Continuing Professional Development Series:
What is the evidence for the effect of hip abduction in standing on hip integrity in children with cerebral palsy?

Introduction and resources required
The following information is based on a literature review carried out in January 2016 by us and our distribution partner, Otto Bock US, in response to an increasing number of questions from clinicians.

This introductory information presents the clinical and research contexts for abducted standing, hip integrity, how we arrived at the need for a literature review, and why it is important to critically evaluate the evidence available from a clinical point of view. Please read the introduction, and obtain as many references as possible, particularly the three which are directly relevant to the research question – we will be looking at these in more depth over the next few weeks.

The clinical importance of maintaining hip integrity
Children with cerebral palsy (CP) are no more likely to be born with hip problems than any other children (Pope, 2007), yet hip dislocation is a real problem for children with CP. An estimated 15% - 20% of the whole CP population is affected (Hagglund, et al., 2014), but this rises to 70%-90% for children at GMFCS levels IV-V (Soo, et al., 2006). In addition to non-ambulation, children at particular risk are those aged 2-5 years with spastic or dyskinetic CP (Hagglund, et al., 2014). Hip dislocation can result in pain, difficulties with positioning and functional abilities, contractures, skin breakdown, difficulties with personal hygiene and other orthopaedic complications (Soo, et al., 2006; Spiegel & Flynn, 2006; Hagglund, et al., 2007; Dalen, et al., 2010; Willoughby, et al., 2012; Paleg, et al., 2013). Maintaining hip integrity for children with CP is therefore a key multidisciplinary aim amongst postural management teams.

Hip dislocation
Hip dislocation is described as “the gradual, lateral displacement of the femoral head from under the acetabulum, and is measured by a migration percentage (MP)” (Mayson, 2011).

The MP is determined radiologically (by X-rays) and is calculated as \( MP = \frac{A}{B} \times 100 \) (Hagglund et al, 2014), Figure 1.

In the population of children with CP, a hip is considered normal when the MP is less than 30%; subluxed when the MP is greater than 30%; and dislocated when the MP is greater than 90% (Spiegel & Flynn, 2006; Hagglund, et al., 2014).

Figure 1: Calculating Migration Percentage
(Adapted from http://www.biomedcentral.com/content/figures/1471-2474-8-101-1.jpg)
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Static standing frames and hip integrity
Standing frames are commonly used as part of postural management programmes to provide a number of physiological and psychosocial benefits for children with cerebral palsy, including maintaining hip integrity (Pin, 2007). The research evidence for this passive stretching practice is limited in general (Gough, 2009), and while there is more support for the benefits of increased bone density and muscle stretching (Pin, 2007), the role of static standing frames in the maintenance of hip integrity remains less clearly demonstrated.

A review by Paleg, et al., (2013) reported six papers relating supported standing programmes specifically to hip integrity, four of which were considered to support improvement. The authors concluded that there was “fair evidence, possibly effective” and gave the outcome a “yellow light” (p.241) to indicate the level of clinical relevance – i.e. “minimal evidence; proceed with caution” (p.233).

There is certainly a widely held clinical view that children with disabilities who stand at the typical developmental age of 12-16 months are considered more likely to form the femoral head and acetabulum of the hip joint (for example, Labandz, 2011; Labandz, 2010; Dobrich, 2010; Rosen, 2010; Silberstein, 2008). In addition, a MacKeith multidisciplinary consensus statement on 24-hour postural management for children with CP recommended that the most severely affected children (GMFCS levels IV or V) should be introduced to standing programmes at 12 months of age (Gericke, 2006).

Abducted standing frames and hip integrity
More recently a single, but heavily cited publication (Martinsson & Himmelmann, 2011), has fueled a clinical trend toward standing in ‘maximum tolerated abduction’ of up to 60° of bilateral hip abduction and 0° extension as a means of specifically developing and maintaining hip integrity in children with CP (see Figure 2).

Figure 2: Abducted standing
(http://blog.easystand.com/content/uploads/2015/05/Zing-MPS-Leg-Abduction.jpg)

The widespread promotion of the Martinsson and Himmelmann (2011) study and marketing of abduction standers by some manufacturers has created uncertainty amongst clinicians about the validity of their existing practice of standing without maximum abduction.
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While professional reflective practice is to be encouraged, it should be accompanied by a critical evaluation of all the available published evidence. This led to a review of the evidence about hip abduction and extension in standing frames.

Method
A review of the published literature was conducted on 10th December 2015. Databases searched were Ovid MEDLINE, Allied and complimentary MEdicine Database (AMED), Excerpta Medica database (Embase), Cumulative Index to Nursing and Allied Health Literature (CINAHL Plus), and Evidence Based Medicine (EBM) Reviews.

Search terms used were abduct* AND stand* AND cerebral palsy AND hip dislocation. 'Hip dislocation' was excluded from the AMED and CINAHL+ searches, as combining all four search terms yielded a zero return. This was not the case for the other databases.

Retrieved papers were limited to those published between 2000 and 2015 with abstracts, focused on children aged 0-18 years, and published in the English language.

Papers were included if they were experimental studies which investigated children with cerebral palsy who used an abducted standing device (legs positioned more than shoulder width apart).

Papers were excluded if they: reviewed existing research; addressed measurement of abduction or gait patterns; exclusively investigated other forms of treatment for hip spasticity (medical or surgical procedures) or conditions other than cerebral palsy; included abduction in other postures (such as sitting and lying) or postural management programmes; or were clinical commentaries.

Hand searches of reference lists were also conducted.

Results

<table>
<thead>
<tr>
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<th>Abduct*</th>
<th>Stand*</th>
<th>Cerebral Palsy</th>
<th>Hip Dislocation</th>
<th>Hits</th>
<th>Limits</th>
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</table>

Hand searches of reference lists 9 1

TOTAL 3

Table 1: Summary and results of search strategy
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Only three papers were located which matched the search criteria (see Tables 1 and 2).

<table>
<thead>
<tr>
<th>Author(s) and Publication</th>
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| Macias-Merlo et al. (2015)a  
Standing programs to promote hip flexibility in children with spastic diplegic cerebral palsy  
| Macias-Merlo et al. (2015)b  
Effects of the standing program with hip abduction on hip acetabular development in children with spastic diplegia cerebral palsy  
*Disability and Rehabilitation* DOI: 10.3109/09638288.2015.1100221 |  
| Martinsson & Himmelmann (2011)  
Effect of weight-bearing in abduction and extension on hip stability in children with cerebral palsy  
*Pediatric Physical Therapy* 2011; 23: 150-157 |

*Table 2: Summary of relevant studies retrieved*

**References**


![LECKEY](https://example.com/leckeys.png)
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Rosen, L., 2010. The need to stand: finding the appropriate standing system to find a client’s needs. Rehab Management [serial online], January.


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Links


www.csp.org.uk/faqs/cpd/what-do-i-need-know-about-continuing-professional-development

Declaration of interest from the authors of this review

1. Clare Canale is an Occupational Therapist and the Clinical Manager for Leckey. Leckey design and manufacture a range of standing frames, currently without 60° total bilateral hip abduction. VIDA, which is a member of the Leckey group, distributes the EasyStand Zing in the UK, a product with 60° total bilateral hip abduction.

2. Dr Andreas Kannenberg is a Certified Family Practitioner and the Executive Medical Director for Otto Bock North America. Otto Bock distributes Leckey products within North America.

Full contact details of authors are contained in the full document which will be provided at the end of the CPD series.

Next week...

Next week we’ll look at the research study by Macias-Merlo et al (2015)a in more depth.