

Mobility and Changes in Walking Ability for People with Cerebral Palsy

A note to health professionals

Cerebral palsy (CP) is defined as a non-progressive lesion of the brain, though the actual clinical presentation of the condition often shows deterioration over time (Rosenbaum et al., 2006). This deterioration can occur in the area of an individual's mobility or ability to transfer. Walking may become more difficult and less efficient due to developing contractures, diminished muscle strength, joint degeneration and an increase in body weight (Andersson & Mattsson, 2001; Jahnsen et al., 2004).

Predicting walking ability across the lifespan

The Gross Motor Function Classification System (GMFCS) provides a good, positive predictive value of walking ability – GMFCS level at 12 years of age is predictive of walking ability in adulthood. McCormick 2007 discusses the probability of GMFCS Level I and II continuing to have similar functional status as an adult being 88% and that the probability of GMFCS Level IV and V who use a wheelchair as their primary mode of mobility continuing to use

a wheelchair in adulthood as 96%. The authors discuss previous studies that have reported function being stable from 2 to 12 years of age and the current study demonstrating stability from 12 years of age into adulthood suggests that predicting function into adulthood can occur at 2 years of age.

Hanna et al 2009 reported on functional decline measured by Gross Motor Function Measure (GMFM-66) and classified using GMFCS from 2 to 21 years in those with cerebral palsy. The functional declines were found to be



clinically significant although the authors commented that due to large variability the decline is an estimate of risk of loss, not “destined” to lose function.

The GMFM curves discussed by Hanna et al 2009 and the predictions possible as suggested by McCormick 2007 indicate that health professionals can be guided in the interventions they provide to people with cerebral palsy across their lifespan in relation to walking and transfers.

The ability to keep walking and transferring also depends on a number of factors. These include management of the condition, the diagnosis (Bottos et al., 2001; Andersson & Mattsson, 2001), motor

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function (McCormick et al, 2007) and age (Jahnsen et al, 2004). Individuals with hemiplegia are less likely to lose their independent walking ability while those with spastic diplegia or choreoathetosis are more likely to do so (Bottos et al, 2001; Jahnsen, et al., 2004). Studies have reported that over 30% of participants demonstrated a decrease in walking ability during adulthood while about 10% stopped walking altogether (Andersson & Mattsoon, 2001; Jahnsen et al., 2004).

Age predictors of mobility

Research has also shown that there are two age groups where major changes to an individual's mobility can occur (Murphy, 2010).



The first age group is around 20 to 25 years. The mobility decline in individuals with spastic diplegia has been attributed to an increase in crouch gait which results in inefficient walking (Murphy, 2010). Increasing difficulty in keeping up with peers in the community, workplace or academic setting has also been reported (Murphy, 2010).

The second age group is around 40 to 45 years of age, where a decrease in functional ability because of increasing fatigue and pain is reported. This is often due to joint degeneration as a result of excessive stresses on the joints (Murphy, 2010). Progressive pain and fatigue are the two most commonly reported reasons for gait deterioration in walking ability (Andersson & Mattsoon, 2001; Jahnsen et al., 2004). A lack of adapted physical activity is also a self-reported cause of deterioration in walking (Jahnsen et al., 2004).

Being aware of these transition age periods means that planning can commence early on to maintain an individual's independence and lifestyle.



It has also been reported that some participants showed an improvement in their walking ability (Andersson & Mattsoon, 2001; Jahnsen et al., 2004), with the authors concluding that the improvement is due to regular physical training and young age. They also hypothesised that respondents who reported an improvement in their walking abilities might also report a deterioration in their walking 10 years later due to overuse and physiological burn out (Andersson & Mattsoon, 2001; Jahnsen et al., 2004).

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Musculoskeletal issues that influence mobility

“Early identification and intervention in the child and young adult remain the ideal in the pursuit of optimal musculoskeletal function and lifestyle throughout the adult years” (Murphy 2010).

Pain is often a contributing factor to decreasing mobility (Mc Ginley, Pogrebnoy & Morgan, 2014). In an adult with CP, a major reason for hip pain is degenerative arthritis of the hips. Hip dysplasia is common in this population with the incidence of hip displacement at 70% for GMFCS Level IV and 90% at GMFCS Level Vs (Soo et al, 2006). Loss of gait and mobility is common at end stage hip disease in functional weight bearing adults with CP. Hence, it is important to prevent hip dysplasia from an early age, through early referral to an orthopaedic team for management (Murphy, 2010).

Patella alta is also a condition that is common in ambulatory adults with spastic diplegia. This is caused by the constant loading of the quadriceps muscles in a flexed gait pattern. Recurrent anterior knee pain, arthritis of the knee joint and the patella femoral joint may occur

(Murphy, 2010). The pain in the knee may be sufficient to affect walking ability in some adults with CP.

Foot pain is common in an adult with CP due to abnormal lever arms which results in deformed feet with degenerative changes in the hindfoot, midfoot and forefoot regions (Murphy, 2010). This gives rise to poor weight bearing surfaces which can make for painful walking and transfers. These altered weight-bearing surfaces can also impact on balance and postural anticipatory responses, further limiting functional abilities.



Cervical stenosis, a narrowing of the spinal column can have a dramatic impact on someone's mobility at any point across the lifespan. Harada et al (1996) found that people with athetoid cerebral palsy have a greater risk of cervical stenosis. Clinically, cervical stenosis has been observed in anyone with asymmetry and rotation components to their movement. Cervical stenosis combined with heightened spinal changes that occur with ageing such as disc degeneration and instability can lead to rapid declines in function and devastating neurological impairment (Murphy 2010).

Health professionals must be hyper vigilant when supporting anyone who is at risk. Given the many individuals with cerebral palsy who have asymmetry and repetitive rotational movements in the cervical spine, a neurosensory assessment must form part of every assessment, with education for the individual about the importance of having this type of assessment every year. Testing power, reflexes and sensation regularly are likely to be the most sensitive assessments to pick up change and to handover to medical staff to initiate further investigation.

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In the event of deterioration, medical assessment and input is considered urgent and should changes be accompanied by rapid decline in function, the situation is considered a medical emergency. Without surgical intervention, there is a very high risk of devastating neurological decline. Medical investigations such as MRI and CT Scans are likely so that neurologists, neurosurgeons and spinal surgeons can determine the best course of action. Following surgery, intensive rehabilitation will be required to restore to as close to original function as possible. The level of function returned will be dependent on degree of cervical stenosis, speed of diagnosis and response to rehabilitation.

Pain and injury around the shoulder and elbow can impact the ability of people with physical disabilities to maintain their independence with transfers and walking. Pain and injury to their upper limb can be devastating for those who rely on elbow crutches or forward-facing walkers to walk or transfer using wall rails. Regular review of mobility equipment, biomechanics of the upper limb, postural education and training and preventing pain and injury must form part of support for anyone who transfers through standing or walks with support. Implementing wheeled mobility for long distances is also encouraged.

Other factors that influence mobility

Other factors that can influence the ability to continue walking and transfer include fatigue, weight gain, physical activity, decreasing balance, falls, increased spasticity, contractures, a decrease in muscle strength and physiological burn-out syndrome.

Fatigue is a major contributor to a decrease in function (McGinley, Pogrebnoy & Morgan, 2014).

An increase in weight has been linked to a decrease in mobility status as increasing weight means that more load and stresses are placed on the body and energy expenditure increases (Plasschaert, Jones & Forward, 2008).

Physical activities such as strengthening, balance exercises and walking training have been linked to improved balance, walking capacity and speed (Andersson et al, 2014). Physical activities have also been shown to have a positive psychosocial benefit (Mulligan, 2011).

A decrease in balance and an increase in falls has been frequently reported as a main reason for changes in mobility throughout adulthood (Morgan and McGinley, 2013). The consequences of falling include soft tissue injuries, fractures and an increase of



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fear of falling, which results in individuals reducing their activities (Pieterse et al, 2006, cited in McGinley, Pogrebnoy & Morgan, 2014).

Physiological burn out is a condition where the body's systems are placed under stress over an extended period of time, resulting in eventual exhaustion of the system (Pimm, 1992). This leads to a decline in functional abilities such as walking and transfers. It is important to prevent physiological burnout before it occurs, as it cannot be reversed (Pimm, 1992).



Steps to maintain walking or transfer abilities

- Protection of joints from early in life, via:
 - Splinting
 - Energy conservation
 - Use of mobility equipment
 - Gait and transfer training
 - Surgery as early as possible to correct lever arm dysfunction and promote better alignment of muscles and joints.
 - Maintenance of healthy body weight.
 - Regular physiotherapy and occupational therapy reviews to monitor for change.
 - Annual neurosensory assessment by physiotherapists and doctors.
 - Education around the importance of monitoring and not ignoring pain, fatigue and changes in function.
 - Reviews covering all aspects of life – home, work, community, day and night.
- Education about the benefits of mobility equipment such as wheelchairs, scooters or walkers from an early age, support with introducing these into daily life, and understanding of equipment as a means to maintaining independence instead of an 'end of the line' option.
 - Education and encouragement around participation in ongoing health and therapy services, for individuals with physical disability of all levels, to detect small problems before they become bigger ones.



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