Assessing FES-assisted walking in cerebral palsy children using a visual gait analysis scale

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Abstract

Clinical experience in using FES to correct for dropped foot in children with cerebral palsy (CP) has highlighted the requirement for a more appropriate and acceptable outcome measure to assess progress. Recording improvements in gait is essential and a visual based scoring system offers a practical option. One example is the Edinburgh Visual Gait Analysis Interval Testing Scale. This study aims to explore the use of this scale and assesses the practical issues arising in translating it into routine clinical use.

1 Introduction

There is a substantial body of literature on the use of FES in walking, particularly for subjects with multiple sclerosis and recovering from stroke. Unfortunately the use of FES in cerebral palsy (CP) children is not as well documented, even though a recent audit has demonstrated some success [1]. This same audit highlighted limitations in the consistency and nature of recording outcome measures in children attending the FES clinic at Salisbury.

The outcome measures currently used at the FES clinic in Salisbury (i.e. PCI and walking speed) are the same for all patients attending an appointment, regardless of age or medical condition. This is in part due to the historical background to the FES clinic, but also to the lack of any practical, appropriate and/or acceptable measure in the literature to assess walking in CP children. General observation suggests that qualitative improvements in walking pattern do not always correlate with improvements in these measures. Especially when some children have a tendency to run or skip during the tests, just as children do in everyday life, (see [1]).

This paper explores the use of a visual gait analysis scale, the \textit{Edinburgh Visual Gait Analysis Interval Testing (G.A.I. T.) Scale}, as an outcome measure for CP children using FES for dropped foot. The nature of the scale suggests that it might provide a more reliable and consistent measure of walking function. If that proves to be the case, it would greatly enhance our ability to track a child’s progress through treatment.

2 Methods

2.1 Study design

A strictly observational/exploratory paired measures design with the intent of assessing the practical issues arising in translating an existing and validated measurement instrument into use with paediatric patients with CP, using FES.

2.2 Participants

Children were recruited from the patient database of the host department; each aged between 7-16 and having a diagnosis of CP with dropped foot and a current user of the ODFS (see [2]), receiving standard treatment and follow-up. Children with other concurrent illness or disability that may affect walking or balance, other than that referred to above (such as chronic ear infection or musculoskeletal problem), were excluded.

2.3 Measurement device

The \textit{G.A.I. T. Scale} is a tabulated system devised for analysing the walking in patients with CP [3]. It uses video recordings to aid in observing deviations from normal movement at anatomical levels from the trunk and the lower limbs. Scoring of 17 observations for each lower limb is used through a three point ordinal scale (0=normal, 1=moderate and 2=marked). To assist with scoring rotation at the pelvis and hip, rotational markers are attached to the participant on both thighs and midway between the front of the hips [4], figure 1. Inter- and intra-observer reliability, along with the sensitivity of this measure for use with patients with CP, has been established [3].
The video system uses two digital video cameras set up for recording in the sagittal and coronal planes (see [5]). Video collection is through using a LabVIEW vi, with a string of JPEG video frames (approximately 23 frames per second) for playback and analysis.

2.4 Test procedure
Walking speed, PCI and video recording for analysis and later scoring of the G.A.I. T. Scale will be recorded concurrently. Each child will be asked to walk briskly over a level 10 metre walkway, with 1 metre at both ends for acceleration and deceleration. The basic 10 metre walk will be repeated six times with each child.

2.5 Data analysis
Descriptive/graphical methods will be applied, as appropriate to the size of the study and its observational character.

3 Results
In this study, the G.A.I. T. Scale has so far only been used with a sample of healthy, unimpaired children. This phase has been used to perfect the technique with the measure, leading to improvements in the test conditions and also in the rotational markers employed. For example, the definition lines/marks on the rotational markers have been modified to ensure clarity of digital image and hence more reliable scoring.

Use within this group has demonstrated the G.A.I.T. Scale to be of benefit in describing gait. For example, the video recording of the paediatric gait pattern shows the variability in walking as observed by [1] and which is so often present in paediatric walking. The use of the current outcome measures (PCI and walking speed) alone does not show this variability that is sometimes present. There may be an increase in PCI or walking speed and there will be no record of reason behind the increase.

The next phase of the project, testing the G.A.I. T. Scale on CP children using FES, is just about to begin and the results will be presented at the conference.

4 Discussion and Conclusions
Local discussions with paediatric clinicians have led the department to investigate other outcome measures appropriate to this patient group. However, since the results from CP children recruited into this study are unavailable, it is not possible to conclude whether the G.A.I. T. Scale is either practical, appropriate or acceptable as a measure of FES-assisted walking ability for children with CP.

The G.A.I.T. Scale may offer the opportunity to provide a practical measure of walking pattern for an individual. Though it is envisaged that this may be recorded concurrently with other measures, including walking speed and PCI.

References

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