

Standing: Facts and Myths



FINANCIAL DISCLOSURE

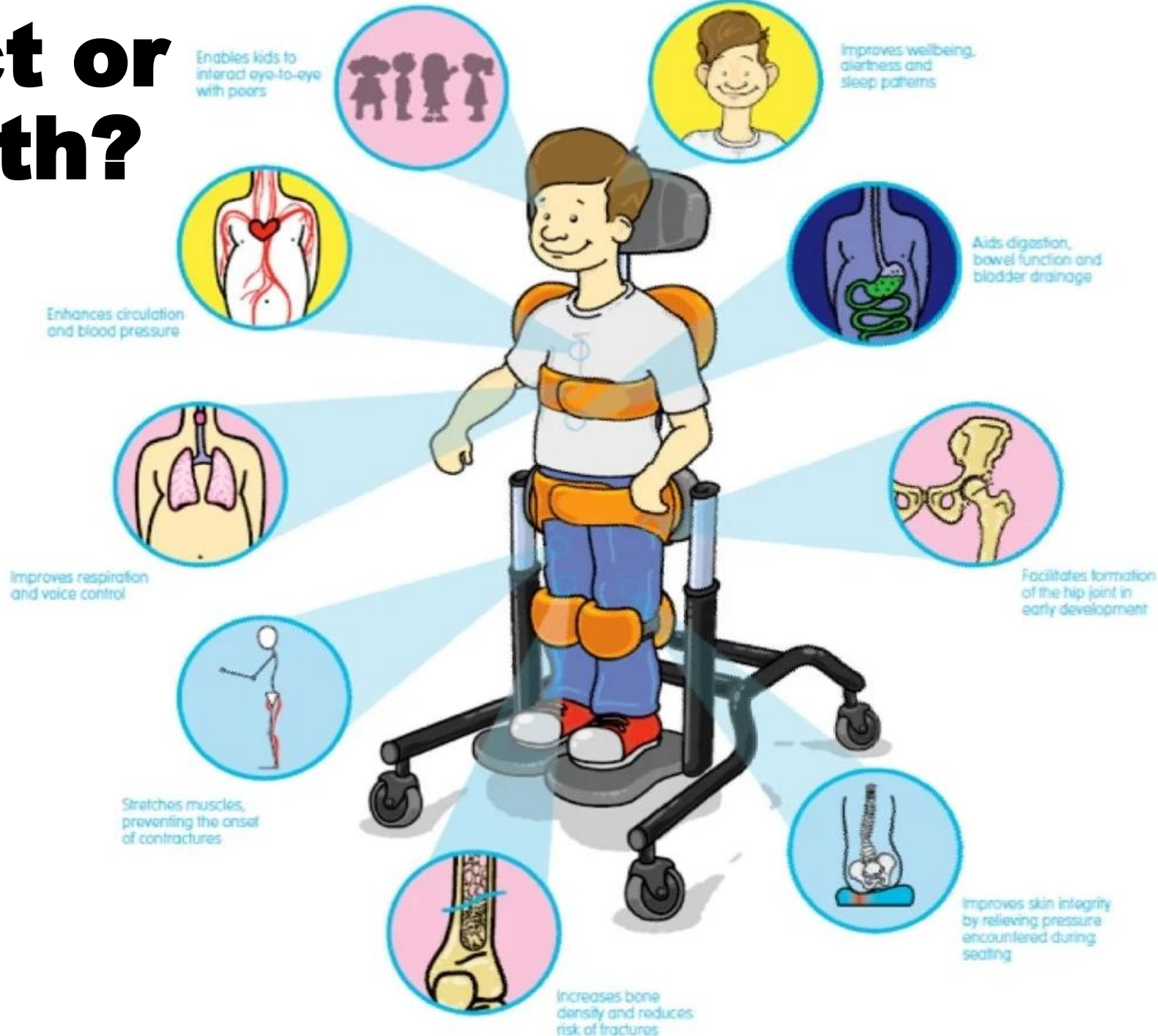
- Ginny Paleg, PT, DScPT
- I have the following financial relationships to disclose:
 - Consultant for: Prime Engineering
- I may discuss BoTox off label use and/or investigational use in my presentation.



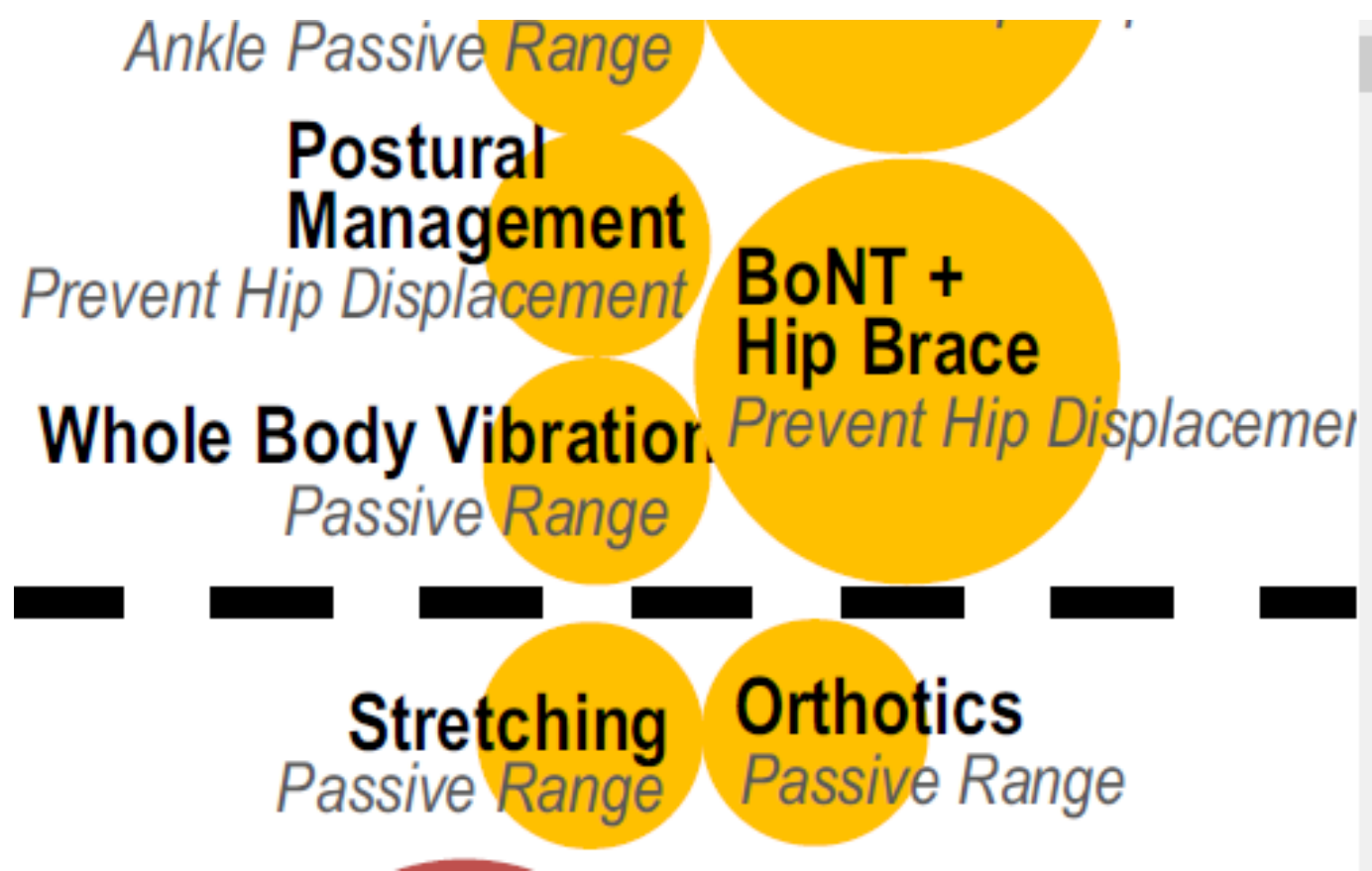
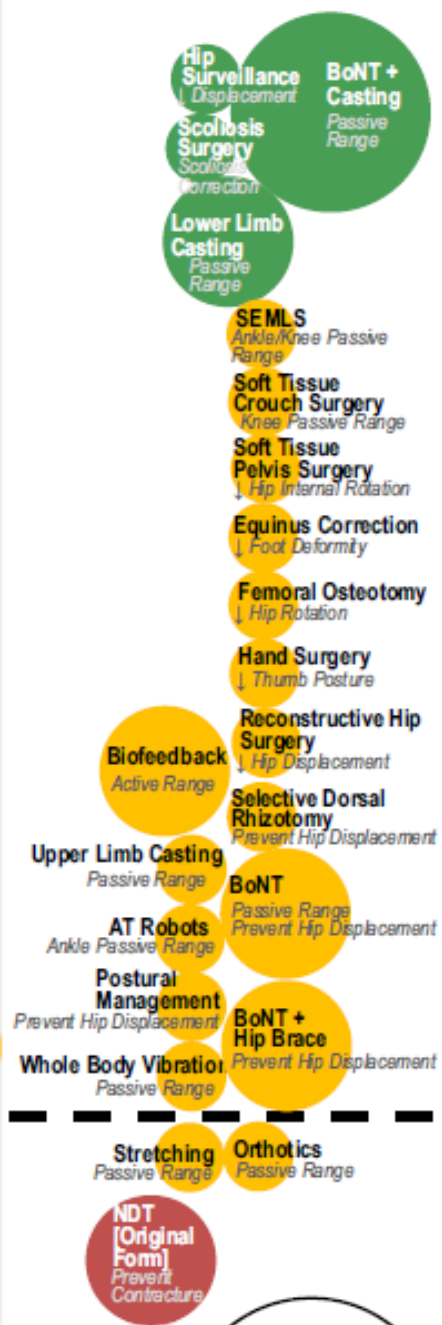
Why I want you to be in this session today?

- If we don't know the real evidence, we might not be basing our clinical decisions on the evidence
- People have the right to participate in different positions besides sitting and lying
- Standing is not “experimental” and we cannot not allow denials based on this

Fact or Myth?



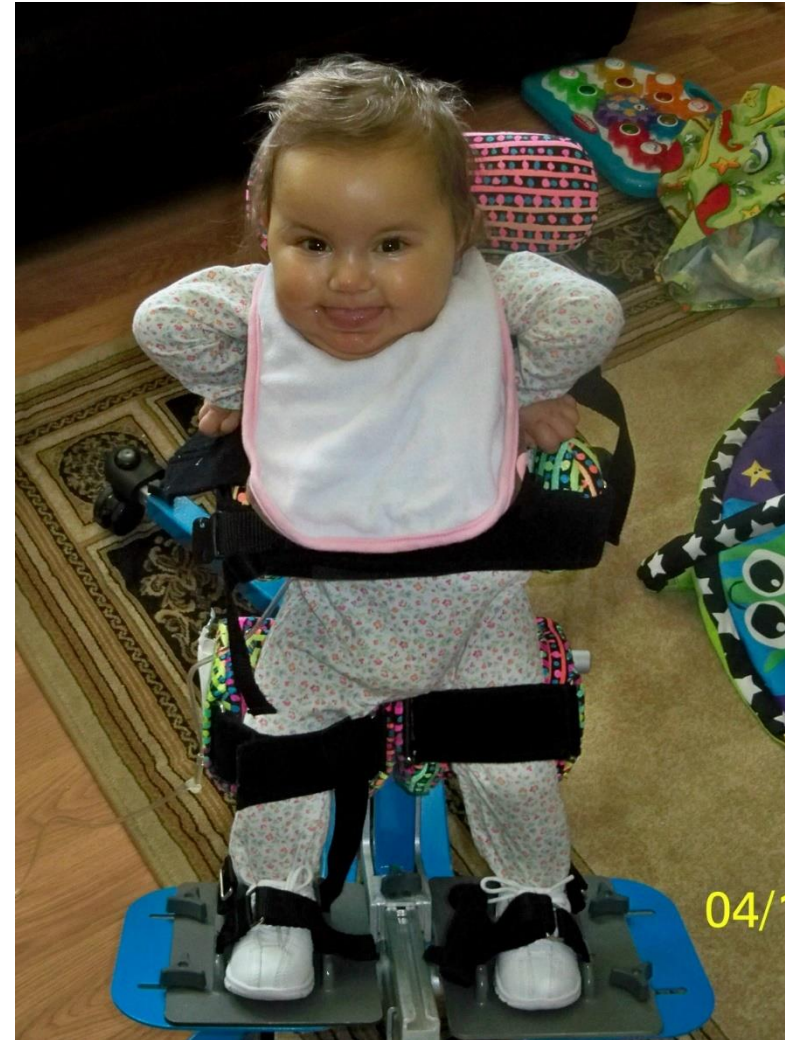
CONTRACTURE & ALIGNMENT



• Novak, 2020

Did We Miss Any?

- We are only bearing 68% of the weight thru the feet (2 studies)
- Sit to stand bore least weight since they were not usually all the way up



Did We Miss Any? (Rodby-Bousquet)

- People with CP are most aligned in their stander
- Asymmetrical hip contractures are a risk factor for hip subluxation
- Knee contractures are a risk for scoliosis



Goodwin, 2017 (UK Survey)

- Children began standing frame use at 1–11 years (median 3 years) and stopped use at 3–16 years (median 9 years 7 months)



Bouts?

- Can we stand in shorter increments multiple times a day?



What About Standing Wheelchairs?



RESNA Position on the Application of Wheelchair Standing Devices



BEGINNER-INTERMEDIATE

**Innovate to Participate: Beyond Body Structures and
Function (Using Sit-to-Stand Power Wheelchairs to
Increase Activity and Participation)**

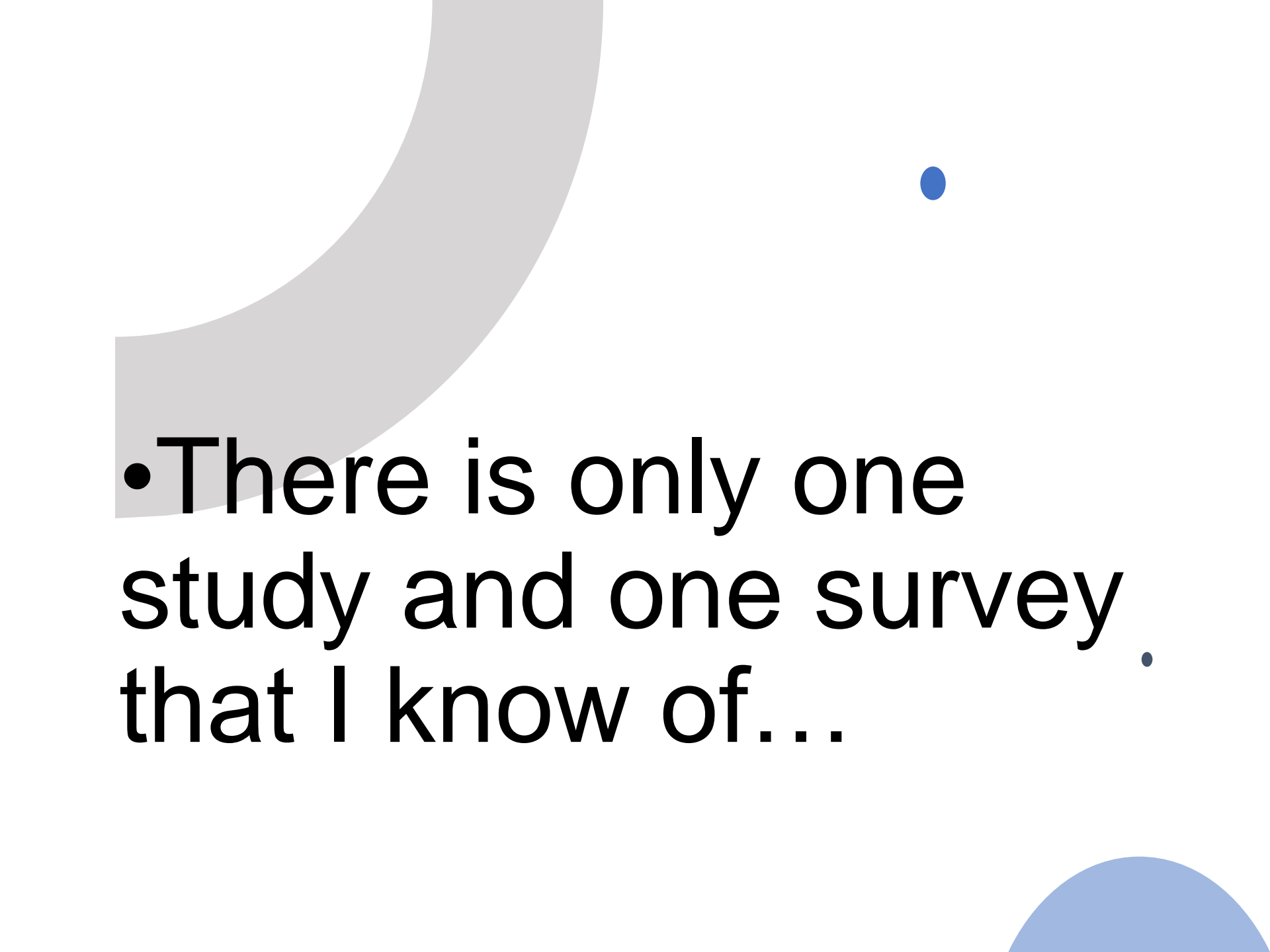
Kim Magnus, Lynore McLean

D6

INTERMEDIATE-ADVANCED

**Why Sit When You Can Stand? A Systematic Review
of the Evidence Related to Sit to Stand Wheelchairs**

Ruth Hanley, Emer Gunning, Jackie Bowler

- 
- There is only one study and one survey that I know of...

Supported Standing in Boys With Duchenne Muscular Dystrophy (Townsend, 2016)

- Methods: Four 12- to 15-year-old boys with DMD engaged in a home-based supported standing program for 6 to 12 months. A single-subject design was employed to examine muscle length. Bone mineral density was assessed at 4-month intervals using dual-energy x-ray absorptiometry.
- Results: Upright, sustained supported standing was tolerated in 3 of the 4 boys. Mean weekly stand times ranged from 1.3 to 3.3 hours. **Improved hip or knee flexor muscle length was seen in 3 of the 4 boys.** No boys showed improved plantar flexor muscle length or increased lumbar bone mineral density.





P1



P2



P3



P4

Fig. 1. Typical standing position of participants (P1-P4).



Vorster, 2019 (Australia)

- Adolescents with Duchenne muscular dystrophy
- Semi-structured interviews were conducted with 12 adolescents, 11 parents and 11 teachers
- “The device appeared to mitigate some of the challenges of progressive muscle weakness by providing the option for the individual with Duchenne muscular dystrophy to choose when and where to stand for participation in a range of activities, beyond what would be possible with existing therapeutic regimes involving standing frames.”



What are the Facts?

- The use of standing devices is **NOT experimental**
- There have been many published studies and systematic reviews since 1950
- Since stander use is standard of care, it would be unethical to have a control group that didn't stand at all
- The preponderance of evidence supports stander use for a few ICF domains

Standing Wheelchairs

- Do people actually go up and down?
- Do they extend their hip/knees fully?
- Is there weight bearing through the feet? Or is it the knees?
- If abduction is necessary, can you?
- Will having a standing w/c mean you can't get a traditional stander?
- Are the benefits the same?
- Is there adequate support/positioning?
- Sheer?

Let's Get Something Straight

- Cpu.p.se critical ROM Values
- For a child at GMFCS levels IV or V, 10 degrees on knees flexion contraction gets you trouble, -1 degree of hip flexion contracture get you in trouble

GMFCS IV – V	Red	Yellow		Green
Hip Abduction	$\leq 20^\circ$	$> 20^\circ$	$< 30^\circ$	$\geq 30^\circ$
Knee Popliteal angle	$\leq 120^\circ$	$> 120^\circ$	$< 130^\circ$	$\geq 130^\circ$
Knee Extension	$\leq -20^\circ$	$> -20^\circ$	$< -10^\circ$	$\geq -10^\circ$
Ankle Dorsiflexion (flexed knee)	$\leq 0^\circ$	$> 0^\circ$	$< 10^\circ$	$\geq 10^\circ$
Ankle Dorsiflexion (extended knee)	$\leq -10^\circ$	$> -10^\circ$	$< 0^\circ$	$\geq 0^\circ$
Hip Internal rotation	$\leq 30^\circ$	$> 30^\circ$	$< 40^\circ$	$\geq 40^\circ$
Hip External rotation	$\leq 30^\circ$	$> 30^\circ$	$< 40^\circ$	$\geq 40^\circ$
Elys' test	$\leq 90^\circ$	$> 90^\circ$	$< 110^\circ$	$\geq 110^\circ$
Hip Extension	$\leq -10^\circ$	$> -10^\circ$	$< 0^\circ$	$\geq 0^\circ$

Ideas



Standing wheelchairs are great for ADLs, environmental modification, vocational applications and, participation



Only one study : Range of Motion (Vorster is descriptive...)



You'll probably still need a traditional stander



In USA, you may lose your funding for a stander if your wheelchair has that function

Sitting all day
contributes
to mortality



van der Ploeg, 2014

- ❖ This study showed a dose-response association between standing time and all-cause mortality in Australian adults aged 45 years and older.
- ❖ Increasing standing may hold promise for alleviating the health risks of prolonged sitting



Standing and mortality in a prospective cohort of Canadian adults. (Katzmarzyk, 2014)



- ❖ Participants were followed for an average of 12.0 yr for the ascertainment of mortality status.
- ❖ There was a significant interaction between physical activity and standing. The association between standing and mortality was significant only among the physically inactive.
- ❖ **Standing may be a healthier alternative to excessive periods of sitting.**



Standing is Exercise for kids in GMFCS Level IV!

Israeli-Mendlovic, 2014

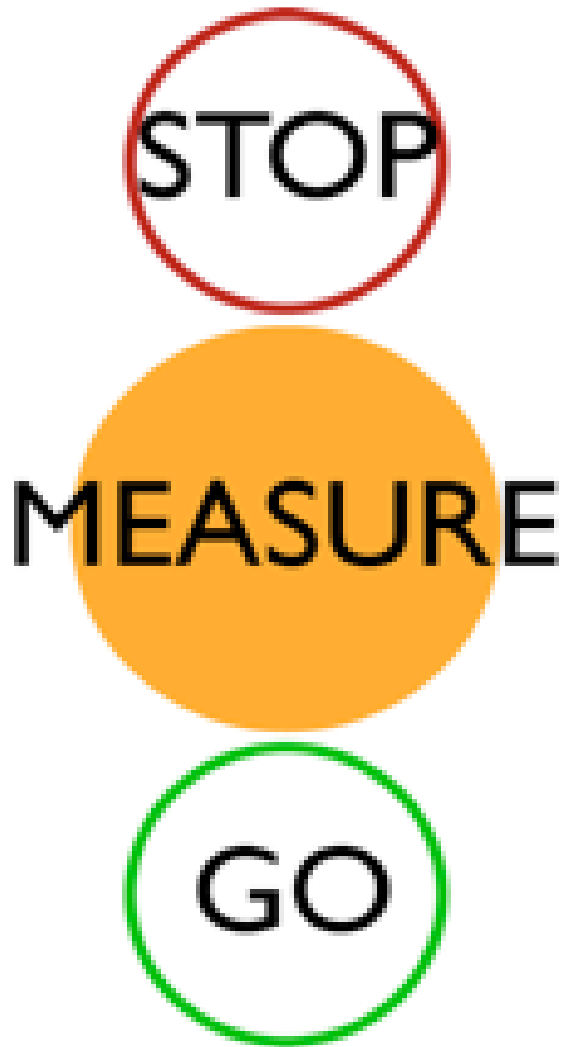
- ❖ N=30 w/ CP aged 6-12 years
- ❖ Children with GMFCS IV increased their Heart Rate and reduced Heart Rate Variability
- ❖ This may imply that the HR autonomic regulation system has an opportunity to be influenced by training



Standing is exercise! (Verschuren, 2014)



- ❖ Mean energy expenditure was >1.5 METs during standing for all GMFCS levels
- ❖ There was a non-significant trend for greater muscle activation for all postures with less support
- ❖ Only for children classified at GMFCS level III did standing result in significantly greater muscle activation compared with rest
- ❖ Changing a child's position to standing may contribute to the accumulation of light activity and reduction of long intervals of sedentary behavior



Levels of Evidence

- ❖ **Green Light Go!** Strong research evidence
- ❖ **Yellow Light** – weak evidence use a valid reliable clinical measurement tool
- ❖ **Red Light – STOP!** Evidence of harm or ineffectiveness

How it works

Quality of evidence

High
Moderate
Low
Very low

Very low
Low
Moderate
High



Strength of recommendation

Strong
Weak +

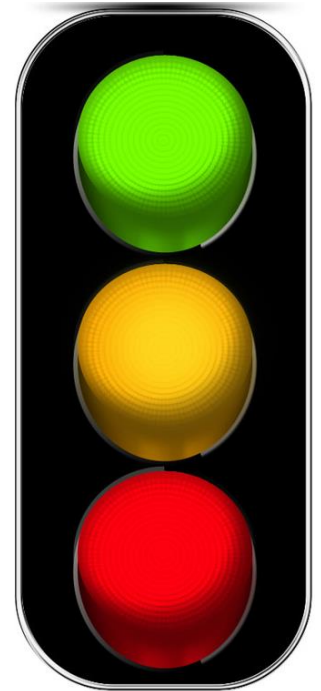
Weak -
Strong



Traffic light code

Green go
Yellow - Measure

Yellow - Measure
Red - stop



Third Party Payor Reviews of the Evidence

- Must be transparent – who did them, what are their qualifications
- How did the search for and find included studies?
- What criteria did they use to include or exclude studies?
- Which system did they use to evaluate studies?
- How did they measure/bias?
- They must present their data/findings in an established accepted manor
- How do they define experimental?

ADULTS

- Paleg G, Livingstone R.
- Systematic review and clinical recommendations for dosage of supported home-based standing programs for adults with stroke, spinal cord injury and other neurological conditions.
- BMC Musculoskelet Disord. 2015 Nov 17;16:358. doi: 10.1186/s12891-015-0813-x.
- PMID: 26576548 Free PMC Article



Paleg and Livingstone, 2015

Dosing for Adults

- ❖ **Strong** evidence supports the impact of home-based supported standing programs on **range of motion and activity**, primarily for individuals with stroke or spinal cord injury
- ❖ Mixed evidence supports impact on bone mineral density.
- ❖ Evidence for other outcomes and populations is weak or very weak.

Paleg and Livingstone, 2015

Dosing for Adults

- ❖ Dosage of 30 minutes 5 times a week may have a positive impact on most outcomes
- ❖ 60 minutes daily is suggested for mental function and bone mineral density.



Effgen, 2008



- Two of 3 studies provided **Level 1** evidence that weight bearing using a stander (Caulton, 2004) and weight bearing activities (Chad, 1999) increase bone mineral density (BMD) in the lumbar spine or femur of children with CP
- Pin (2007) concluded that static weight bearing “in a standing frame is a **simple but effective** way to increase BMD in children with cerebral palsy”



Hough, 2010

- Eight of 2034 articles met the inclusion criteria
- There were 3 trials of weight-bearing through varying approaches
- One (Caulton, 2004) showed a **large and significant effect** on the lumbar spine when increasing static standing time



Meta-analysis

- Weight bearing exercise has a **significant effect** on improving BMD of the femur in children with CP (Kim, 2017)



Reviews that include standing and/or weightbearing

Pin , 2007

Effgen, 2008

Arva, 2009

Glickman, 2010

Montero, 2011

Newman, 2012

Franki, 2012

Novak, 2013

Paleg, 2013

Paleg, 2015

Dicianno, 2016

Craig, 2016

Kim, 2017

Miller, 2017

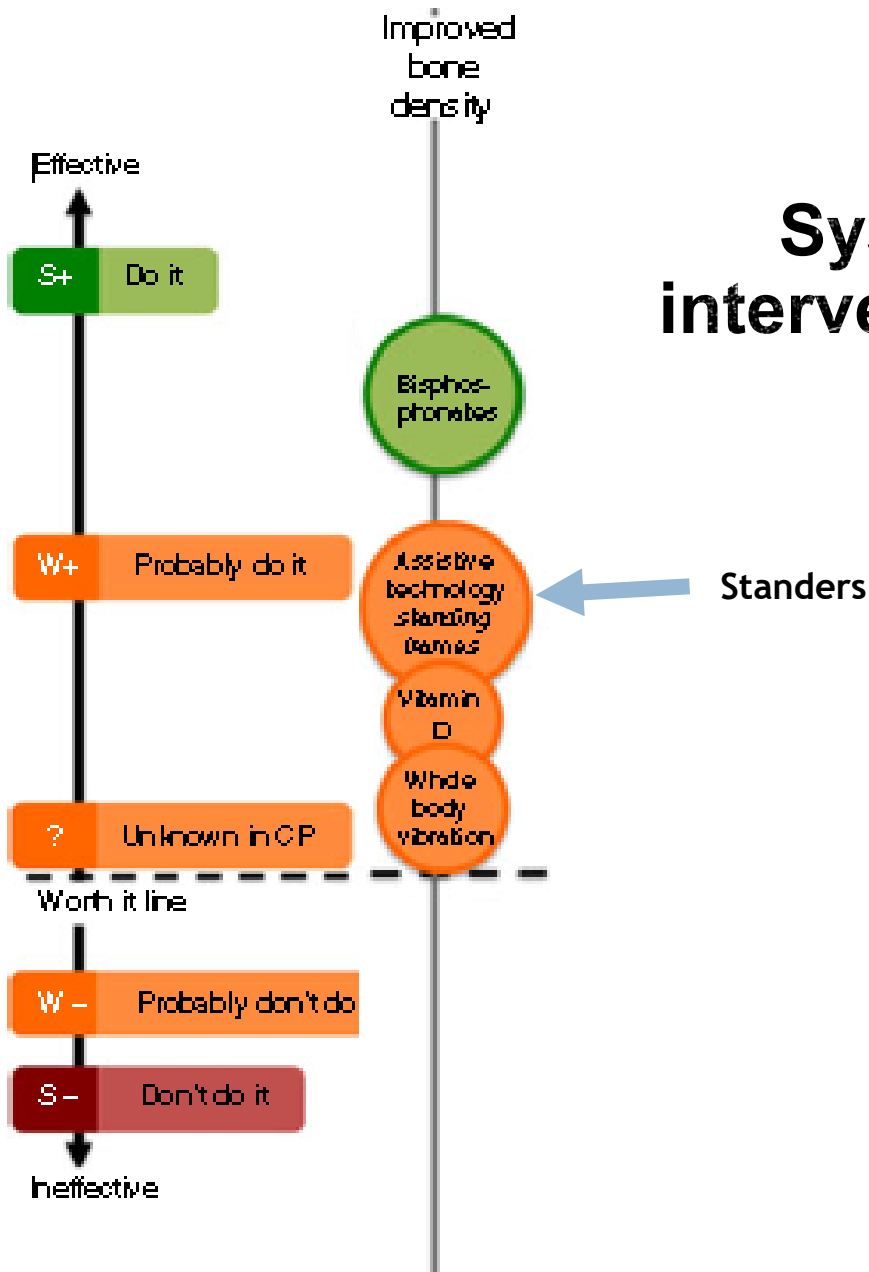
Meyling, 2018

Pérez Ramírez, 2019

Novak, 2020

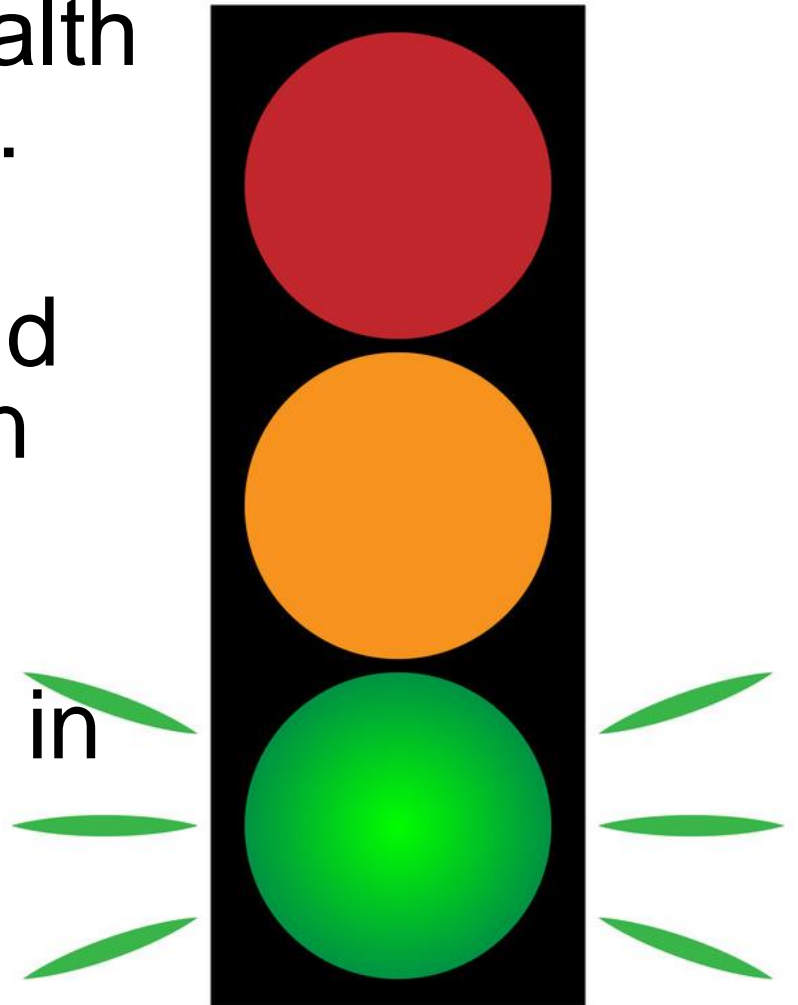
Systematic Review on ALL interventions for children with CP

Iona Novak, 2013 (Australia)



Novak, 2020

- ❖ “Green light allied health interventions include... weight-bearing”
- ❖ (BMD, Hip Health, and Contracture prevention are specifically mentioned)
- ❖ Standards not isolated in this review



Guidelines for Standers

- AACPD M Osteoporosis Care Path
- AACPD M Hypotonia Care Path

Care
Pathways



AACPDM RECCOMENDATION

- www.aacpdm.org/publications/care-pathways/osteoporosis
- Three prevention strategies are recommended:
- Nutrition and Calcium (Ca)
- Vitamin D2/D3 (VitD)
- Supplementation Weight Bearing, **use of a standing frame.**



AACPDM Hypotonia Carepath

0- 6 months						7-12 months						13-18 months						19-24 months						25-73 + months					
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	+	+	+	+
Massage ●●○○																													
Tummy Time ●●○○																													
Active Motor Therapy: goal-directed, child-initiated, therapist-coached, parent-delivered, context-relevant ●●○○																													
				Postural management and supported sitting ●○○○																									
						Compression garments ●○○○																							
							Adaptive equipment (gait trainers, standers) ●●○○																						
									Power mobility ●●○○																				
											Orthotics ●●○○																		
												Treadmill ●●○○																	
													Hip surveillance ●●○○																

CLINICAL GUIDELINE FOR STANDING ADULTS FOLLOWING SPINAL CORD INJURY

2013

**Spinal Cord Injury Centre Physiotherapy Lead Clinicians
United Kingdom and Ireland**



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Standing frames for children and adults

What are the Myths? (might be true, but we have no evidence)

- Standing helps the bladder, socialization, vision, wakefulness...
- Wheelchair standers are the same as standing devices
- Standing improves participation
- Abduction, prone and/or increased amounts of inclination decreases weight bearing



We Know What
Happens If We
Do Nothing!

Postural asymmetry in non-ambulant adults with cerebral palsy: a scoping review

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ABSTRACT

Purpose: Non-ambulant adults with cerebral palsy are vulnerable to development of postural asymmetry and associated complications. The primary aim of this scoping review was to identify postural deformities in non-ambulant adults with cerebral palsy.

Materials and methods: Comprehensive searches were undertaken in EMBASE, CINAHL, AMED, Cochrane, Psych INFO, and Joanna Briggs (1986–Jan 2017), supplemented by hand searching. Two reviewers independently extracted data using a customised tool focusing on study design, participant characteristics, postural descriptors, measurement tools, and interventions.

Results: From 2546 potential records, 17 studies were included. Variability in populations, reporting methodology, and measurement systems was evident. Data suggest more than 30% of this population have hip migration percentage in excess of 30%, more than 75% experience "scoliosis", and more than 40% demonstrate pelvic obliquity. Estimates ranged from 14% to 100% hip and 32% to 87% knee contracture incidence. Conservative interventions were infrequently and poorly described.

Conclusion: Many non-ambulant adults with cerebral palsy experience postural asymmetry associated with windswept hips, scoliosis, pelvic obliquity, and limb contracture. Options for non-radiographic monitoring of postural asymmetry should be identified, and conservative interventions formally were evaluated in this population.

ARTICLE HISTORY

Received 14 September 2017

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KEYWORDS

Cerebral palsy; posture; deformity; scoliosis; windswept; migration percentage

► IMPLICATIONS FOR REHABILITATION

- The common postural asymmetries of windswept hips, scoliosis, pelvic obliquity, and limb contracture require standardised clinical measurement.
- Radiography is most commonly used to monitor postural asymmetry in this population, but standardised positioning is not applied and may not be feasible indicating a need for alternate methods and rigorous documentation.
- The Posture and Postural Ability Scale may be considered for use in the management of body shape in adults with CP.

Our Challenge

- If we misrepresent the evidence, we lose all credibility
- We cannot allow third party payors to continue to deny funding stating that standing is “experimental”
- We cannot allow denial of a stander when child has a walking device
- We cannot tolerate arbitrary criteria

Our Burden

- To prove that standing wheelchairs are equivalent to traditional standers
- What if having a standing wheelchair blocks access to traditional standing devices?
- What about abduction?



**Time to
stand up
and fight for
a person's
right to
stand up!**

[https://www.who.int/
phi/implementation/
assistive_technology/
phi_gate/en/](https://www.who.int/phi/implementation/assistive_technology/phi_gate/en/)

Fact or Myth?

- Fact: Use of a standing device has **good/strong** evidence for a few ICF outcomes, and **weak** evidence for many ICF outcomes (but still evidence!)
- Your USA LMN must concentrate on **medical necessity in the home**
- Myth: We have all the evidence we need, our work is done

**Can we Talk? (ginny@paleg.com)
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