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Fatigue, quality of life and walking ability in adults with cerebral palsy

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ABSTRACT

Introduction: Few studies on fatigue, quality of life and walking ability in adults with cerebral palsy (CP) are available.

It is unclear whether these variables are associated.

Aim: The aim was to study the influence of CP on fatigue, quality of life, and gait of adult patients.

Material and methods: Three-dimensional gait analysis was performed on 24 women and 26 men, mean age 32.1 (range 21.7–67.2), 23 with unilateral and 27 with bilateral CP. The Gait Profile Score was calculated; Fatigue Severity and EQ Visual Analogue scales were used.

Results: Fatigue severity was higher than in controls, mean 3.8 (SD 1.8) vs 3.0 ($p = 0.012$). Fatigue in the unilateral group was 3.3 (SD 1.8) and in the bilateral 4.2 (SD 1.7), ($p = 0.07$). EQ Visual Analogue scale in the unilateral group was mean 79.5 (21.9) and in the bilateral 64.0 (20.8), $p = 0.007$.

The group with bilateral CP tended toward crouch gait, decreased balance and low walking speed. Muscle work was shifted from the ankle to hip muscles.

Fatigue correlated with the Gait Profile Score, CC = 0.31 ($p = 0.038$), and with knee flexion deviation, CC = 0.31 ($p = 0.037$).

Discussion: Crouch gait, increased knee flexion in stance, contributes to increased deviation in the lower extremity associated with high fatigue and low quality of life in adults with CP, effects more pronounced in those with bilateral CP. Compensation mechanisms in gait were noted.

Conclusion: Rational follow-up programs for CP, ideally identifying risk factors early, should be established to prevent development of fatigue and deterioration of gait in adulthood.

1. Introduction

1.1. Fatigue

Increased fatigue is often reported secondary to neurological diseases, such as poliomyelitis and multiple sclerosis, and more recently by adults with cerebral palsy (CP) [1–5]. In a study of 56 young adults with CP, Russchen et al. found that 39.3% experienced fatigue, and for 12.5% the fatigue was severe [4]. Malone et al. report that pain and fatigue have an impact on adults with CP and their ability to participate in daily life [6].

The definition of fatigue varies, but it is generally agreed to include not just physical fatigue symptoms, such as muscle strength and force, but also other aspects. For example, Krupp et al. defined fatigue as “a sense of physical tiredness and lack of energy, distinct from sadness or weakness” [7].

1.2. Quality of life and pain

Furukawa et al. found reduced subjective well-being among adults with CP with deteriorated physical function [8]; van der Slot and coworkers reported that adults with bilateral CP perceived low health-related quality of life for physical functions [9] and, in another study, that the severity of fatigue was associated with depressive symptoms and chronic pain [10].

1.3. Walking ability

Although CP is a static neurological condition, symptoms and functional ability change over the course of childhood with maturation and growth [11,12]. Hanna et al., using the Gross Motor Function Classification Scale (GMFCS and the Gross Motor Function Measure (GMFM-66) assessments to study children and adolescents 2–21 years of age with CP at the GMFCS level I and II, found their mobility to be

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stable over time [13]. Conversely, Opheim et al. found deterioration of walking ability in early and middle adulthood, even in patients with relatively mild CP, GMFCS level I and II [2,14]. Day et al. reported little likelihood of improvement of ambulatory capacity after 25 years of age in CP; rather, a decline was likely [15]. It is also apparent that there are differences in gait even between high functioning patients with unilateral and bilateral CP, although this issue has rarely been addressed in adults Miller [16].

Crouch gait is a common problem in bilateral CP and often increases with age and weight gain in adolescence. It has several causes and may be partly resistant to treatment, leading to marked deterioration of mobility. Reports describing surgery in ambulatory adolescents and young adults with crouch and internal rotation gait have become more frequent [16–20]. The surgery is often extensive, the rehabilitation long, and the indication and optimal timing is still not clear.

There are few studies on the long-term result of management of CP patients with focus on gait and fatigue. To obtain more knowledge and a better understanding of the need for early intervention in childhood, with the goal of ensuring good long-term function into adulthood, it is important to identify variables that influence walking ability, increase fatigue and impair quality of life in adults with CP.

2. Aim

The aim was to study fatigue, quality of life and walking ability, and their correlations, in adults with cerebral palsy.

3. Material and methods

This study was approved by the ethical committee. From the regional database, covering a population of 240 000 inhabitants, 197 adults with CP were identified. Information about walking ability was obtained from the physiotherapists at the habilitation center. Ninety-one could walk independently without support, 36 walked with support or aid, 13 had very limited walking ability, and 57 could not walk at all. A letter with information and an invitation to participate was sent to the 127 who could walk (91 independently and 36 with support or aid) of whom 56 responded that they were able to walk 10 m without aid or support, and were willing to participate. They visited the Gait Analysis Laboratory, where 4 were too tired or unstable to walk independently and in 2 cases, technical errors made it impossible to analyse the data. Fig. 1.

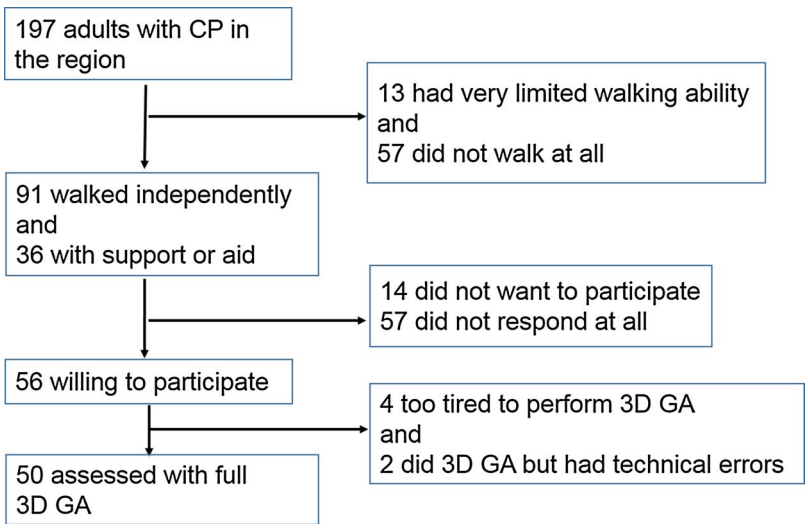

Fig. 1. Recruitment and inclusion. CP: cerebral palsy; 3D GA: Three dimensional gait analysis.

3.1. Fatigue

Fatigue was measured with the Fatigue Severity Scale (FSS) [7]. FSS is a nine-item, self-administered questionnaire, scores ranging from 1 (strongly disagree) to 7 (strongly agree). A high score indicates a high level of fatigue [4,21].

3.2. Quality of life and pain

Quality of life was assessed with EQ Visual Analogue scale (EQ VAS), which records self-rated health with endpoints “the best and worst health you can imagine” [22]. We also included the question on pain and discomfort from the EQ-5D with three alternative answers; no, moderate or severe pain and discomfort.

3.3. Physical examination

Physical examination was performed by one physiotherapist, assessing passive range of motion of lower extremity using a goniometer in standardized positions [23].

3.4. Three-dimensional gait analysis (3DGA)

A three-dimensional motion analysis system incorporating 62 retroflective markers and 12 digital cameras (Oqus 400 Qualisys medical AB, Gothenburg, Sweden) was used to obtain kinematic measurements. The markers were secured to specific anatomical locations in accordance with a modified Helen-Heyes Model [24,25]. Two force plates (Kistler, Winterthur Wulflingen, Switzerland) was used to obtain the kinetic measurements. The patient walked barefoot without any walking aid or support, at a self-selected speed on a 10-m walkway. Several gait cycles and force plate acquisitions were recorded and the mean was calculated.

We aimed to calculated representative temporal spatial, kinematic and kinetic variables corresponding to the prerequisites for normal gait according to Perry 1985, namely: adequate step length, pre-positioning of the foot, stability in stance, foot clearance in swing, and low energy consumption [26]. Walking speed was calculated as well as the Gait Profile Score to provide an overall assessment of gait deviation from normal [27]. In addition, knee flexion deviation movement was calculated [27]. A control group of 20 individuals was used.

4. Statistical analysis

The involved side was selected for calculations in the unilateral CP