FUNCTIONAL STATUS OF ADULTS WITH CEREBRAL PALSY REPRESENTED IN GMFCS LEVELS AND IN A GAIT NOMOGRAM

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INTRODUCTION

The Gross Motor Function Classification System (GMFCS) is an overall method used to categorize children [1] and adults [2] with cerebral palsy (CP) into 5 levels based on their gross motor performance. To monitor patients' functional status, outcome measures like the gait nomogram, based on temporal-distance parameters as described by Vaughan & O'Malley [3], can be used. Our question is: Are the differences in functional status as classified by GMFCS levels reproduced by the gait nomogram?

METHODS

As part of a long-term follow-up study, 31 patients with CP who had received the spasticity-releasing neurosurgical procedure selective dorsal rhizotomy, were classified into the first 3 (ambulatory) GMFCS levels. In addition, they were asked to walk with their own customary gait on a walkway that was 10 m long. Temporal-distance parameters (step frequency, step length and speed) were captured with an eight-camera Vicon system (250 Hz). These parameters were normalised by the patients' leg length, based on the method of Hof [4], which converted the outcomes into dimensionless values. The mean age of the 31 patients was 28.7 years (range 21.4 – 44.5 years) and included 18 males and 13 females.

RESULTS AND DISCUSSION

Of the 31 patients with CP who participated in the study, 15 were classified at GMFCS level I (walks without limitations), 11 at GMFCS level II (walks with limitations) and 5 at GMFCS level III (walks with hand-held mobility).

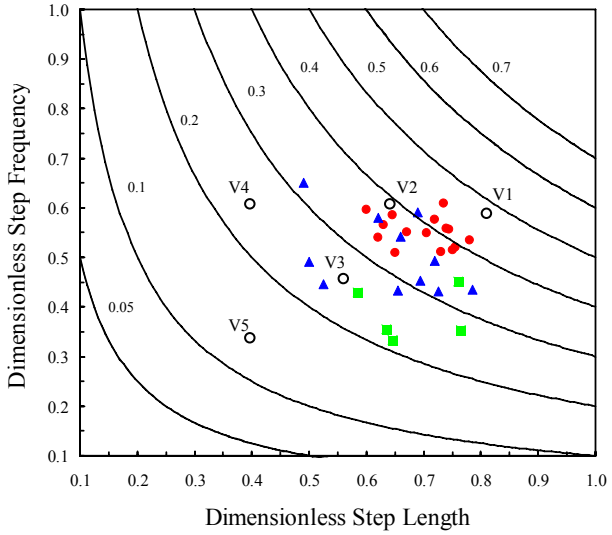

Figure 1 A gait nomogram for dimensionless step frequency versus dimensionless step length, with contours of dimensionless speed. Clusters V1: healthy controls; and V2-5: different CP clusters (○) [3]. Patients classified in GMFCS I ●; GMFCS II ▲; and GMFCS III ■.

Table 1 Median values of dimensionless temporal-distance parameters for patients classified in GMFCS I, II and III.

Dimensionless parameters	I	II	III
Step frequency	0.55	0.49	0.36
Step length	0.72	0.66	0.64
Speed	0.38	0.31	0.25

Figure 1 shows the distribution of patients' outcomes in the gait nomogram. Group I are clustered around V1 and V2, group II shows a greater variability and are scattered between V2 and V3, while group III are more concentrated around V3. Table 1 gives the median values for each group per parameter. Statistical analysis showed no significant differences between the 3 GMFCS groups for dimensionless step length, and only between groups I and III for dimensionless step frequency ($p<0.01$). However, the median values of group I were significantly different to groups II and III for dimensionless speed ($p=0.02$ and $p<0.01$ respectively) (Figure 2).

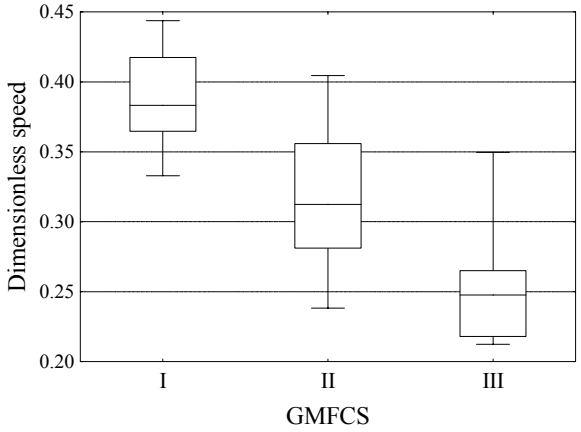

Figure 2 Median, interquartiles and ranges of dimensionless speed for patients classified at GMFCS levels I, II and III.

CONCLUSIONS

The gait nomogram shows that the patients classified at GMFCS Levels I, II and III present different functional status based on their dimensionless temporal-distance parameters. However, this outcome is based on a limited sample size and may not be significant for all parameters.

ACKNOWLEDGEMENTS

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REFERENCES

1. Palisano R et al. *DM & CN* 39,214-223, 1997
2. Jahnsen R et al. *DM & CN*. 48,734-738, 2006.
3. Vaughan CL, O'Malley M *DM & CN* . 47, 377-383, 2005.
4. Hof AL. *Gait Posture* 4,22–223, 1996.