Further evidence of validity of the Gait Deviation Index

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1. Introduction

Due to the complexity and volume of data generated by three-dimensional gait analysis, categorisation of gait patterns in individuals with cerebral palsy (CP) has been the focus of numerous investigations. Such techniques seek to determine the extent of pathology and in many instances, assess the effectiveness of a given intervention. Primarily, classification techniques can be divided into two groups: qualitative and quantitative. The qualitative approach depends on the expertise of the clinician who attempts to categorise patients into pre-defined, distinguishable patterns. Examples of this type of approach have been documented in children with hemiplegia [1,2] and diplegia [3]. This type of approach is often useful in determining etiology and in some instances, can assist with formulating treatment plans [3]. Alternatively, quantitative methods mathematically analyse gait pattern deviation from a non-impaired sample and, though more objective, may be less user friendly in the clinical environment. This latter approach may be more useful in determining overall change in gait pattern and therefore be more useful as an evaluative tool in intervention studies with large cohorts of subjects.

The quantitative approach has employed various techniques such as cluster analysis [4], neural networks [5] and fuzzy logic [6]. However it was the development of the Gillette Gait Index (GGI), often referred to as the normalcy index [7], that was most embraced in the clinical literature. This latter tool uses principal component analysis to identify how 16 selected gait variables in a person with pathological gait vary from those of a typically developed (TD) control group; differences are presented as a single value. The authors suggest that pre- and post-intervention GGI values could be used to determine any change in gait as a result of an intervention. More recently the original authors of the GGI have highlighted a number of its limitations [8]; these include the choice of the component parameters and the interdependence between the GGI and control data used. As a result of these limitations, a new quantitative measure – the Gait Deviation Index (GDI) – has recently been proposed [8]. Utilising pattern recognition, the GDI compares nine kinematic variables of a subject’s gait against those of a control group; this requires kinematics from the pelvis and hip in all three planes, the knee and ankle in the sagittal plane and foot progression. Each lower limb is considered independently. This method of comparison involves compiling a large dataset composed of control and clinically impaired kinematic data, the aim being to reflect the extent of gait variation possible. Singular value decomposition is then employed to decompose the dataset whereby the range of