Purpose: To systematically review and compare the daily habitual physical activity levels and sedentary times of young people with cerebral palsy to their typically developing peers and to physical activity guidelines. Method: After searching electronic databases, two reviewers independently applied criteria. Studies were required to include young people with cerebral palsy (up to 18 years) and to quantitatively measure habitual physical activity, defined as activity across at least one day. Data extraction was independently verified, and quality analysis completed by two reviewers. Results: Of 895 identified studies, six moderate to high quality studies were included. There were four measures of habitual physical activity. Participants were aged 5 to 18 years and typically had moderate to high gross motor function. Across all ages and levels of motor function, young people with cerebral palsy participated in 13% to 53% less habitual physical activity than their peers. Levels of activity were approximately 30% lower than guidelines. Sedentary times were twice the maximum recommended amount. Conclusions: Young people with cerebral palsy participate in significantly lower levels of habitual physical activity than their peers, and less than recommended guidelines. Long-term negative health consequences of inactivity such as metabolic dysfunction, cardiovascular disease and poor bone density are therefore more likely. Keywords: Cerebral palsy, physical activity, sedentary time, young people

Background

Young people with cerebral palsy are at risk of reduced habitual physical activity and increased sedentary time, due to the physical impairments that characterize their condition. Levels of habitual physical activity in young people with cerebral palsy do not meet the recommended levels to maintain good health. Clinicians should encourage and facilitate opportunities to increase habitual physical activity and reduce the amount of time spent sedentary to optimize long-term health outcomes.

Implications for Rehabilitation

- Young people with cerebral palsy have reduced levels of habitual physical activity compared with their typically developing peers. Levels of habitual physical activity in young people with cerebral palsy do not meet the recommended levels to maintain good health.
- Clinicians should encourage and facilitate opportunities to increase habitual physical activity and reduce the amount of time spent sedentary to optimize long-term health outcomes.

The long-term effects of reduced habitual physical activity and increased sedentary time can lead to a greater risk of developing secondary health problems such as metabolic dysfunction, cardiovascular disease and poor bone density. These problems can in turn result in poorer overall health, reduced life expectancy [2] and therefore a greater burden of disease in years of life lost to disability and ill health [3].

Physical activity has been defined as ‘any bodily movement that results in energy expenditure’ [4]. The term ‘habitual physical activity’ differentiates a single instance of energy expenditure, for example, standing from a chair, from the accumulated measurement of all physical activity performed over at least one day [5]. Therefore, habitual physical activity consists of things such as occupationally related activity, leisure activities as well as organized and spontaneous sports games. Habitual physical activity can be measured in a number of ways, including the doubly labeled water technique, a noninvasive method that uses two stable isotopes of water, and their differences in rates of loss from the body, to measure energy expenditure above resting level [6]. Physical activity...
is also measured via step counts with a pedometer, through quantifying the duration and intensity of activity with an accelerometer and by describing the type and quantity of daily physical activities using self-report and proxy questionnaires.

Ideally, childhood should be marked by high levels of intense play and habitual physical activity. Besides providing opportunity for creative games and promoting gross motor skill development, it has been suggested that these periods of increased physical activity provide protective health benefits [7,8]. These include benefits to the skeletal system in the form of weight-bearing, to healthy body composition in the form of weight maintenance and to psycho-social health in positively assisting the development of self esteem and self-concept [7,8], and in improving mental health [7]. In addition, it has been demonstrated that physical activity is dose-dependent in young people, meaning that with increasing physical activity comes increased health benefit [9].

Just as habitual physical activity can be an indicator of overall health, so too can a person’s level of sedentary time, with increasing evidence detailing the negative effects that prolonged inactivity has on multiple body systems, including the metabolic and cardiovascular systems [10,11]. Increased sedentary time is thought to have a negative effect on the metabolic and cardiovascular systems independent to the amount of exercise participated in during a week. Rather than being two ends of the same spectrum, physical activity and sedentary time are thought to encompass two different – though as yet fully unknown – cellular responses [12]. Consequently, for optimal health it is recommended that the amount of time spent sitting still or lying is limited, and the level of habitual physical activity increased.

Recommendations describing the ideal levels of activity and limits to sedentary time have been developed by numerous governments as part of public health campaigns. In addition, global recommendations now also exist [13]. Young people with cerebral palsy, due to difficulty with movement, may be a vulnerable group who find it challenging to meet the physical activity guidelines, therefore predisposing them to the negative health implications associated with low levels of physical activity and high levels of sedentary time. This systematic review aimed to directly compare the levels of habitual physical activity and sedentary time of children and adolescents with cerebral palsy to that of their typically developing peers. Secondarily, it aimed to compare the levels of habitual physical activity and sedentary time of those with cerebral palsy to physical activity guidelines, to assess whether the amount of time spent in habitual physical activity or in sedentary behavior met the recommended levels.

Method

Study selection

Articles were identified through a systematic search of the following electronic databases, from the earliest available date up until September 2011: AMED, AMI, CINAHL, the Cochrane Library, EMBASE, ERIC, Medline, PEDro, PsychINFO and ProQuest. Key search terms included “cerebral palsy,” “physical activity,” and “exercise,” along with their synonyms and MeSH terms. These searches were supplemented with citation tracking of included papers using Google Scholar and reviewing the reference lists of included papers. An example of a search is included in Appendix 1.

Studies were included if they were written in English, quantitatively measured either habitual physical activity or sedentary behaviour, included participants with a diagnosis of cerebral palsy, included a population with a mean age of 18 years or less and compared their habitual physical activity data to that of normative data or to matched typically developing peers. Studies were excluded if they only reported a qualitative aspect of physical activity. Studies were also excluded if they did not provide raw data for analysis. Inclusion and exclusion criteria were applied independently by two reviewers (Stacey L. Carlon, Karen J. Dodd), who discussed any differences of opinion until consensus was reached.

Data collection process

A standardised form was developed and used for data extraction. Information was collected under the broader headings of study design, demographics of participants, outcome measures and measurement procedure, statistical analysis and reported results. For the included research papers data extraction was performed by one reviewer (Stacey L. Carlon). Data entry was independently verified by a second reviewer (Nicholas F. Taylor).

Risk of bias in individual studies

The quality of each included paper was assessed using a quality assessment checklist for observational studies, based on the criteria described by Khan et al. [14] and previously modified and applied by Shields et al. (Table I) [15]. The five quality criteria aimed to determine whether or not each of the studies had an appropriate level of internal validity and employed the use of a relevant statistical test. Each item was scored as either having been fully met (two points), partially met (one point), or not having been met at all (zero points). Quality assessment was completed by two reviewers independently (Stacey L. Carlon, Nicholas F. Taylor).

Synthesis of results

Standardized mean differences (effect sizes) were calculated by dividing mean differences between the groups by the pooled standard deviation (Hedges g). Standardised mean differences were used as they allowed for comparison of data across the studies, despite using different units of measurement of physical activity. Cohen’s descriptors were used to

<table>
<thead>
<tr>
<th>No.</th>
<th>Criterion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Was the study based on a representative sample selected from a relevant population?</td>
</tr>
<tr>
<td>2</td>
<td>Were the criteria for inclusion and exclusion explicit for both the children with cerebral palsy and the children with typical development?</td>
</tr>
<tr>
<td>3</td>
<td>Were the two groups comparable on all potential confounding factors?</td>
</tr>
<tr>
<td>4</td>
<td>Did the outcome measurement tools used demonstrate sufficient validity for comparing the physical activity levels of the groups?</td>
</tr>
<tr>
<td>5</td>
<td>Was an appropriate statistical analysis used?</td>
</tr>
</tbody>
</table>
The age range of participants covered all school ages, from 5 to 18 years, with mean ages ranging from 5.9 to 13.7 years (Table II). There were no data on the physical activity levels of pre-school aged children with cerebral palsy. Three studies had substantially more males represented [27,28,30]. Gross Motor Function Classification System (GMFCS) [31] levels were reported in five studies [25–28,30]. Most participants were classified at either GMFCS level I (47.1%) or II (27.2%), with 14.1% classified at level III, 7.3% at IV and only 4.6% at level V, suggesting that more than half of the participants had moderate to high levels of gross motor skill. Of those reported, 78% of participants with cerebral palsy had a diagnosis of spastic hemiplegia or diplegia, with relatively few young people with other motor types and distributions.

Details on the typically developing comparison groups were limited across each of the six studies, either through insufficient information on their recruitment [28,29], details of where they were sourced [26], or a lack of demographic data [27].

From the three studies that reported data on schooling, most participants with cerebral palsy attended a mainstream school (64%), with one third enrolled in a special school or rehabilitation centre (Table II).

Four measures of habitual physical activity were utilized in the six studies. The doubly labeled water technique [25,29] gave data as a ratio of total energy expenditure to activity-related energy expenditure, resulting in the calculation of physical activity levels A biaxial accelerometer [26,28], worn on the ankle, provided a single-leg step count for each participant. The Physical Activity Questionnaire [27] gave an overview of the activities completed in the preceding week, along with a rating of frequency or intensity. A previously unpublished proxy questionnaire of physical activity [30] collected data on both structured and unstructured physical activity, with data produced in both metabolic equivalents of tasks and in hours of participation in structured sport.

In all studies the young people with cerebral palsy performed significantly less habitual physical activity than their typically developing peers, regardless of the outcome measure employed (Table III). A meta-analysis of the between-group differences was not performed due to the heterogeneity of the groups studied and the outcome measures applied. As Table III shows, calculated effect sizes ranged from 0.40 (moderate) to 1.80 (large), both of these from the same study [28]. Expressed in another way, the habitual physical activity levels of young people with cerebral palsy were 13% to 53% less than their typically developing peers. A record of sedentary time, in this case television viewing time, was only provided in one study [27]; there were, however, no data from the typically developing population with which to compare.

Comparison of the physical activity levels of young people with cerebral palsy to recommended exercise guidelines demonstrated that young people with cerebral palsy typically have greatly reduced levels of daily activity (Table IV). In the absence of recommended levels for children and youth, data obtained for PALs were compared to adult guidelines [32]. The recommended daily step count for young people was 12,000 to 15,000 [33], though this was halved as the results measured
Table II. Summary of included studies.

<table>
<thead>
<tr>
<th>Author</th>
<th>QA/10</th>
<th>Sample size</th>
<th>Sex</th>
<th>Age mean and SD</th>
<th>GMFCS %</th>
<th>Motor type and distribution (%)</th>
<th>IQ/cognition/schooling (%)</th>
<th>SES</th>
<th>Comparison group</th>
<th>PA outcome measure</th>
<th>Units of measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bell et al. (2010)</td>
<td>9</td>
<td>n = 32</td>
<td>M: 16 F: 16</td>
<td>CP: 8 year 7 month (2 year 7 month)</td>
<td>I: 50</td>
<td>Diplegia: 56</td>
<td>Learning difficulties: 1</td>
<td>Not reported</td>
<td>TD siblings and friends of participants with CP (n = 6 siblings)</td>
<td>PAL calculated as a ratio of TEE. TEE measured by the doubly labeled water technique</td>
<td>PALs</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>TD: 8 year 1 month (2 year 2 month)</td>
<td>II: 50</td>
<td>Hemiplegia: 44</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Range: 5–12 years</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bjornson et al. (2007)</td>
<td>7</td>
<td>n = 111</td>
<td>M: 57 F: 54</td>
<td>CP: 11 year 10 month (1 year 4 month)</td>
<td>I: 31</td>
<td>Not reported</td>
<td>Not reported</td>
<td>Parental education levels: vocational school or college: 39.5% CP and 26.7% C</td>
<td>Sex matched TD youth in the same age range, known to participants with CP</td>
<td>Stepwatch Activity Monitor, worn for 7 days.</td>
<td>Steps per day</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>TD: 11 year 11 month (1 year 3 month)</td>
<td>II: 30</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Range: 10–13 years CP &amp; TD</td>
<td>III: 20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maher et al. (2007)</td>
<td>8</td>
<td>n = 678</td>
<td>CP: M: 76 F: 35</td>
<td>CP: 13 year 8 month (1 year 11 month)</td>
<td>I: 37.8</td>
<td>Diplegia: 33.9</td>
<td>Mainstream: 73.2</td>
<td>972.6 (85.1) CP (Australian mean: 1000 [100])</td>
<td>Data obtained from PAL study with TD youth of the same age range</td>
<td>PAQ-A, with 7 day reference frame and 51.5% response rate</td>
<td>Mean PA questionnaire score and sedentary activity in hours per week</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>II: 24.3</td>
<td>Hemiplegia: 29.5</td>
<td>Special: 19.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>III: 9.0</td>
<td>Quadriplegia: 22.3</td>
<td>Disability unit: 2.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IV: 15.3</td>
<td>Athetoid: 4.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>V: 13.5</td>
<td>Ataxia: 4.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Unspecified: 5.4</td>
<td>Other: 3.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Stevens et al. (2010) | 6     | n = 54      | M: 44 F: 10 | Means and SDs not reported | I: 77.7 and II: 22.2 | 4–10 years: diplegia: 71.4; hemiplegia: 14.3; triplegia: 7.1 and quadriplegia: 7.1 | Not reported              | TD children recruited through public advertising | Stepwatch Activity Monitor, Data collected over 3 weekdays and 1 weekend day | Steps per day and percentage of daily time spent inactive | (Continued)
Table II. (Continued)

<table>
<thead>
<tr>
<th>Author</th>
<th>Sample size</th>
<th>Sex</th>
<th>Age: mean and SD</th>
<th>GMFCS %</th>
<th>Motor type and distribution (%)</th>
<th>IQ/cognition/schooling (%)</th>
<th>SES</th>
<th>Comparison group</th>
<th>PA outcome measure</th>
<th>Units of measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Van den Berg-Emons et al. (1995)</td>
<td>n = 20</td>
<td>M: 10 and F: 10</td>
<td>CP: M: 7 year 10 month (1 year 7 month) and F: 8 year 3 month (1 year 3 month)</td>
<td>Pre-GMFCS publication: 'Ambulant': n = 9 and 'Wheelchair': n = 1</td>
<td>Spastic diplegia 100</td>
<td>Not reported</td>
<td>TD children who volunteered to participate</td>
<td>Daily PAL measured as a ratio of TEE to SMR, via the doubly labeled water technique</td>
<td>PALs</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>CP: 5 F: 5 in each group</td>
<td>TD: M: 8 year 5 month (1 year) and F: 8 year 5 month (1 year)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Range: 6–10 years CP and TD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zwier et al. (2010)</td>
<td>n = 154</td>
<td>M: 80; F: 74</td>
<td>CP: 6 year (1 year)</td>
<td>I: 56</td>
<td>Spastic diplegia: 47</td>
<td>Regular school: 57</td>
<td>Not reported</td>
<td>Children from two mainstream schools</td>
<td>Unpublished proxy questionnaire with 7 day reference frame</td>
<td>METS x hours per week and total sports duration in hours per week</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>CP: 58; F: 39</td>
<td>II: 21</td>
<td>Spastic hemiplegia: 43</td>
<td>Ataxic: 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>TD: 22 F: 35</td>
<td>III: 17</td>
<td>Ataxic: 4</td>
<td>Special school: 43</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>TD: 5 year 11 month (1 year)</td>
<td>IV: 6</td>
<td>Dyskinesia: 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Range: 5–7 years</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CP, cerebral palsy; GMFCS, Gross Motor Function Classification System; METs, metabolic equivalents of tasks; PA, Physical Activity; PALs, physical activity levels; PAQ-A, Physical Activity Questionnaire for Adolescents; QA, quality assessment; SES, socioeconomic status; SMR, sleeping metabolic rate; TD, typically developing; TEE, total energy expenditure.
only the steps of a single leg. In one instance, young people with cerebral palsy were measured as taking only half of the recommended amount of daily steps [28]. Dutch guidelines provided recommendations for the amount of time and intensity of exercise participation per week [34], and young people with cerebral palsy were found to participate in approximately half the amount of activity, at just over half the intensity [30]. Considering sedentary time, where screen time refers to hours spent in front of either a television or computer monitor for nonacademic purposes [35], results from one study reported an average screen time of 28.6 h per week, which is double the maximum recommended amount [27]. Typically developing young people met the recommended activity levels in the two studies measuring PALs [25,29] and the two studies counting steps [26,28].

**Discussion**

The results of this systematic review confirm clinical impressions that young people with cerebral palsy participate in substantially less habitual physical activity than their typically developing peers. In addition, when compared with guidelines, young people with cerebral palsy showed physical activity amounts that were greatly below the daily levels encouraged by national health bodies and levels of sedentary time far in excess of recommendations. The health and social benefits of exercise and high levels of habitual physical activity are well recognized [7,8], and can be considered an especially important issue to address in young people with cerebral palsy, given the inherent difficulty with posture and movement that this population have. Age-related changes may combine with other factors to result in a decline of functional ability throughout adolescence [36]; a requisite amount of physical activity may act to delay some of this decline [37]. It is concerning that young people with cerebral palsy have significantly lower levels of physical activity than both their typically developing peers and the recommended activity guidelines. Reduced levels of activity are indicative of a lower degree of general health and contribute to an earlier entry into the cycle of inactivity and corresponding health concerns. This review highlights that young people with cerebral palsy are at great risk of the long-term health consequences of reduced levels of habitual physical activity and increased sedentary time.
A key feature of this review has been the consideration of the sedentary time in addition to levels of habitual physical activity. Recent research in adult populations has highlighted the predictive nature of increased sedentary time to both greater waist circumference and diagnosis of the metabolic syndrome, independent of the levels of physical activity being completed and the time spent in moderate intensity exercise [10,11]. The implication of this being that a person may still be at risk of poor health outcomes if levels of sedentary time are high [38,39], despite meeting physical activity guidelines. Physiologically, if this pattern is similar in young people, it suggests that strong emphasis may need to be placed on a twotiered approach to physical activity. In clinical practice, this could mean encouraging an increase in the levels of exercise participation and developing innovative ways to limit the total time spent in sedentary pursuits, ensuring that prolonged periods of sedentary time are broken up with bursts of movement and activity. Practical examples, such as those used in public health campaigns and implemented in other populations could include designing and integrating supportive standing work stations in classrooms [40]. Also, in a similar vein to the Walking School Bus [41], time could be allocated for students to walk or self-propel their wheelchairs between classes, rather than remaining stationary or being attendant propelled between locations. It might also be beneficial for health professionals to write activity prescriptions as a part of highlighting the importance of and encouraging clients to increase their habitual physical activity [42].

Despite the strong rationale for implementation, there are barriers – both personal and environmental – in addition to physical challenges, which often limit the successful implementation of activity programs for people with physical impairments. In working with young people with cerebral palsy, therapy aims may need to specifically address, through education and mentoring, personal limiting factors such as those that are based on a lack of information, those with an origin of fear, for example a fear of injury, or limiting factors relating to time management and priority development [43]. More broadly, environmental barriers such as a lack of appropriate equipment at an accessible price and limited access to fitness venues [44] may need to be addressed through therapy advocacy and input to public policy development.

Information on habitual physical activity levels and sedentary time is available for school-aged children (5–18 years). However, information about younger children with cerebral palsy under the age of 5 years is unavailable. Therefore, as yet, we have no empirical evidence about the activity levels of young children with cerebral palsy compared to their typically developing peers, or to recommended guidelines on play for this population. Future research measuring physical activity in this younger age group will add to a more thorough life-span description of the impact of cerebral palsy. In a typically developing population it has been suggested that physical activity behaviors in childhood and adolescence do, to an extent, carry over to the habits formed as adults [45,46]. Being able to quantify the pattern of activity discrepancies between younger children with cerebral palsy and their typically developing peers will assist in the development of specific, targeted and evidenced based interventions from a younger age, with the goal of maximizing health and fitness in the short and long term.

Results of this review must be interpreted with the knowledge that most of what is known about habitual physical activity is confined to school-aged children and adolescents with spastic cerebral palsy who have a higher gross motor function. At a population level, figures from the Australian Cerebral Palsy Register suggest that around 30% of the population of young people have gross motor levels classified at GMFCS I and almost 20% at level II [47]. In contrast, almost 75% of the participants in the included studies were described as having gross motor function at GMFCS levels I and II. In addition, the representation of young people with a diversity of topological distributions and motor types was also limited, resulting in a reduction of the overall generalizability of the findings. Although there is currently limited data, it could be hypothesized that those with a greater physical disability are likely to be even more physically inactive, since difficulty with movement is increased, as evidenced in one study that described habitual physical activity across a diverse population [27]. As young people with gross motor classifications of GMFCS I and II can experience a reduction of function and activity with age [48], and those with higher levels of motor impairment may complete less activity, the key point remains that opportunities for habitual physical activity for young people with cerebral palsy across all spectrums of function needs to be facilitated.

In the absence of age appropriate recommendations, the application of adult guidelines for measurement of levels of PALs in a population of young people was a limiting factor of this review. Compared to guidelines for the recommended number of daily steps for children and youth, levels for young people were seen to be greater than the levels recommended for adults. It is therefore possible that for comparisons of activity to PAL guidelines, the results of this review provide a conservative estimate of habitual physical activity for children and youth. Related to this, there are concerns about whether such guidelines are applicable to young people with cerebral palsy where levels of habitual energy expenditure and hence activity levels may be affected by abnormal muscle tone. However, two of the studies included in our review measured habitual physical activity directly with the doubly labeled water technique [25,29] and the results of these studies were consistent with the conclusion of substantially reduced PALs in this population. There may also be concerns regarding studies that used accelerometers to measure habitual physical activity in people with cerebral palsy may not provide an accurate representation of habitual physical activity, due to the movement disorder and abnormal muscle tone associated with cerebral palsy, and the effect that this could have on monitor readings. However, the two studies in our review that used accelerometers used the StepWatch device, which has demonstrated excellent criterion validity when assessed against manual step counting in young people with cerebral palsy [26]. A recent systematic review compares the reliability, validity and clinical utility of all objective measures of habitual physical activity [49], allowing clinicians and researchers to assess the outcome measures and make decisions best fitting their given population and setting.
Conclusions

Regardless of the outcome measure used, young people with cerebral palsy appear to be less habitually physically active than their typically developing peers, as well as less active than recommended by physical activity guidelines. In addition, from the small amount of data available, it can be seen that levels of sedentary time in young people with cerebral palsy are also far higher than recommended. For these reasons, a key role for many clinicians working with young people with cerebral palsy is to encourage and facilitate opportunities to increase habitual physical activity and reduce the amount of time spent sedentary, in order to optimize long-term health outcomes.

Declaration of Interest: The authors report no declarations of interest. The content and writing of this paper is a product of the authors alone.

References


16. Bania T, Dodd KJ, Taylor N. Habitual physical activity can be increased in people with cerebral palsy in order to optimize long-term health outcomes.

Declaration of Interest: The authors report no declarations of interest. The content and writing of this paper is a product of the authors alone.
Habitual physical activity and sedentary time


Appendix 1

Sample search strategy

- Exp cerebral palsy
- (Cerebral palsy or hemiplegia or diplegia).ti,ab
- 1 or 2
- Exp physical activity
- (Physical activity or exercise or sport).ti,ab
- 4 or 5
- 3 and 6

Limit to English language.