Wearable Canes: Who, what, when, where and how

Presented by
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Power Point Content

Slide 1: Wearable Canes Improve motor, concept, language and social skills
Dr. Grace Ambrose-Zaken, COMS
Founder Safe Toddlers
With gratitude to Safe Toddlers Co-Founder Biomedical Engineering professor Marom Bikson and Lead Engineer Mohamad FallahRad

Slide 2: Who needs a wearable cane?
- Children five and younger who have mobility visual impairment or blindness
- Mobility visual impairment is the inability to visually avoid obvious obstacles
- Five and younger because that's the current size of the wearable cane

Slide 3: Mobility visual impairment and blindness (MVI/B)
MVI/B results in slower walking speeds, greater likelihood of incident mobility (e.g., tripping over obstacles) and greater risk of developing a mobility disability.

Figure 1 Vision Contrast Test System poster. Above the phrase, "Reduced contrast sensitivity".

Figure 2 Field test diagram. Above the phrase, "restricted fields".

Figure 3 A Schnellen chart. Above the phrase, "higher acuities".
Slide 4: Identifying mobility visual impairment and blindness (MVI/B)

video

Slide 5: Observable signs of MVI/B

- An unwillingness to move even though physically able to bear weight.
- A preference to hold on to an object or person to move across open space.
- A negative reaction to walking such as:
  - delayed or poor gait, slow pace, and/or unbalanced posture.
  - self-created taut extremities (hands like fists),
  - self-injurious behaviors (hitting self or others).
  - lack of walking, asks to be picked up and carried (hypotonia)
  - preference to push objects (chairs, toys) to cross space

Slide 6: Preverbal MVI assessment

<table>
<thead>
<tr>
<th>A. Affect</th>
<th>Visible signs of emotional state</th>
</tr>
</thead>
<tbody>
<tr>
<td>Score</td>
<td>Hand Position when locomoting</td>
</tr>
<tr>
<td>1</td>
<td>Hand aggression (eye poking, punching, hitting self/others)</td>
</tr>
<tr>
<td>2</td>
<td>Hands held mid body to near head, arms bent</td>
</tr>
<tr>
<td>3</td>
<td>Hands held at sides, long straight arms</td>
</tr>
<tr>
<td>4</td>
<td>Arm swing, can manipulation</td>
</tr>
<tr>
<td>5</td>
<td>Appropriate to developmental potential</td>
</tr>
</tbody>
</table>

Slide 7: Self-injurious behaviors (hitting self or others).

video
Slide 8: Preverbal MVI assessment

<table>
<thead>
<tr>
<th>Motor</th>
<th>Observable moving about the environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Score</td>
<td>Self-generated relocation efforts</td>
</tr>
<tr>
<td>1</td>
<td>Stationary;, no attempt to relocate</td>
</tr>
<tr>
<td>2</td>
<td>Moves arms and trunk only</td>
</tr>
<tr>
<td>3</td>
<td>Constant contact with objects</td>
</tr>
<tr>
<td>4</td>
<td>Walks across/standing open space</td>
</tr>
<tr>
<td>5</td>
<td>Appropriate to developmental potential</td>
</tr>
</tbody>
</table>

Slide 9: An unwillingness to move

video

Slide 10: A preference to hold on

video

Slide 11: Preference to push objects

video

Slide 12: Preverbal MVI assessment

<table>
<thead>
<tr>
<th>Cognition</th>
<th>Demonstration of intellect and concept awareness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Score</td>
<td>Ability to communicate wants, needs and thoughts to others</td>
</tr>
<tr>
<td>1</td>
<td>Quiet</td>
</tr>
<tr>
<td>2</td>
<td>Verbalizations</td>
</tr>
<tr>
<td>3</td>
<td>Babbling, echolalia</td>
</tr>
<tr>
<td>4</td>
<td>Purposeful communication</td>
</tr>
<tr>
<td>5</td>
<td>Appropriate to developmental potential</td>
</tr>
</tbody>
</table>
Slide 13:

Figure 4 Toddler stands and holds a cane in her hand.

Watch as 2 year 4 month old child uses her can to navigate, probe and learn what is in her world. Toddlers can and should be introduced to canes even before they start walking.

You will see she does not just pus a cane (as my students used to do with the heavier canes with rolling tips, which they tended more to drop or toss as they did not understand the vital information they could provide). The lighter can enables her to actually probe to touch and identify objects in her environment. For more information on can usage with preschoolers contact alliedva@aol.com

https://www.youtube.com/watch?v=rlGN44XJ7bY&t=278s

We Are Unique for a Reason 3 years ago
I’m full of tears of joy god bless these children

👍 51 👎 Reply

Images above show thumbs up and thumbs down images along with the word “Reply”

James eddington 2 years ago
What a sweet Angel god Bless little one

👍 51 👎 Reply

Images above show thumbs up and thumbs down images along with the word “Reply”
Slide 14: Developmental Milestones: Gross motor

Figure 5 Graphic - see explanation below.

Explanation of graphic: two tables appear on the page with an arrow moving from the right-hand table to the left-hand table. Each of the age groups (by months) are circled. In the right-hand table these additional phrases are underlined: 15 months – Walking alone, feet wide, 18 months – but cannot avoid, and 2 years – avoiding obstacle.

Left-hand table – 2 Mobile phase

9 months
- Rolling
- Squirming
- Attempts to crawl
- When held, steps with alternate feet

12 months
- Cruising
- Crawling, bottom shuffling, creeping or bear walking

Right-hand table – 3 Highly mobile phase

15 months
- Walks alone, feet wide, arms up, often falls, bumps into furniture
- Stands from sitting w/out support

18 months
- Walks well with arms down
- Start n stop safely
- Runs carefully, but cannot avoid obstacle

2 years
- Runs avoiding obstacle
Slide 15: Cane tip position when long can held in left and right hand

A bar graph
Vertical axis – 0-0.4
Horizontal axis – from left to right:

Left Hand
- Behind/Off Ground
- Wide Left
- Left Foot
- Right Foot
- Center

Right Hand
- Center
- Left Foot
- Right Foot
- Wide Right
- Behind/off ground

Large triangle pointing down with tip between the 2 horizontal axis of “center”. Within the triangle are the words, “Objects Surfaces Drop-offs”. On either side of the triangle are the words (left and right side of horizontal axis) “Unsafe”. The bars of the horizontal axis that fall between “Left Hand – Left Foot” and “Right Hand-Right Foot” are marked with red lines.
Figure 7 Maslow's Hierarchy chart. See explanation below.

Large triangle divided into 5 levels (from bottom to top) with brackets to the right grouping the levels of needs:

**Basic Needs:**
1. Physiological needs: food, water, warmth, rest
2. Safety needs: security, safety

**Psychological Needs:**
3. Belongingness and love needs: intimate relationships, friends
4. Esteem needs: prestige and feeling of accomplishment

**Self-fulfillment Needs:**
5. Self-actualization: achieving one’s full potential, including creative activities
Figure 8 Complex graphic contains bar graph with the following information (see below)

**Age of child (months by current demonstrated motor skill milestone (n=153)**

- Vertical axis – Frequency 0.0 – 40.0
- Horizontal axis – Age of child (months) 0-180 months

**Motor skill milestones key**

- Blue 10 months – stands
- Red 11 months – cruises
- Green 12 months – walks with assistance
- Orange 15 months – walks wide-based gait, cannot avoid obstacles
- Yellow 18 months – walks well, runs cannot avoid obstacles
- Turquoise 24 months – runs able to avoid obstacles

10 months – stands: Mean=34.2308, Std. Dev. =26.768, N=13
15 months – walks a wide-based gait, cannot avoid obstacle: Mean=38.8448, Std. Dev.=22.91158, N=58
18 months – walks well runs cannot avoid obstacles: Mean=35.40, Std. Dev.=20.29053, N=5
Slide 18: Cognitive delays
Age of child (months) by learning ability (n=67)

Figure 9 Complex bar graph: see explanation below.

Vertical axis – frequency
Horizontal axis – age of child (months)

Learning ability key
- Blue – non-specific comments
- Red – Intellectually disabled
- Green – developmentally delayed
- Orange – within normal limits

Non-specific comments – Mean=35.9091, Std. Dev.=28.84252, N=11
Intellectually disabled – Mean=58.3077, Std. Dev.=33.12951, N=13
Developmentally delayed – Mean=41.00, Std. Dev.=18.56206, N=41
Within normal limits – Mean=20.50, Std. Dev.=4.94975, N=2
Slide 19: Play skill delays

Figure 10 complex bar graph: see explanation below.

Age of child (months) by activities when plays on own (n=61)

Vertical axis – frequency (0-20)
Horizontal axis – age of child (months) 0-132

Activities on own key
- Blue – crawls around
- Red – stay in on location
- Green – walks around (bumps into stuff)
- Orange – explores everything
- Yellow – always by me
- Turquoise – cannot be left alone
- Pink – hits self, becomes angry frustrated
- Purple – climbs on furniture, cruises

Crawls around – Mean=46.20, Std. Dev.=32.6654, N=15
Stay in on location – Mean=46.70, Std. Dev.=24.60327, N=30
Walks around (bumps into stuff) – Mean=31.50, Std. Dev.=14.64319, N=14
Explores everything – Mean=24, Std. Dev.= , N=1
Always by me – Mean=54, Std. Dev.= , N=1
Slide 20: Mobility devices reported

Figure 11 Complex bar graph: see explanation below.

Age of child (months by type of mobility device (n=169)

Vertical axis – frequency (0-40)

Horizontal axis – age of child (months) from 0-180

Type of mobility device key

- Blue – homemade AMD
- Red – PT device (walker, gait trainer, AFOs)
- Green – long cane
- Orange – none
- Yellow – push toy
- Turquoise – adapted long cane
- Pink – toddler cane (wearable)
- Purple – baton, brush
Slide 21: What is a wearable cane?

Figure 12 Illustration of a wearable cane includes information about the location of the following items: Magnetic handles with moving mechanism, front designed for outside use, carbon fiber tube shafts with white reflective coating.

Figure 13 Illustration of a belt including the locations of the following: rubber foam, stretchable connector, fastener, and spring wires as the structure.

Figure 14 Illustration of wearable cane with an indicator that reads as follows: front designed for inside use.
Slide 22: What is a wearable cane?

Figure 15 A toddler using a wearable cane walks beside a "Caution Wet Floor" sign.

Figure 16 A toddler explores a carpeted area while an adult looks on.

Slide 23: When
- As often as sighted children use light for their adventures.
- There is no benefit to walking or running without path information.

Slide 24: Where
- Everywhere, all day, every day.
- There is no benefit to walking or running without path information.

Slide 25: How
Videos
- Matias
- Akira
- Charna
- Ysabella
- Marshall
Slide 26: Using the cane

Figure 17 A toddler using a wearable cane opens a toy chest.

- Initial crying fades with experience
- Improved agility navigating while wearing the cane
- Appreciation of tactile information about path ahead
- Develop cane skills:
  - pushing
  - sweeping
  - scraping
  - banging
  - backing up
  - freeing
  - twisting
  - lifting
  - re-positioning
Slide 27: Motor skills

Figure 18 A toddler using a wearable cane runs around a bin of toys.

- Maintaining balance when cane halts
- Rising from floor seat wearing the cane
- Freeing the cane
- Turning to locate clear path
- Stopping at drop off

Slide 29: Motor Outcomes

Figure 19 A toddler using a wearable cane; his hands grip the side shafts as he walks.

- Tactile defensiveness reduced
- Posture straightened
- Gait narrowed
- Pace quickened
  - Running
- Balance and agility improved
Slide 29: Improved outcomes

Figure 20 A toddler using a wearable cane discovers a push toy on the floor when the front of the cane makes contact with it.

- Concepts
  - Self-start exploration
- Use of language
  - Increased verbalizations
  - concrete language
- Social skills
  - Defy authority

Slide 30: Usage guidelines

- Everywhere they can’t see where they’re going
- Anytime they might want to get up and go somewhere

Slide 31: Safe Toddlers - nonprofit

- SafeToddlers.org
- Anyone can donate a wearable cane.

Figure 21 Safe Toddlers logo
Texas School for the Blind & Visually
Outreach Program

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