%	18%	2%	1%	15%
Level of Gait	FGA 0	0%	0%	3%	69%	98%*	37%
	FGA 1	0%	1%	3%	22%*	2%	4%
	FGA 2	1%	3%	4%	7%	0%	2%
	FGA 3	1%	10%	31%*	2%	0%	8%
	FGA 4	98%*	86%	59%	0%	0%	49%
Total		25%	16%	17%	14%	27%	100%

$p < 0,001$ . \* there is statistical dependence

The results of Table 2 show an association between FGA and GMFCS. The most affected levels (GMFCS IV and V) have a greater probability of being non-ambulatory (FGA0). However, level IV individuals showed a 22% chance of achieving a therapeutic gait (FGA1). Nevertheless, GMFCS level I showed 98% chance of having independent gait. These results demonstrate that motor function and gait level tend to correlate according to the impairment of the patient.

Opehim et al.<sup>17</sup> reported that GMFCS III individuals presented a greater risk of decline in their gait quality than adults with diparesis in relation to other types of topographical distribution, which can be related to the data in Table 2, in which level III individuals show a 31% chance of having a restricted community gait in adulthood. This fact could be justified by the overload and greater effort of meeting the demands of daily life.<sup>17</sup>

Considering the motor level of GMFCS III, some sort of gait assistance is necessary, and with the physiological changes of aging already mentioned earlier, this could make it even more difficult for these individuals to access employment. The results showed no statistical association between the GMFCS level III and the employment item, but analyzing absolute numbers, it can be verified that 82% of these individuals have no employment. It was also possible to verify a statistical association between the gait classification, such as restricted community and the individual with GMFCS III, which could be one more justification of the difficulty in accessing employment.

Concerning education as a determining factor for cognitive and communication levels, Donkervoort et al.<sup>8</sup> found a relationship between education and GMFCS in young adults with CP who had no severe learning problems. However, it is not possible to infer a cognitive

level influence on the level of education in the present study, for patients with cognitive deficits were excluded from the sample.

Wood et al.<sup>29</sup> observed that GMFCS, education, and age were associated with daily activities and social participation, while the presence of epilepsy and severe cognitive and motor deficits exerted a negative influence on them.

Magill Evans et al.<sup>30</sup> reported that independence in transport and mobility are significantly related to the possibility of getting employment. Tobimatsu et al.<sup>31</sup> also concluded in their study that mobility (possibility of walking) and education level are factors that determine the acquisition of employment in Japan. In this study, a significant statistical difference can be observed between all the GMFCS levels (Table 2) and that the adults with CP that are less compromised have more chances of employment than those more compromised, which corroborates the results found in the studies above.

Nevertheless, Michelsen et al.<sup>32</sup> observed only a small difference between patients with diparesis and those with tetraparesis in regards to employability and reported that accessibility is a determining factor to the entry of those patients in the labor market. The authors compared a group of adults who had CP with a group of individuals who had no disabilities and affirmed that one of the influencing factors in the low rate of employability for individuals with CP is that they present greater problems with social interaction, which in the future, would interfere with gaining employment.

Pain is considered an important factor that influences the quality of life and may affect one's mental as well as physical functioning.<sup>22</sup> Various studies reported a high incidence of pain in adults with CP in these main areas: lower back, hip, and lower limbs. In the results, the percentage of patients who reported pain was only 20.86% and no relation was found with their GMFCS levels. Other studies that also evaluated the relationship between pain and the GMFCS levels obtained a higher incidence of pain, 59 and 68.75%, respectively, however, they also found no correlation between those parameters.<sup>28,33</sup>

A limiting factor of the present article was the exclusion of patients with cognitive deficit from the analysis. In addition, a quantifying scale was not used for the pain item-only mentioned if there were pain in the patient's daily routine reported during the medical consultation and described in the medical record. Other factors such as family income and

marital status were not broached in the analysis and, therefore, it is necessary to have new studies that verify the remaining correlations.

## CONCLUSION

It could be concluded that the GMFCS levels mostly afflicted (IV and V) presented less chance of reaching some level of education, employment, and gait when compared to the least afflicted GMFCS levels (I, II, and III). However, more studies are needed that analyze the social impact of not having access to employment and education for these individuals, so as to establish greater understanding to execute projects to include this population in society.

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