

Gross Motor Development Programming for Young Children with Visual Impairments

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Individuals with Visual Impairments



**SUNY
BROCKPORT**

Four Pillars

1. Leadership
2. Scholarship
3. Education
4. Program/Service



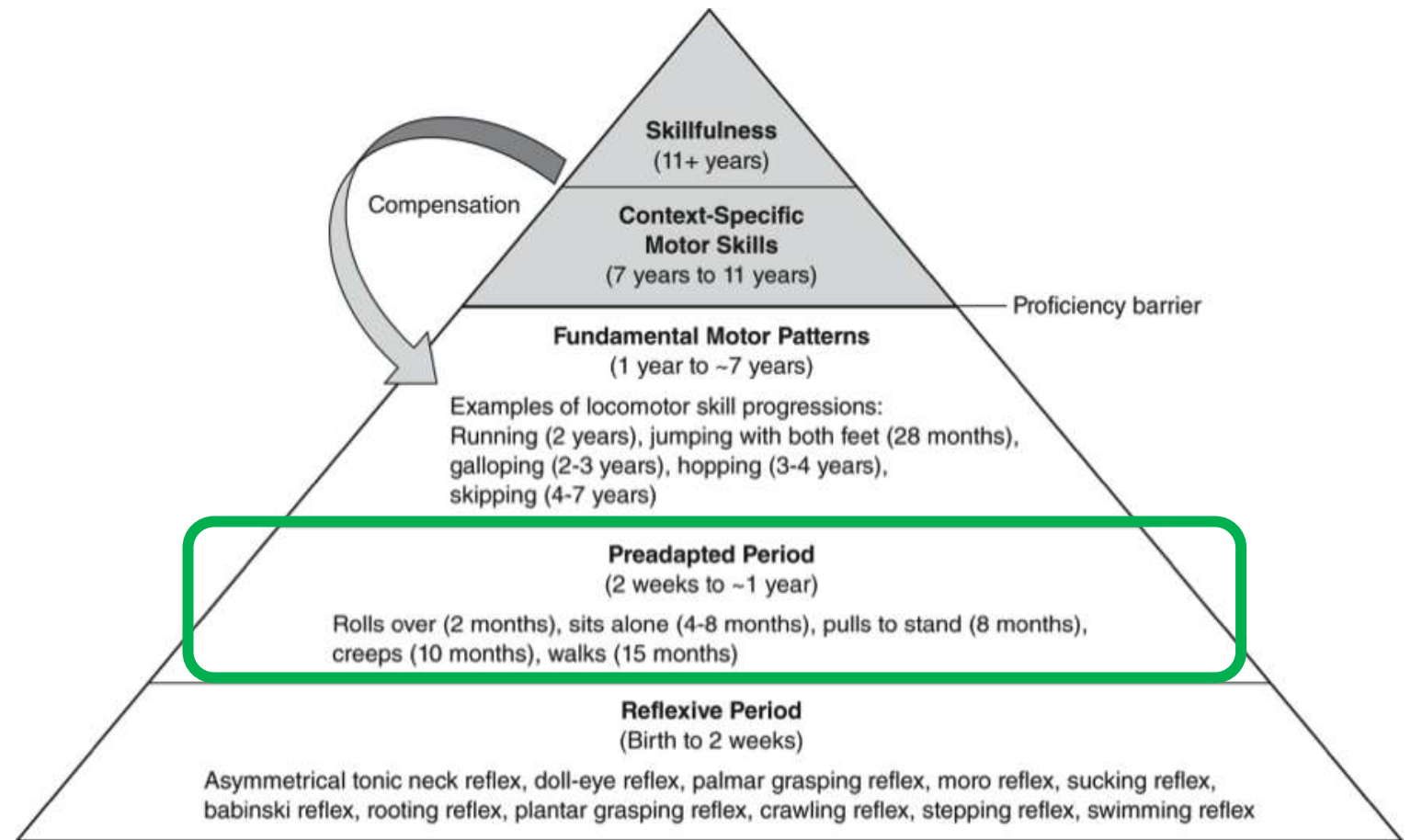
IMSVI



Institute of Movement Studies for
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Mountain of Motor Development



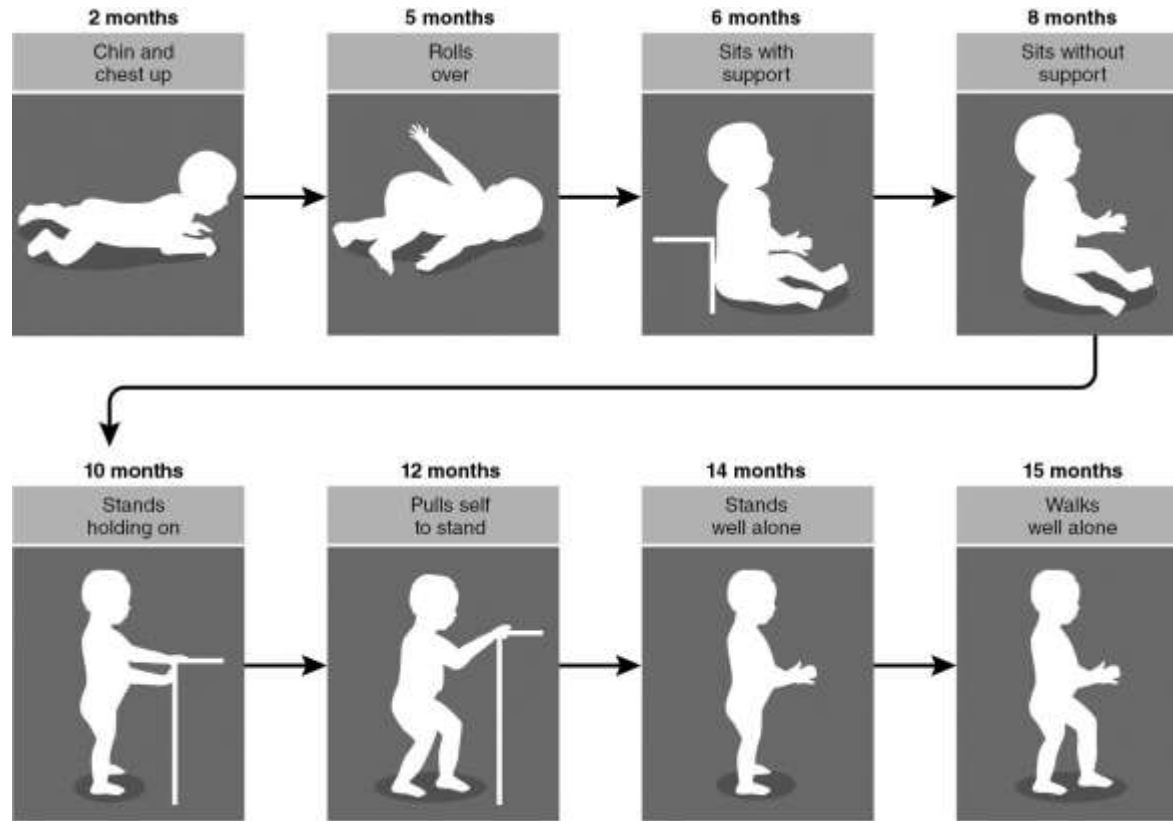
Adapted by permission from Clark and Metcalfe 2002.

Motor Milestones

- Voluntary, goal-directed movement
- Cortically controlled movements that, generally, follow predictable sequence
- Wide variation among individuals regarding when a particular skill will appear
- Take place in a cephalocaudal direction (aka head-to-toe)
- Each voluntary movement is a building block for subsequent movements



Infant Motor Milestone Sequence



Based on Shirley 1931.

Locomotor and Posture Motor Milestones

2 months: Lifts head in prone position

3 months: Lifts shoulders (turns head)



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Locomotor and Posture Motor Milestones

5 months: Rolls over, sits
supported



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Example:
Rolling Over

Reaching and Grasping

Attainment of sitting allows the infant to reach, grasp, and manipulate objects

- Occurs rapidly over the first 8 months
- Challenging (and important) skills because the infant incorporates haptic and visual perception along with motor control and coordination of the arms
- Development of reaching emerges given a confluence of both intrinsic and extrinsic factors



Locomotion: The Three Cs

01

Crawling (begins around 34 weeks of age)

- Sometimes skipped entirely
- Torso in contact with the ground

02

Creeping (begins around 9 months of age)

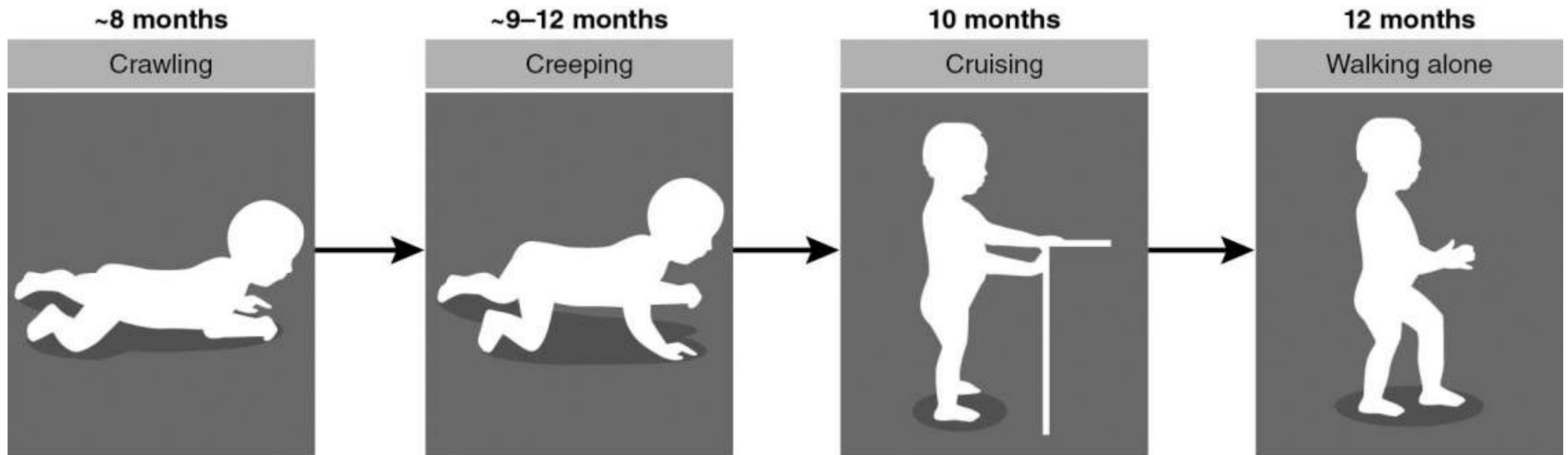
- Torso not in contact with the ground

03

Cruising (begins at 8-11 months of age)

- Moving laterally while upright, using both arms for support

Early Locomotor Progression





Crawling

**Creeping
8 months**



Cruising



Bear Crawl




Stands alone & walks with assistance



Independent Walking





Motor Milestones in Children who are Blind

- Delays found in fine-motor skills, & locomotion.
- The delay in posture control from the lower level of motor stimulation due to the lack of sight and cognitive prerequisites
- Blind infants must replace visuomotor coordination with an audioproprioceptive coordination and control of movement, were still lacking at this age.

CHARGE Syndrome

CHARGE syndrome is a disorder that affects many areas of the body. CHARGE is an abbreviation for several of the features common in the disorder:

- Coloboma
- Heart defects
- Atresia choanae
- Restriction of growth
- Genital abnormalities
- Ear abnormalities



Motor Milestones in Children with CHARGE Syndrome

Table 2.

Results of t-tests and means and standard deviations for age of motor milestone between children with and without CHARGE syndrome.

Motor Milestone	CHARGE (<i>N</i> = 28)		Controls (<i>N</i> = 32)		<i>t</i>	<i>df</i>	<i>p</i>	<i>d</i>
	Mean	SD	Mean	SD				
Holding head	8.68	5.01	2.32	1.42	5.29	20.81	<.001	1.73
Rolling over	10.05	3.40	3.87	2.00	6.21	28.43	<.001	2.22
Sitting w/o support	13.83	7.41	6.13	1.72	4.30	18.72	<.001	1.43
Crawling	16.19	5.85	7.61	2.56	5.42	20.05	<.001	1.90
Creeping	19.54	7.71	8.47	2.44	5.01	13.65	<.001	1.94
Standing with support	19.32	8.47	8.58	2.51	5.30	21.13	<.001	1.72
Standing w/o support	23.50	6.19	10.58	3.10	6.73	14.50	<.001	2.64
Cruising	22.39	10.21	10.76	2.46	4.71	18.87	<.001	1.57
Walking	26.27	6.44	12.42	2.34	6.88	11.55	<.001	2.86

Walking

- Development of independent walking is a complex task.
 - Muscles must be strong enough to support the body in an upright stance
 - Stable enough to allow balance shifts to occur.
- Children with VI are often 6 months or more delayed on independent walking (Haibach, et al., 2011)
- Children with CHARGE syndrome do not walk independently until 3 to 5 years of age (Hartsthorne, Hefner, Davenport, & Thelin, 2011; Hartsthorne et al., 2007).



Balance in Children with CHARGE

Haibach & Lieberman, 2013

- CHARGE Children (Mean 9.3 years SD 1.8 years)
- Controls - Average age began walking – 13.66 mths, SD 2.83 mths
- CHARGE – average age began walking 41.65 mths, SD - 17.35 mths
 - 14/ 22 fell in the last year
 - 14 indicated fear of falling
 - 9 used mobility aid
- Charge average PBS score (m 35.67; sd 14.69)
 - 12 of the 21 (57%) were at risk for falling
- Pbs was moderately correlated with abc scores ($r = 0.56$, $p = 0.008$)



Independent walking and balance in children with CHARGE syndrome

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Table 1. Correlations between balance measures and age at walking.

	WalkAge	Anticipatory	Reactive	Sensory	Dynamic
WalkAge	1.00	-.69*	-.69*	-.71*	-.60*
Anticipatory		1.00	.69*	.75*	.83*
Reactive			1.00	.68*	.66*
Sensory				1.00	.73*
Dynamic					1.00

* $p < .001$.

Table 2. Comparison of balance scores between children with and without CHARGE syndrome.

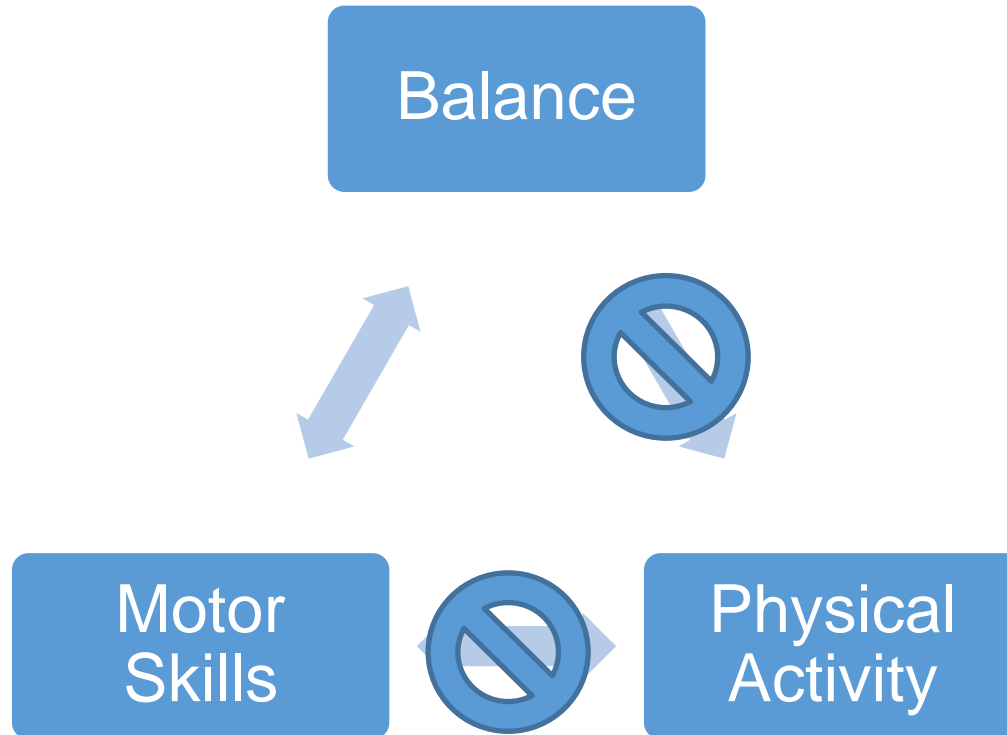
	CHARGE (N = 27)		Controls (N = 22)		Z	p	R
	Median	Range	Median	Range			
Anticipatory control	4.00	1.00–6.00	6.00	5.00–6.00	-5.96	<.000	.85
Reactive postural control	4.00	0.00–6.00	6.00	2.00–6.00	-3.89	<.000	.56
Sensory orientation	5.00	0.00–6.00	6.00	6.00–6.00	-4.07	<.000	.58
Dynamic gait	8.00	1.00–10.00	10.00	8.00–10.00	-3.94	<.000	.56



Walking and Balance in Children with CHARGE Syndrome

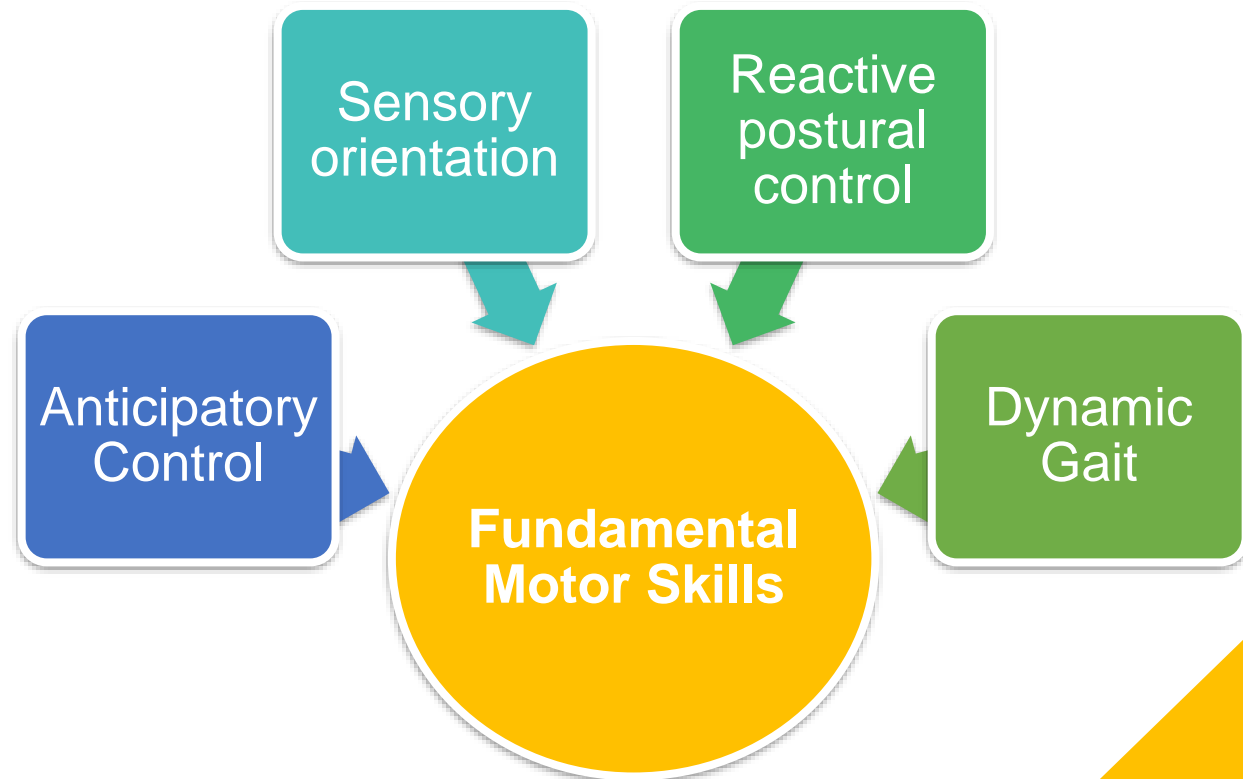
Physical activity

- Very low activity levels – paq-c
 - Summary score mean 2.3



So what?

Balance, especially anticipatory control, plays an important role in fundamental motor skills of children with CHARGE syndrome.




Locomotor Affordances

Infants are acquiring motor milestones in a continuously growing and changing body.

Infants must learn to adapt their movements to their changing body

Environmental affordances can change the acquisition of locomotor milestones.



Gross motor chart for children with low vision

Age Group	Milestones
Birth to 3 months	<ul style="list-style-type: none">Holds head steady while being movedLifts head up when on bellyElevates self by arms when on belly (totally blind or LP only babies may not do this until after they roll from back to belly)
4 to 6 months	<ul style="list-style-type: none">Sits with some supportRolls from belly to back, from back to bellySits alone steadilyPulls to standing (while holding your hands)Moves forward through crawling, creeping, or any other method
7 to 9 months	<ul style="list-style-type: none">Pulls self to sitting positionPulls to standing position (using furniture)Sits downAttempts to walk (while holding your hand)Creeps forward on hands and knees 3 feet or moreTakes coordinated steps (while holding your hand)
10 to 12 months	<ul style="list-style-type: none">Stands aloneBends down to pick up objectWalks sideways holding on to furnitureWalks alone (3 steps)Walks alone with good coordination (5 steps)Pushes small obstacles out of the wayWalks about house or yard independently
13 to 15 months	<ul style="list-style-type: none">Moves around large obstacleWalks up stairs with help, down stairs with help



Fine motor chart for children with low vision

Age Group	Milestones
Birth to 3 months	Plays with hands Uses hands for purposeful action Retains object placed in hand Plays with toys that produce sound
4 to 6 months	Reaches for object in contact with body with 1 hand (rather than 2) Places objects in mouth Uses pads of fingertips to grasp small objects Transfers object from hand to hand Brings object to midline Pulls objects out of container
7 to 9 months	Explores different textures Places object in container Pulls string to activate toy Plays pat-a-cake
10 to 12 months	Places one peg repeatedly into hole
22 to 24 months	Stacks large objects



Infants Who Are At Risk

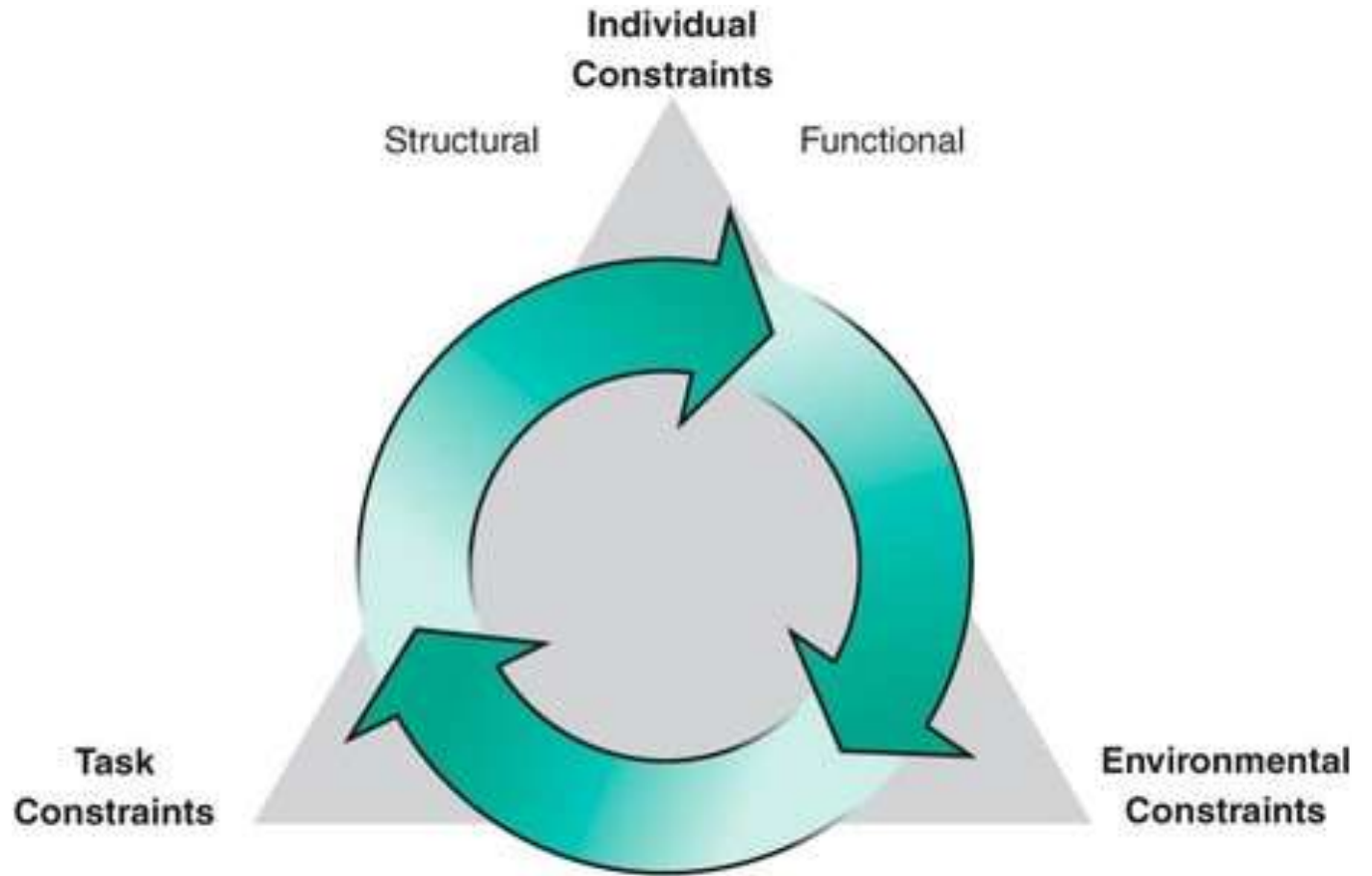
- **Early and accurate identification of infants at risk for movement problems is of significant importance**
- **Delays in the presentation of well-designed early intervention programs is problematic for infants who are at risk**
- **Neural plasticity is maximally present during infancy and early childhood, thus magnifying the need for early intervention**

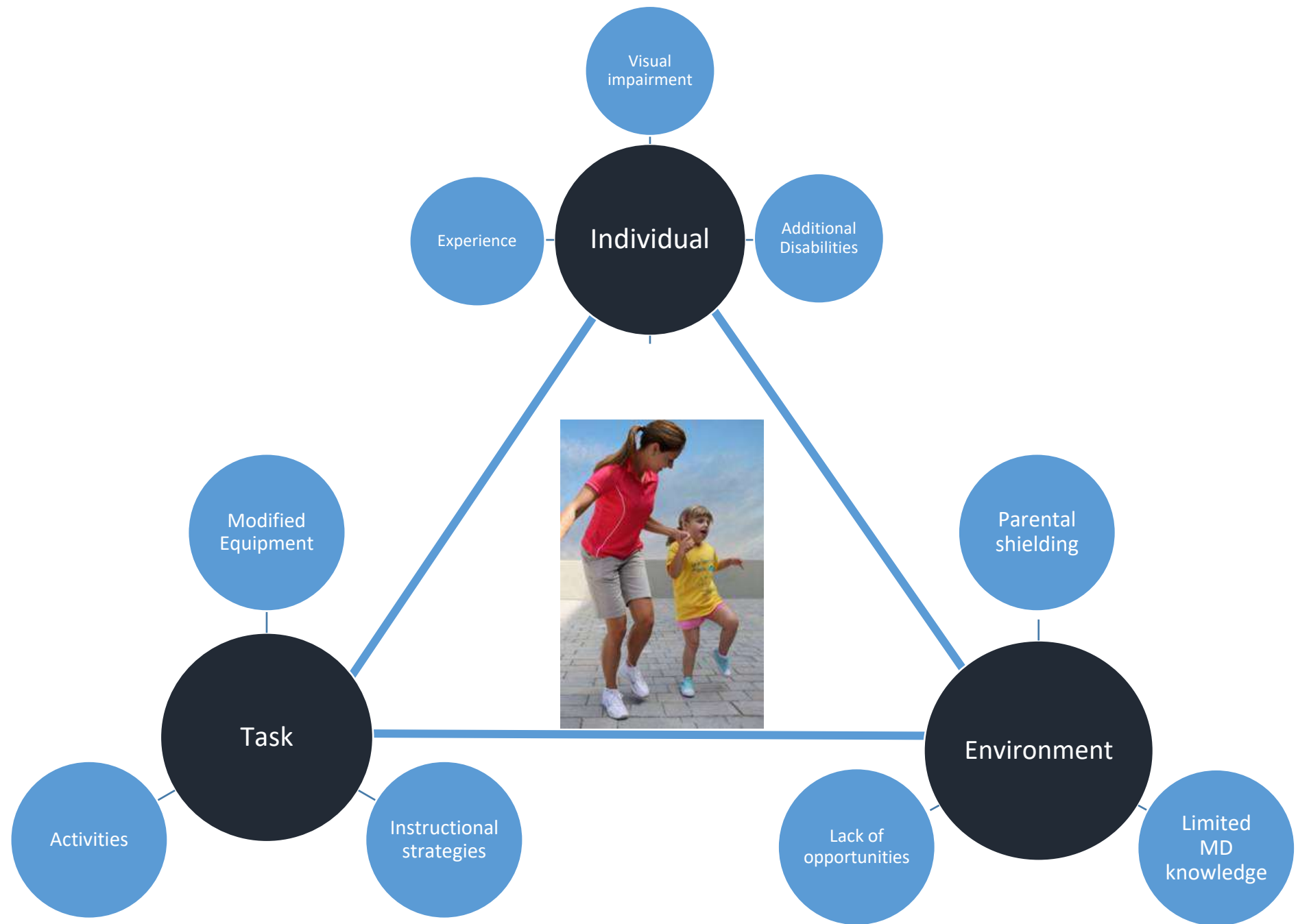
Interventions for Infants Who Are At Risk

Key points

- Do the interventions have proven efficacy?
- Have we identified important outcomes?
- Do we have, and are we appropriately using, the right assessment tools?
- Is the intervention being carried out effectively and consistently?

Newell's Model Constraints







Home Environment

Beach et al. (2021)

- Parents of young children with and without CHARGE syndrome aged 18-42 months
- Purposes: 1) to explore and describe the home environment from parents of very young children with CHARGE Syndrome and 2) compare these results to the home environment of typically developing children.

Affordances in the Home Environment for Motor Development

Outside Space

Inside Space

Variety of Stimulation

Fine Motor Toys

Gross Motor Toys

Home Environment Results

Participants with CHARGE acquired motor milestones, such as standing and age of independently walking, significantly later than their peers without disabilities

The groups only differed on outside space suggesting that parents of children without disabilities offer better outside space affordances than the parents of children with CHARGE

Age of walking for children with CHARGE syndrome was positively correlated with outside space ($r_s = .63, p = .038$), fine motor toys ($r_s = .70, p = .016$), gross motor toys ($r_s = .84, p = .001$), and total AHMED ($r_s = .88, p < .001$).



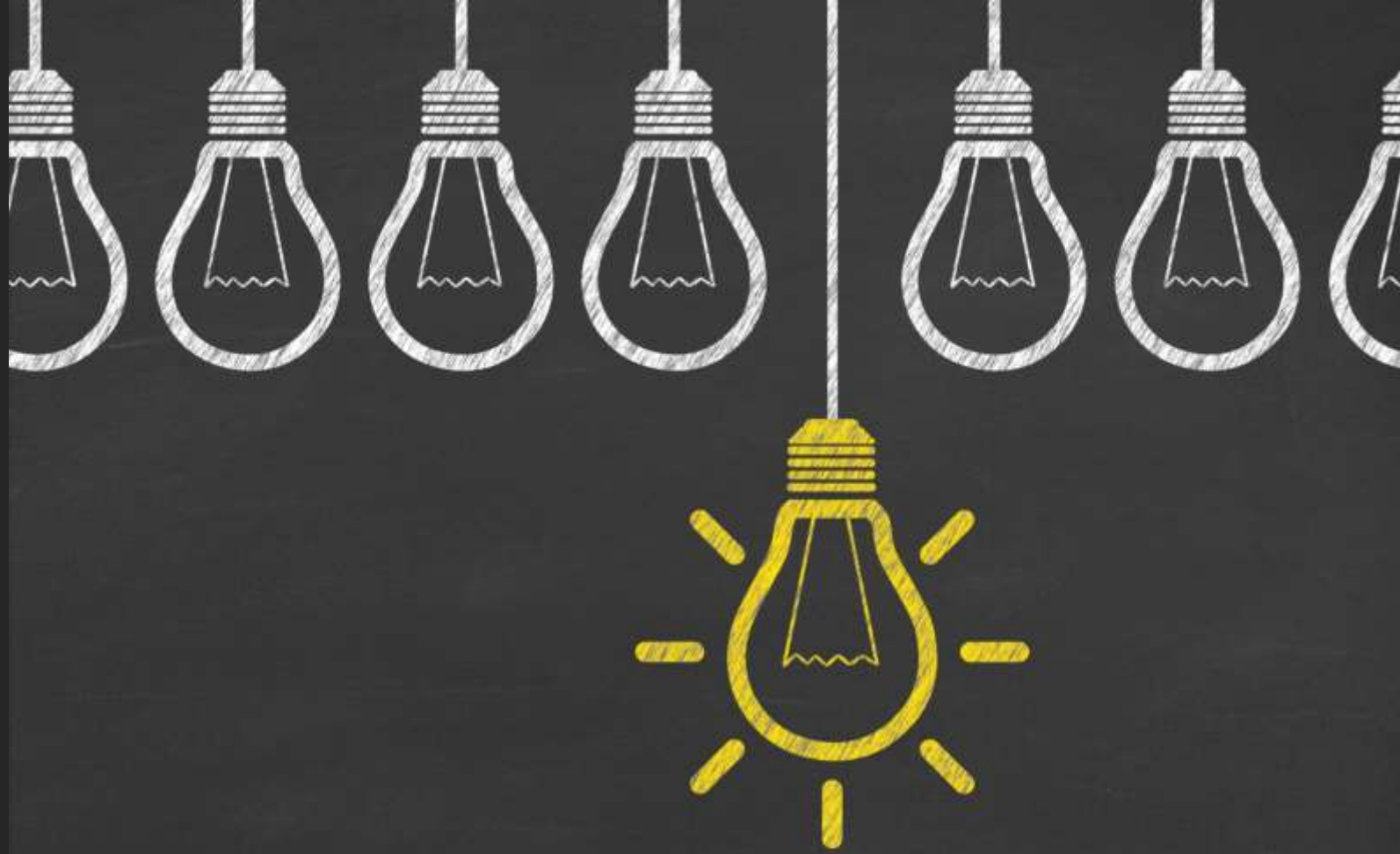
Importance of Home Environment


Results reveal the importance of home affordances in child motor development.

Motor skill development has an interactive effect with cognitive, emotional, and motor-perceptual development (Haydari, et al., 2009).

Home environment resources include toys and space, but also parental and family support such as encouragement, guidance, and regular engagement with their child.

Task & Environmental Strategies



A top-down photograph of a young child with blonde hair, wearing a white shirt with small red polka dots and white pants with colorful horizontal stripes. The child is sitting on a light-colored carpet and is focused on playing with a colorful stacking ring toy. The toy consists of several rings in various colors (red, orange, yellow, green, blue) that can be stacked on a central wooden post. The child's hands are visible, with one hand holding a ring and the other near the stack. A large, semi-transparent white circle is overlaid on the left side of the image, containing text.

Using Constraints to Design Developmentally Appropriate Movement Activities

- **Task**

- Bright Colored Balls and Toys
- Toys with sound
- Music

- **Environment**

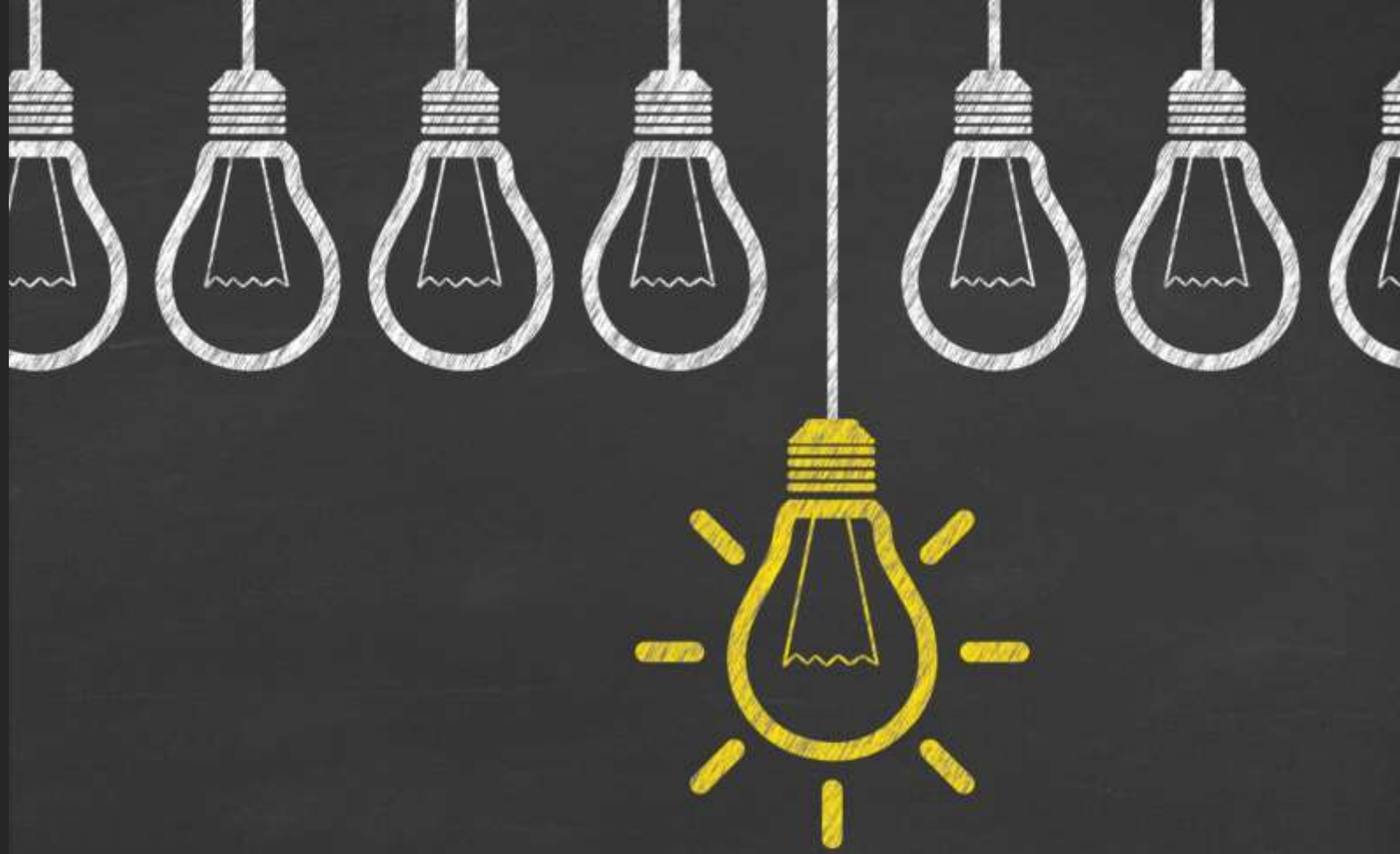
- Nonslip surface
- Instructional Strategies
- Parental Involvement
- Rich Environment
- Social interaction



Task (toy) Considerations

- Safety – Babies with low vision mouth toys more often
- Simple is often best
- Focus on textures, sounds, and high contrast
- Promotes manipulation or movement

Instructional Strategies



Encouraging Crawling

Progression 1 – Age 3-6 months

- Place on all tummy, with infant holding up on arms, push feet up to encourage them to push with feet

Progression 2 – Age 6-9 months

- Place infant on all fours supporting them under chest as they move forward
- Strengthens shoulder and neck

Crawling Assistance

Progression 3 – Age 6-9 months

- Place a hand towel around infant's torso
- Trains sensory and motor skills
- Option 2 – wheelbarrow; trains shoulder, arm, and neck

Progression 4 – Age 6 to 12 months

- Place a bright colored and/or auditory toy a couple of feet ahead of them

Share
challenges
and tips



Independent Walking Tips

Minimize holding hands

- We won't let them fall
- Preventing them from using their hands
 - Challenges standing and walking balance progressions
- Encourages them to lean forward
- Encourages them to walk too quickly to keep up
- Once begun, infants will want to continue to do so



Encouraging Walking

- 1 - Place folded towel across chest under armpits; place motivator in front of infant
- 2 – walking with broom handle for your child to hold; push the broomstick slightly forward to encourage stepping
- 3 – Cruising between chairs
- 4 – Walking to you
- 5 – Walking using a baby walker
- 6 – Independent walking – sometimes walking with toys/ objects in hands can help



Balance
Activities





Resources

Books, Websites, Videos

Gross Motor Development Curriculum

for Children With Visual Impairment



Lauren J. Lieberman and Pamela S. Haibach



Gross Motor Development Curriculum & Video

Websites

- [The American Printing House for the Blind](#)
 - Books, products, equipment, and videos
 - www.aph.org/pe
- Camp Abilities-educational sports camps for children who are visually impaired or deafblind
 - Includes videos and web sites for other camps around the world
 - www.campabilities.org (Instructional Materials)
- Perkins School for the Blind
 - Videos and books about how to teach children who are deafblind
 - www.Perkins.org



Thank you for
attending!