Introduction

This study focused on the biomechanical differences between experienced and inexperienced wheelchair users (WCU) whilst taking part in sport. Data collection was performed at The Cheetahs Wheelchair Sports Club in Thornton-Cleveleys, Lancashire, UK. Their objective is to create a level playing field for disabled children when regards to sport, by allowing able bodied children to take part in disabled sporting activities with the disabled children. Environmentally, this sports club removes the barriers which previously would not allow disabled children to take part in sport. This increases the participation opportunities for disabled children and promotes improvements in health and wellbeing (Figure 1.).

WCU can execute different propulsion techniques. It is believed inexperienced WCU execute a pumping propulsion, which is a stroke that possess a highest metabolic cost (de Groot et al. 2004). Trunk flexion, a common compensatory movement for inexperienced WCU, generates power that the upper limbs of these WCU are incapable of as they exhibit characteristics associated with low efficiency (Rodgers et al. 2000). Experienced WCU, on the other hand, depend on solely their upper-limbs for efficient movement. Consequently, inexperienced WCU need to produce trunk flexion as they tire more readily.

Methodology

Members of The Cheetahs were invited to take part in the present study. 11 subjects (Average age – 9.18 years old, height – 1.30m) agreed to take part. The participants (2 ♂ and 9 ♂) were divided into two groups; experienced WCU (n = 7) and inexperienced WCU (n = 4). All subjects were asked to perform three functional tasks in a wheelchair to assess their efficiency, mobility, power and speed (Tanaka et al. 2010). These tests consisted of:

• 30 second agility test (Figure 3.),
• 1 minute distance test. (Figure 4.),
• 10 metre sprint test.

All of which were performed at Thornton YMCA sports hall. During the testing the subjects were asked to wear the upper-body piece of the XSens MVN BIOMECH motion capture suit (Figure 2.) which enabled movement tracking via camera-less inertial sensors. Following the testing, comparisons were made between the experienced and inexperienced groups by the differences in the outcome measures from the tests and also by biomechanical analysis of the upper-limb angles during propulsive cycles.

Results

The subjects in the WCU category had been attending The Cheetahs for, on average, 8.5 months compared to the NWCU who had been attending for 6.75 months. Results from the functional tests are as follows:

Discussion

From the results of the functional tests it can be seen the inexperienced WCU outperformed the experienced WCU on every task despite them being, on average, younger and having also attended The Cheetahs for a lesser time period. This may be due to decreased upper-limb strength or motor control deficits being elements of the experienced WCU disability, consequently causing impairment (Finley et al. 2004). It is postulated that experienced WCU displayed more frequent wheel contact, of a shorter duration, with a smaller range of motion in comparison to inexperienced WCU; another reason why these test results may have been seen. Although the experienced WCU refine their propulsion technique on a day to day basis it is thought that the reason why the inexperienced WCU outsourced the experienced WCU on the functional tests is due to the larger ranges of motion they utilised during propulsion which included trunk movement and consequently aided in producing additional power (Figure 5).

Recommendations

From informal observations it is clear that The Cheetahs Wheelchair Sports Club is very much game based. If The Cheetahs are aiming to establish a recreational club where children can come and enjoy games with their peers then the current approach should be continued. If the club are aiming to increase the functional ability of the children in their wheelchairs, however, then a more exercise intense approach should be adopted. There is a possibility of some of the children attending are going on to take part in competitive wheelchair sports in the future, if this is the case, then they will further benefit from a more sport specific and thoroughly drilled session which will help increase function.

References


