The Role of Physical Therapy for Individuals with Autism Spectrum Disorders (ASDs)

Catherine Alexander Wilson, PT, DPT
LEND Fellow
UNC Center for Development and Learning
Carolina Institute for Developmental Disabilities

1

Overview

- Introduce ASD and prevalence
- Summarize recent research on ASD pertinent to PT practice
- Utilize the ICF Model as a framework for motor symptoms associated with ASD
- Explore the role of PT in promoting physical activity for individuals with ASD
- Engage in conversation about personal experiences evaluating and treating individuals with ASD

2

Overview

- **Introduce ASD and prevalence**
- Summarize recent research on ASD pertinent to PT practice
- Utilize the ICF Model as a framework for motor symptoms associated with ASD
- Explore the role of PT in promoting physical activity for individuals with ASD
- Engage in conversation about personal experiences evaluating and treating individuals with ASD

3

Autism 101 (Rapin & Tuchman, 2008)

- Collection of symptoms
  - Lack of social reciprocity
  - Delayed language & imaginative play
  - Restricted and repetitive behaviors
- Autism Spectrum Disorders
  - Autism
  - Asperger's Syndrome
  - Pervasive Developmental Disorder, not otherwise specified (PDD-NOS)

4

By the numbers (CDC, 2007)

- North Carolina: 6.5 per 1,000 children
  - 1 out of 152 children
  - 1990: 1 out of 2500 children
- Males > Females
- 80% had documented developmental concerns before 2 years of age
  - Language
  - Social concerns
  - Imaginative play

5

Why is it increasing? (Daniels, 2006)

- Changes in diagnostic criteria and labels
- Increasing availability of diagnostic tools
- Improved case identification
- True changes in prevalence
  - Environmental and genetic factors
- NOT due to vaccines (Institute of Medicine, 2004)

6

Overview

- Introduce ASD and prevalence
- **Summarize recent research on ASD pertinent to PT practice**
- Utilize the ICF Model as a framework for motor symptoms associated with ASD
- Explore the role of PT in promoting physical activity for individuals with ASD
- Engage in conversation about personal experiences evaluating and treating individuals with ASD

7

Motor Symptoms (Ming, Brimacombe, Wagner, 2007)

- Chart review of 154 children with ASD
- 2-6 year old: 83
- 7-18 year old: 71
- 4.9:1 male to female ratio
- Autism (74), PDD-NOS (70), Asperger's (10)

8

Motor Deficit	Children with ASD (n=154)	2-6 years (n= 83)	7-18 years (n= 71)
Hypotonia	51%	63%	38%
Apraxia	34%	41%	27%
Toe-walking	19%	25%	13%
Reduced ankle mobility	2%	2%	3%
Gross motor delay**	9%	12%	6%

* Denver Developmental Screen

9

Recent Research Findings

- Toddlers with ASD had delays in gross motor, fine motor, or both (Provost *et al,* 2007)
- School age children with ASD scored below the 15% on the MABC (Green *et al*, 2009).
- Gait analysis: difficulty walking along a straight line, variable stride length and duration, reduced 'smoothness' (Rinehart *et al,* 2006)

10

'Movement Disorder' Perspective (Rinehart, 2008)

- Motor symptoms are prominent…but poorly understood
- Potential to improve understanding of the neurological underpinnings of ASD
- Inter-disciplinary approach to include gross motor assessment

11

Research Instruments From Our Toolbox

- Peabody Developmental Motor Scale-2 (Provost *et al, 2007*)
- Bruininks-Oseretsky Test of Motor Proficiency-2 (Deitz *et al,* 2007)
- Movement Assessment Battery for Children (MABC) (Green *et al,* 2009)
- Vineland Adaptive Behavior Scale (Sutera *et al,* 2007)
- Short Sensory Profile (Rogers, Hepburn, Wehner, 2003)

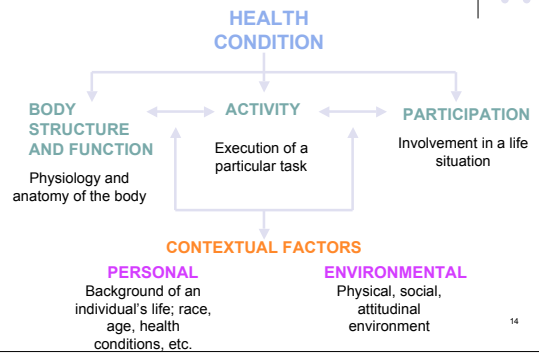
12

Overview

- Introduce ASD and prevalence
- Summarize recent research on ASD pertinent to PT practice
- **Utilize the ICF Model as a framework for motor symptoms associated with ASD**
- Explore the role of PT in promoting physical activity for individuals with ASD
- Engage in conversation about personal experiences evaluating and treating individuals with ASD

13

The International Classification of Function, Disability, and Health (ICF) Model (Jette, 2006)

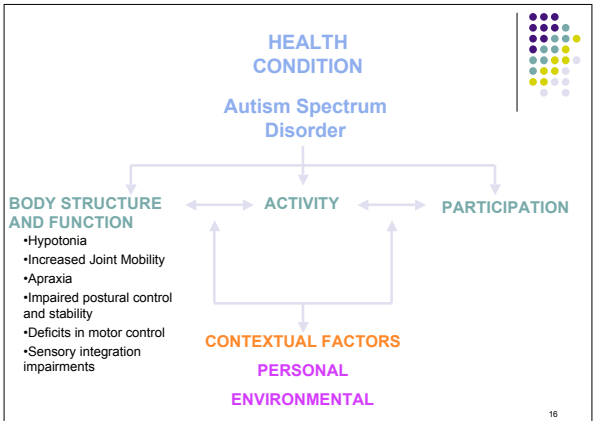


14

Body Structure/Function

- Hypotonia
- Increased Joint Mobility
- Apraxia
- Impaired postural control and stability
- Deficits in motor control
- Sensory integration impairments

15

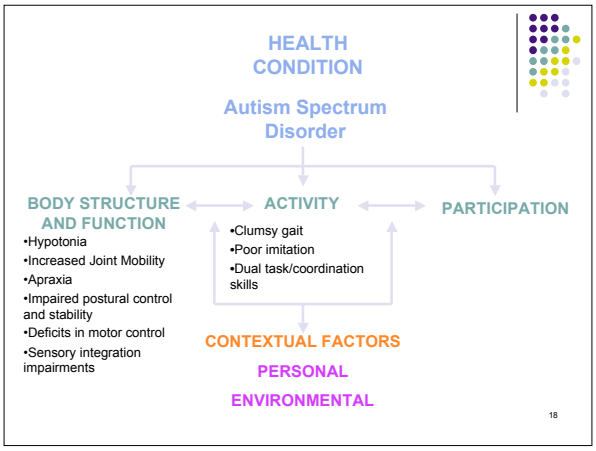


16

Activity

- Clumsy gait
  - Rinehart (2006)
- Poor imitation
  - Williams, Whiten, Singh (2004)
- Challenged by dual task activities
  - Green *et al* (2009)
- Challenged by activities that require coordination

17

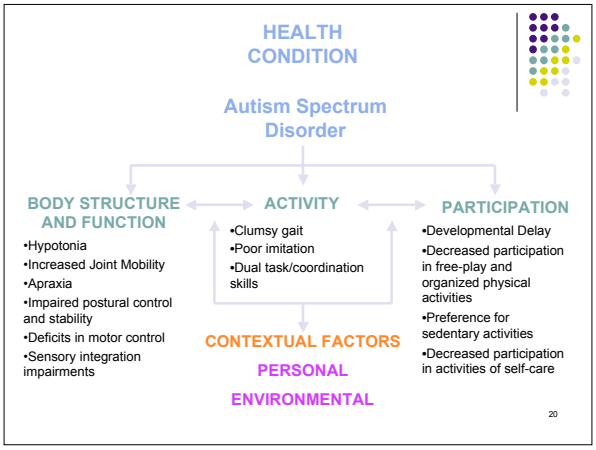


18

Participation

- Developmental Delay (Provost *et al* 2007)
- Decreased participation in free-play and organized physical activities (Cairney et *al.,* 2005)
- Preference for sedentary activities (Provost *et al* 2007)
- Decreased participation in activities of self-care (Sutera *et al*, 2007)

19



20

Personal (Rapin & Tuchman, 2008)

- Cognition
- Verbal and Nonverbal Skills
- Attention
- Mood/affect
- Motivating factors
- Memory
- Sensory symptoms

21

Personal: Sensory (Rapin & Tuchman, 2008)

- Variable responsiveness
  - Decreased
  - Increased
- Somatosensory
  - Insensitivity to pain/craving deep pressure
  - Intolerance for textures, touch
- Vision
  - Unaware of obstacles and gaze aversion
  - Enhanced perception of details

22

Personal: Sensory (cont.)

(Rapin & Tuchman, 2008)

- Auditory
  - Failure to respond
  - Intolerance to loudness and certain frequencies
- Vestibular function
  - Tolerance for upside-down posture, spinning
  - Motion sickness
- Taste/olfaction
  - Smell or lick objects
  - Extreme selectivity of acceptable foods

23

Short Sensory Profile

(McIntosh, Miller, Shyu, 1999)

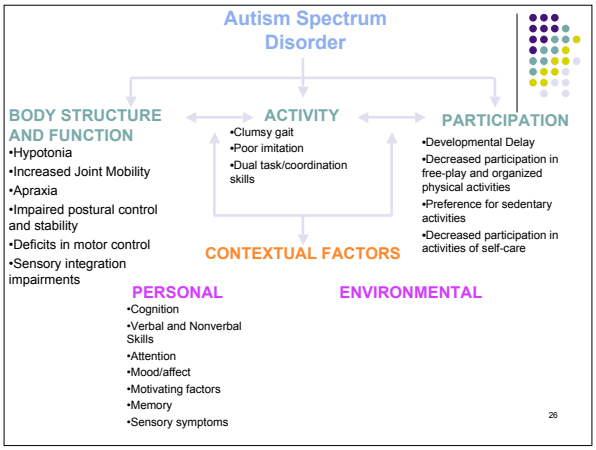
- Parent Report Measure
  - Tactile Sensitivity
  - Taste/Smell Sensitivity
  - Movement Sensitivity
  - Underesponsive/Seeks Sensation
  - Auditory Filtering
  - Low Energy/Weak
  - Visual/Auditory Sensitivity

24

Personal

- Cognition
- Verbal and Nonverbal Skills
- Attention
- Mood/affect
- Motivating factors
- Memory
- Sensory symptoms

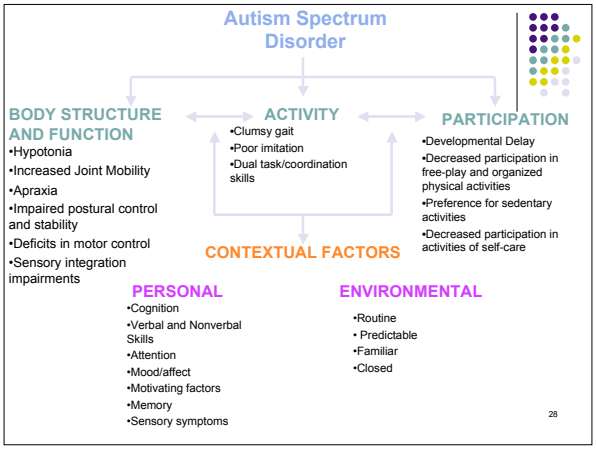
25



Environment

- Routine
- Predictable
- Familiar
- Closed/Open

27



ICF Wrap-up

- Framework for evaluating a child
- Identify what can be modified/what cannot be modified
- Identify skills that are present
- Determine appropriate assessment tool
- Introduce and integrate these skills in functional environments using motor learning principles

29

Motor Learning (Valvano, 2004)

- Develop activity-related goals and objectives
- Plan activity-focused intervention
- Set up the environment
- Identify what is motivating as a reward
  - Practical for multiple environments
  - Phase out reward
- Repetition
- Vary the environment and task

30

Overview

- Introduce ASD and prevalence
- Summarize recent research on ASD pertinent to PT practice
- Utilize the ICF Model as a framework for motor symptoms associated with ASD
- **Explore the role of PT in promoting physical activity for individuals with ASD**
- Engage in conversation about personal experiences evaluating and treating individuals with ASD

31

The Spectrum of BMI

- Low BMI
  - Low appetite
  - Narrow range of preferred foods
  - Slower digestion
  - Delayed physical growth

Lesinskiene, Vilunaite, & Paskeviciute (2002)

32

A more prevalent pattern…

Age (author)	At risk for overweight	Overweight
2-5 years (Xiong *et al, 2009*)	31.8%	17%
6-11 years (Xiong *et al, 2009*)	37.9%	21.8%
2-5 years (Curtin *et al, 2005*)	23.8%	14.2%
6-11 years (Curtin *et al, 2005*)	37.8%	18.8%

33

Why the risk for high BMI is greater for ASD (Pan & Frey, 2006)

- Preference toward sedentary activity
- Fewer opportunities for structured physical activities
- Over-nutrition
- Stimulant medication-related weight gait
- Depression

34

Compared to peers, children with ASD…

- Are less active (Pan & Frey, 2006)
- Are more likely to be overweight (Curtin, 2005)
- Do not exercise regularly (Easterseals, 2006)
  - Only 20% of parents report their child with ASD exercises regularly

35

Benefits of Exercise

- Improved fitness and self-esteem (Parfitt, 2009)
- Decreased anxiety (Parfitt, 2009)
- Better sleep and digestion (Slattery, 2004; Lee & Lin, 2007)
- Increased opportunity for peer interaction
- Maintenance of a healthy weight (Pitetti, 2007)
- ASD- Potential link with a decrease in self-stimulating behaviors (Kern, 1984; Rosenthal-Malek, 1997)
  - Important link between behavior

36

Beyond Treatment…

- Add a physical activity goal
- Encourage incorporation of physical activity into the child/family routine
- Identify barriers to participation (personal and environmental)
- Identify successful techniques for promoting participation and training

37

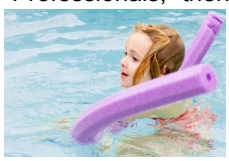
Suggested Activities

- Walking
- Trampoline
- Martial Arts
- Bicycle/Tricycle Riding
- Swimming
- Ball Play
- Community Playground

38

Pamphlet Link

- Let's Get Moving: Encouraging physical activities for your child with an Autism Spectrum Disorder
- www.cdl.unc.edu
- Click on "Professionals," then "Resources"



39

A child walks into a clinic…

- **Environment**
- **Routine**
- **Physical Activity**

40

Many thanks to:

- UNC Department of Physical Therapy
- Leadership Education in Neurodevelopmental Disabilities (LEND) Program at the UNC Center for Development and Learning and Carolina Institute for Developmental Disabilities
- Angela Rosenberg, PT, DrPH
- Dawn Phillips, PT, MS
- Katie Ollendick, PT

41

Overview

- Introduce ASD and prevalence
- Summarize recent research on ASD pertinent to PT practice
- Utilize the ICF Model as a framework for motor symptoms associated with ASD
- Explore the role of PT in promoting physical activity for individuals with ASD
- **Engage in conversation about personal experiences evaluating and treating individuals with ASD**

42

Turn to your neighbor…

- What has been a strategy that you have used with an individual with ASD that has been beneficial?
- What are practical and feasible ways that you could structure the environment before a treatment session with an individual with ASD?

43

- Do you know of any community resources for physical activity for individuals with ASD?
- How do you justify services to third party payers for a child with ASD?

44

Questions?

45

References

Introduction and Overview

Centers for Disease Control and Prevention. Prevalence of Autism Spectrum Disorders- Autism and Developmental Disabilities Monitoring Network, 14 sites, United States, 2002. Surveillance Summaries, 2002. *Morbidity and Mortality Weekly Report.* 2007; 56 (SS12-28).

Daniels JL. Autism and Environment. *Environmental Health Perspectives.* 2006; 114(7): A 396.

Institute of Medicine of the National Academies. Immunization Safety Review: Vaccines and Autism. Released May 14, 2004. Available at: www.iom.edu/reports/2004/immunization-safety-review-vaccines-and -autism.aspx Accessed October 15, 2009.

Rapin I, Tuchman RF. Autism: Definition, neurobiology, screening, diagnosis. *Pediatr Clin N Am.* 2009; 55*:* 1129-1146.

46

Motor Impairment

Deitz JC, Kartin D, Kopp K. Review of the Bruininks-Oseretsky Test of Motor Proficiency, Second Edition (BOT-2). *Physical and Occupational Therapy in Pediatrics.* 2007; 27(4): 87-102.

Green D, Charman T, *et al.* Impairments in movement skills of children with autistic spectrum disorders. *Developmental Medicine and Child Neurology*. 2009; 51(4): 311-316.

McIntosh DN, Miller LJ, Shyu V. Development and validation of the short sensory profile. In W. Dunn (Ed.), *The sensory profile examiner's manual.* San Antonio, TX: The Psychological Corporation.

Ming X, Brimacombe M, Wagner GC. Prevalence of motor impairment in autism spectrum disorders. *Brain Development.* 2007; 29(9): 565-570.

Provost B, Lopez BR, Heimerl S. (2007). A comparison of motor delays in young children: Autism spectrum disorder, developmental delay, and developmental concerns. *J Autism Dev Disorder, 37:* 321-328.

Rinehart NJ, Tonge BJ, Iansek R, *et al.* (2006). Gait function in newly diagnosed children with autism: Cerebellar and basal ganglia related motor disorder. *Developmental Medicine & Child Neurology, 48:* 819-824.

47

Motor Impairment (cont.)

Rinehart N. (2008). Motor stereotypies in children with autism and other developmental disorders. *Developmental Medicine and Child Neurology, 51*: 1-5.

Rogers SJ, Hepburn S, Wehner E. Parent reports of sensory symptoms in toddlers with autism and those with other developmental disorders. *Journal of Autism and Developmental Disorders.* 2003; 33(6): 631-642.

Sutera S, Pandey J, Esser E, Rosenthal MA, Wilson LB, Barton M, Green J, Hodgson S, Robins DL, Dumont-Mathieu T, Fein D. Predictors of optimal outcome in toddlers diagnoses with autism spectrum disorders. *J Autism Dev Disord*. 2007; *37:* 98-107.

Williams JH, Whiten A, & Singh, T. A systematic review of action imitation in autistic spectrum disorders. *Journal of Autism and Developmental Disorders. 2004; 34:* 285-299.

ICF Model

Jette AM. Toward a common language for function, disability, and health. *Physical Therapy.* 2006; 86(5): 726-734.

48

Physical Activity

Cairney J, Hay J, Faught B, Mandiog J, Flouris A. Developmental coordination disorder, self-efficacy toward physical activity, and play: Does gender matter? *Adapted Physical Activity Quarterly. 2005; 22:* 67-82.

Curtin C, Bandini LG, Perrin EC, Tybor DJ, Must A. Prevalence of overweight in children and adolescents with autism spectrum disorders: A chart review. *BMC Pediatrics*. 2005; 5:48.

Easter Seals. (2008). Living with Autism Study. 2008. Available at: http://www.easterseals.com /site/ PageServer? pagename=ntlc8_l iving_ with _aut ism_study_home. Accessed May 14, 2009.

Kern L, Koegel RL, Dunlap G. The influence of vigorous versus mild exercise on autistic stereotyped behaviors. *Journal of Autism and Developmental Disorders.* 1984; 14(1): 57-67.

Lee AJ, Lin WH. Association between sleep quality and physical fitness in female young adults. *J Sports Med Phys Fitness.* 2007; 47(4): 462-7.

Lesinskiene S, Vilunaite E, Paskeviciute B. Aspectss of the development of autistic children. *Medicina.* 2002; 38(4): 405-411.

Physical Activity (cont.)

Pan C, Frey GC. Physical activity patterns in youth with Autism Spectrum Disorder. *J Autism Dev Disorder*. 2006; 36: 597-606.

Parfitt G, Pavey T, Rowlands AV. Children's physical activity and psychological health: The relevance of intensity. *Acta Paediatrica*. 2009; 98: 1037-1043.

Pitetti KH, Rendoff AD, Grover T, Beets MW. The efficacy of a 9-month treadmill walking program on the exercise capacity and weight reduction for adolescents with severe autism. *Journal of Autism and Developmental Disorders.* 2007; 37: 997-1006.

Rosenthal-Malek A, Mitchell S. Brief report: The effects of exercise on the self-stimulatory behaviors and positive responding of adolescents with autism. *Journal of Autism and Developmental Disorders.* 1997; 27(2): 193-202.

Slattery ML. Physical activity and colorectal cancer. *Sports Medicine.* 2004; 34(4): 239-52.

Xiong N, Ji C, Li Y, He Z, Bo H, Zhao Y. The physical status of children with autism in China. *Research in Developmental Disabilities.* 2009; 30(1): 70-76.

Motor Learning

Valvano J. Activity-focused motor interventions for children with neurological conditions. *Physical & Occupational Therapy in Pediatrics.* 2004; 24(1/2): 79-107.