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continued

Hot Topics in Pediatrics

Guest Editor: Lisa Kenyon, PT, DPT, PhD, PCS

11/5: Evidence Based Physical Therapy Management of Idiopathic Toe Walking

Sally P. LeCras, PT, DPT, PCS

11/6: What Are We Waiting For? The Power of Early Mobility

Lisa Kenyon, PT, DPT, PhD, PCS

11/7: Meeting the Sensory Needs of Children with Autism Spectrum Disorder(ASD):

A Primer for Therapy Professionals

Melissa Tovin, PT, MA, PhD, PCS, CEEAA

11/8: Keys to Physical Literacy and Fundamental Movement Skills for Children Who Use

Wheelchairs: Consideration for Adapted Sport and Inclusive Physical Education

Krista Best, PhD

11/9: Clinical Application of the Congenital Muscular Torticollis Clinical Practice Guideline

Micah Huegel, PT, DPT

continued

Meeting the Sensory Needs of Children with Autism Spectrum Disorder (ASD): A Primer for Therapy Professionals

Melissa Moran Tovin, PT, MA, PhD, PCS

Nova Southeastern University

continued

continued

Learning Outcomes

After this course, participants will be able to:

- Describe the impact of sensory processing disorder in children with ASD in 3 functional areas: sensory-motor function, social behavior, and participation
- Correctly identify at least 3 tests and measures used to assess sensory processing and sensory-motor function in children with ASD
- Develop a plan of care consisting of at least 3 strategies to meet the individual sensory needs of a child with ASD

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continued

Quick Review of ASD

Definition, incidence, etiology, diagnosis

4

continued

Definition

- Autism spectrum disorder (ASD) is a developmental disability that can cause significant social, communication and behavioral challenges. (CDC, 2018)
- Autism, or autism spectrum disorder (ASD), refers to a broad range of conditions characterized by challenges with social skills, repetitive behaviors, speech and nonverbal communication. (Autism Speaks, 2018)

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continued

- According to CDC report, the incidence is 1 in 59 in the U.S.
 - 4 times as likely in boys
- During the 1990's, autism increased at a rate of 172%
 - 1997 birth cohort: 1 in 150
- <http://www.cdc.gov/ncbddd/autism/data.html>

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continued

- Four distinct autism diagnoses under one umbrella diagnosis of autism spectrum disorder (ASD).
 - Autistic disorder
 - Childhood disintegrative disorder
 - Pervasive developmental disorder-not otherwise specified (PDD-NOS)
 - Asperger syndrome

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continued

- Autistic Disorder-“classic” autism
 - Significant language delays
 - Social and communication challenges
 - Unusual behaviors and interests
 - May have intellectual disability.

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continued

- Pervasive Developmental Disorder – Not Otherwise Specified (PDD-NOS)- “atypical autism”
 - Meet some of the criteria for autistic disorder or Asperger’s syndrome, but not all.
 - Usually have fewer and milder symptoms than those with autistic disorder.
 - The symptoms might cause only social and communication challenges.

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continued

- Asperger’s Syndrome
 - Milder symptoms of autistic disorder.
 - Have social challenges and unusual behaviors and interests.
 - Typically do not have problems with language or intellectual disability.

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continued

➤ *There is not one autism!*

- Each person with autism will present with unique set of strengths, challenges, and needs
 - Mild to severe

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continued

Causes

- A combination of genetic, biologic and environmental factors influence the development of autism.
- Current research
 - Study to Explore Early Development (SEED)
 - To examine many possible risk factors for ASD, including genetic, environmental, pregnancy, and behavioral factors.
 - Currently the largest study in the US (CDC, 2018)
 - SPARK
 - To collect information and DNA for genetic analysis from 50,000 individuals with autism and their families to
 - Understand causes
 - Develop supports and treatments

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continued

Red Flag Signs

- Timing and severity vary widely
 - Few months to 3 years
 - Hallmark signs usually appear by age 2 to 3
- Early Diagnosis
 - 18 months
- Most children are not diagnosed until after age 4

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continued

By 6 Months

- Lack of warm, joyful expressions (eg, big smiles)
- Limited or no eye contact

By 9 Months

- Lack of alternate back-an-forth sharing of sounds, smiles, facial expressions

By 12 Months

- Limited or no pre-speech gestures
- Limited or no joint attention
- Does not respond to name
- Limited or no babbling or cooing

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continued

continued

By 14 Months

- Very few or no words
- Little or no joint attention

By 18 Months

- Does not play "pretend" games

By 24 Months

- Does not say two-word phrases (on his or her own)

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continued

Additional signs

Delayed development of speech, language and social skills

Avoids eye contact and prefers to be alone

Loss of language or social skills already acquired

Trouble relating to others or understanding other people's feelings

Appear unaware when people talk to them or call their name

Repeats or echoes words or phrases (echolalia)

Difficulty adapting to changes in routine

Avoids being held or cuddled, or might cuddle only on their terms

Restricted interests and/or repetitive behaviors (eg, flapping, rocking, spinning.)

Unusual or intense reactions to sensory input (under or over-sensitive)

Show little safety or danger awareness

Reversal of pronouns

Deficits and/or delays in motor skills, coordination, praxis, postural control

Motor stereotypes

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- www.autismspeaks.org has video library of signs and symptoms
- CDC Milestone Tracker
 - <https://www.cdc.gov/ncbddd/actearly/index.html>
 - *Early identification is associated with significantly improved outcomes*
 - Treatment should start when ASD is *suspected*

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Step 1 in Early Diagnosis

- Developmental Screening
 - American Academy of Pediatrics (AAP) and CDCs National Center on Birth Defects and Developmental Disabilities(NCBDD) recommendation for all children
 - Autism-specific screening at 18 and 24 months of age
 - Broad developmental screening at 9, 18, and 24 months
 - Additional screening
 - If child is at high risk for developmental delays
 - preterm birth
 - low birth weight
 - Sibling with ASD
 - Behaviors associated with ASD

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continued

Screening tools

- Ages and Stages Questionnaires (ASQ)
- M-CHAT-R (Modified Checklist for Autism in Toddlers, Revised)
- Gilliam Autism Rating Scale –2nd Edition (GARS-2)

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continued

2nd step

- Comprehensive evaluation
 - Specialists who can do this type of evaluation include
 - Developmental Pediatricians
 - Child Neurologists
 - Child Psychologists
 - DSM V criteria
 - <https://www.autismspeaks.org/dsm-5-criteria>

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Diagnostic Tools

- Autism Observation Schedule (ADOS)
 - Gold Standard Tool: 12 months to adulthood
 - 45 min-1 hour
 - Social reciprocity; non-verbal and verbal communication; stereotypical behaviors and interests
- Autism Diagnostic Interview-Revised (ADI-R)
 - Companion Parent Interview
- Childhood Autism Rating Scale (CARS-2): 2 yrs to adult
 - Rates behaviors to determine severity of symptoms
 - Standard version
 - High Functioning scale

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- Wiggins et al.
 - Young children with ASD
 - More tactile and taste/smell sensitivities and difficulties with auditory filtering than young children with other DD
 - Sensory scores significantly correlated with stereotyped interests and behaviors
 - Findings supported:
 - Young children with ASD show more sensory impairments than young children with other DD
 - Sensory symptoms significantly relate to stereotyped interests and behaviors
 - Sensory abnormalities are distinguishing symptoms of ASD
 - Sensory abnormalities should be considered in diagnostic algorithms for younger cohorts

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Sensory Processing Disorder

- A Piece of the Puzzle
 - Individuals with ASD show symptoms of SI dysfunction, which result in many of the “autistic” behaviors
 - These behaviors and sensory impairments impact children and adults with ASD in numerous ways
 - *Development across all areas*
 - *Attention and Learning*
 - *Independence*
 - *Social interaction and relationships*
 - *Participation at all levels*
 - *And more....*

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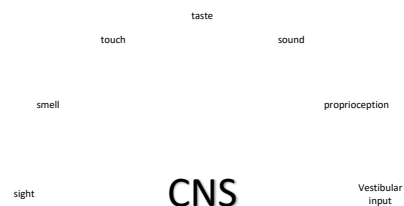
But...

- What is sensory processing?
- Why is it important for me as a PT working with individuals with ASD?
- Where do I start?
- How will I know what to do?
- Where is the evidence?

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Sensory Processing/Integration

- The ability of the CNS to process information gathered through the senses, integrate it with information stored in the brain from previous experience, and make a meaningful response.
- The CNS organizes sensory and motor information for use/action.
- SI is a *process*!



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Successful Sensory Processing

- Modulation: Brainstem level
 - Ready to interact and learn
 - Scan input for relevance
 - Can self-calm and organize for focused attention

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continued

- Self-regulation (higher level modulation): Cortical level
 - Can use strategies to self-modulate
 - (eg, Shake leg, chew pencil, run, workout, coffee, chew gum)
 - Can change state to match demands of environment
 - (eg., From playground to classroom, from outside to church)

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continued

- Discrimination: Cortical Level
 - Can distinguish between sensations, and label appropriately
 - Is necessary for skillful interaction with environment
 - eg., someone bumps into you as you pass each other in the hallway... what do you do?

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continued

What happens when the brain is not able to process in-coming sensory information?

Sensory Processing Disorder (SPD)

...aka *Sensory Integration Dysfunction (SID)*

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continued

Causes of SPD

- Not always known, but appears to be combination of factors that are genetic and environmental
- Research on SPD, including causes:
 - Star Institute for SPD
 - <https://www.spdstar.org/basic/latest-research-findings>

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Historical Perspective

- Dr. Jean Ayers
 - OT who first theorized about SI and SI dysfunction in 1960's.
 - Traffic Jam analogy
 - Treatment as Multidisciplinary

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Clinical Presentation of SPD

- SPD presents in a wide range of symptoms, severity and functional deficits in children and adults with ASD
- SPD is often present in other commonly seen diagnoses such as
 - Developmental Delay
 - CP
 - ADHD/ADD
- Is sometimes the only diagnosis: SPD/SID

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Many signs and symptoms

- Difficulty responding to sensory input in a way to optimize function, participation and learning
 - Over-reaction/under-reaction to stimuli
 - Defensiveness versus sensory seeking
- Level of Alertness/Arousal
 - State of attention to allow optimal function and learning.
 - Low arousal kids might appear high arousal/high activity
 - Need input to maintain arousal.

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- Insert arousal graph

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continued

- Atypical Activity Levels
 - Disorganized/lacks purpose (tornado)
 - Lacks exploration or purposeful play
 - Lacks variety in play
 - Appears clumsy
 - Poor postural control
 - Movement avoidance
 - Lacks coordination/praxis
 - Atypical sleep/wake cycles
 - Difficulty adjusting activity level to situation/transitioning
 - Difficulty self-calming

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continued

- Difficulty modulating emotions
- Impaired ANS regulation (fight, flight, fright)
- Digestion issues
- Atypical eating patterns
- Atypical respiration
- Developmental Delays
- Behavioral and Social-emotional Issues
 - Aggressiveness
 - Isolation
 - Poor self-concept
- Impaired Executive Functioning

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CONTINUED

- *How do I make **sense** of sensory processing disorder?*

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CONTINUED

- Lucy Miller et al., (2007)
 - Proposed a diagnostic taxonomy for SPD
 - Established subgroups within sensory integration dysfunction to account for the wide range of clinical presentations.
 - Distinguished between SI theory, SI treatment, SPD
 - 3 main patterns
 - Sensory Modulation Disorder (SMD)
 - Sensory Discrimination Disorder (SDD)
 - Sensory-Based Motor Disorder (SBMD)

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continued

Pattern 1: SMD

- Individual has difficulty responding to sensory input with behavior (emotional and attentional) that is appropriate for the demands of the situation.
- 3 subtypes

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continued

SMD (cont.)

- Subtype 1: Sensory Over-responsiveness (SOR)
 - Response to stimuli is faster, more intense, and longer than typical
 - Can involve one system (tactile defensiveness) or multiple systems (sensory defensiveness)
 - Difficulties in new situations or transitions, individual is rigid and controlling
 - Exaggerated fight, flight, fright response
 - Emotional responsiveness: irritability, moodiness, inconsolability

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SMD (cont)

- Subtype 2: Sensory Under-responsiveness (SUR)
 - Disregard or do not respond to sensory stimuli
 - Fail to respond to pain
 - Clumsy
 - Poor body scheme
 - Withdrawn, difficult to engage, inattentive, self-absorbed, lethargic

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SMD (cont)

- Subtype 3: Sensory Seeking
 - Crave unusual amount or type of sensory input
 - Engage in actions to add intensity
 - Social inappropriateness (touching others, etc)
 - Unsafe behaviors; constant moving; impulsiveness
 - Can be explosive/aggressive if can't satisfy need
 - SS often interferes with function
 - Often occurs with ADHD

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continued

Pattern 2: SDD

- Difficulty interpreting qualities of sensory input or discriminate between stimuli
- Can involve one or more systems (eg, auditory only or combination)
- Slow performance
- Learning or language disability
- Low self-confidence
- Frequently occurs with SUR or SOR

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continued

Pattern 3: SBMD

- Poor postural and volitional movement as a result of sensory problems
 - 2 subtypes

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continued

- Subtype 1

- Postural Disorder: difficulty stabilizing body during movement or at rest.
- Inappropriate muscle tone (hyper, hypo, poor control)
- Poor stability, poor righting and equilibrium reactions
- Poor ocular motor control
- Avoids movement because of instability and fear (not over-reactivity)
- Can be active but with poor control, unsafe

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continued

- Subtype 2

- Dyspraxia
 - Poor coordination
 - Poor motor planning
 - Awkward movement
 - Delays
 - Usually in presence of SOR, SUR and SDD

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Assessment

- Sensory processing
- SPD impact on
 - Function and participation (ICF)
 - Normal development and play
 - Self-care
 - Independent living
 - Community mobility and access
 - Safety
 - Family/patient/teacher understanding and support
 - Resources

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Assessment

- Identify sensory processing impairments in the assessment process
 - Interview/questionnaires
 - Observation
 - Standardized SPD Assessment Tools
 - Sensory Processing Assessment (SPA)
 - Sensory Performance Analysis (SPA)-criterion referenced assessment of gross and fine motor tasks.
 - Sensory Integration and Praxis Test (SIPT)
 - <https://www.wpspublish.com/store/p/2971/sipt-sensory-integration-and-praxis-tests>
 - Sensory Profile and Sensory Profile 2
 - <https://www.pearsonclinical.com/therapy/products/100000566/sensory-profile.html>
 - The Miller Assessment for Preschoolers (MAP)

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SENSORY PROFILE

Winnie Dunn, Ph.D., OTR, FAOTA

Caregiver Questionnaire

Child's Name: _____ Birth Date: _____ Date: _____

Completed by: _____ Relationship to Child: _____

Service Provider's Name: _____ Discipline: _____

INSTRUCTIONS

Please check the box that **best** describes the frequency with which your child does the following behaviors. Please answer all of the statements. If you are unable to comment because you have not observed the behavior or believe that it does not apply to your child, please draw an X through the number for that item. Write any comments at the end of each section. Please do not write in the Section Raw Score Total row.

Use the following key to mark your responses:

ALWAYS	When presented with the opportunity, your child always responds in this manner, 100% of the time.
FREQUENTLY	When presented with the opportunity, your child frequently responds in this manner, about 75% of the time.
OCCASIONALLY	When presented with the opportunity, your child occasionally responds in this manner, about 50% of the time.
SELDOM	When presented with the opportunity, your child seldom responds in this manner, about 25% of the time.
NEVER	When presented with the opportunity, your child never responds in this manner, 0% of the time.

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continued

- Motor Assessment
 - Developmental screening-- under 3 yrs
 - Ages and Stages Questionnaire (ASQ)
 - Modified Checklist of Autism in Children (MCHAT)
 - Developmental Assessments
 - Bayley Scales of Infant Development (Motor performance)
 - Vineland Adaptive Behavior Scales (functional skills and adaptive behaviors)
 - Overall Motor Performance Measures
 - Peabody (PDMS-2)
 - Buininks-Oseretsky Test of Motor Performance (BOTMP-2)
 - Praxis and Imitation
 - Modified Florida Apraxia Battery
 - SIPT
 - The Miller Assessment for Preschoolers (MAP)
 - Motor coordination
 - Movement Assessment Battery for Children (MABC)

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- Functional Performance and Participation Measures
 - Pediatric Evaluations of Disability Inventory (PEDI) 6 mos to 7 yrs
 - School Functional assessment (SFA)
- Participation in recreation and leisure activities outside of school
 - Children's Assessment of Participation and Enjoyment (CAPE)
 - Preferences for Activities of Children (PAC)
 - Both are self-report measures; ages 6 through 21 yrs

Intervention

- Goal
 - To address the central mechanism of sensory modulation for assigning value to input (including pain, fear, anxiety)— processing!
 - To readjust the way the nervous system responds to the environment.

Tenets of Treatment

- CNS is a self-organizing system that is based on learning and memory
- The CNS is plastic
- Intense somatosensory input causes endorphin and serotonin release, impacting pain modulation.
- Proprioceptive input impacts the cerebellum which modulates body responses and postural actions and coordination.
- Vestibular input also strongly influences cerebellum and ANS activity
- Intensity, duration, frequency and rhythm of the sensory information determine whether the sensory receptors will be receptive.

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- SI treatment requires a comprehensive, intensive and individual approach.
 - Awareness
 - Sensory Diet (home program)
 - Inter-professional Collaborative Treatment Approach
 - Treat SMD first
 - Work on functional skill with support
 - Skill with faded support
 - Skill only

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Interventions

- Deep pressure, proprioception/heavy work, respiration/breathing are all organizing for both the low arousal and high arousal child to improve modulation
 - Somatosensory system

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Deep Pressure

- Wilbarger *Deep Pressure* Protocol (brushing)
 - Performed on extremities and back (abdomen has ANS outcroppings)
 - 3 brushes on each area (10 on extremity) followed by 10 joint compressions. Stroke in both directions
 - Always follow with compressions



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Weighted Products



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Pressure Products



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Other Deep Pressure Strategies

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Proprioceptive

- Joint compression/distraction
 - Jumping
 - Jogging
 - Pushing/pulling/holding
 - Bouncing
 - Hanging
- Vibration
- “Heavy (muscle) work”
- Breathing/Respiration
 - Resisted sucking/blowing
 - Whistles, bubble blowers

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Proprioceptive and Heavy Work products



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Vibration Products and Toys



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Other “Heavy Work” Strategies

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Vestibular

- Vestibular input
 - Unidirectional → multidirectional
 - Adjust intensity according to needs of the child
 - Intense vestibular input- use with caution in a high arousal child
- Linear
 - Swings
 - Scooters, Bicycles
 - Bolsters/rollers
 - Trampoline
- Multidirectional
 - Swings
 - Balls
 - Floatation Devices

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Vestibular

- Rotation
 - Spin/rotation boards
 - Swings
 - Swivel chair
- **for low arousal kids only

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Vestibular Equipment



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Tactile

- Fidgets
- Work with different mediums: paint, shaving cream, "goop", slimy balls, knobby balls, fabrics, etc.



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Combination Activities

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Hippotherapy

- Vestibular
- Proprioceptive
- Heavy Work
- Rhythmic movements
- Social/Emotional

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continued

Aquatherapy

- Deep pressure
- Heavy work
- Respiration
- Balance responses
- Can offer extreme temperature changes
 - Therapeutic temperature is 88-92 degrees

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continued

More Strategies

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Visual Strategies for modulation

- Reduce visual clutter
 - Maintaining a visually organized environment
- Visual schedules

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Music/Rhythm

- Rhythmic patterns
 - In our bodies
 - In our surroundings
 - Brain function
 - Research- rhythm is the key to music's role in intellectual development
- Rhythm is calming, organizing
 - eg., sounds in mother's womb

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Music as Therapeutic Medium

- Music and Rhythm
 - Music, metronome, counting and singing
 - As an accessory to therapy treatment
 - As an organizational (and behavioral) strategy for home
 - Choice of music
- Music therapy
 - Board Certified Music Therapist
 - American Music Therapy Association: <https://www.musictherapy.org/>
 - Music therapy and ASD
 - Improving social, emotional, communication, sensorimotor, and academic/cognitive functioning
 - https://www.musictherapy.org/assets/1/7/Fact_Sheet_ASD_and_MT_8-26-15.pdf

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- Sound Therapy
 - Therapeutic Listening, Sheila Frick, OT
 - <https://vitallinks.com/therapeutic-listening/therapists/>
- Interactive Metronome
 - Based on research that indicates activities that require sequencing, coordination, motor planning and timing will increase a person's attention, focus, learning

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“Quiet Place”

- Calming retreat for downtime and re-organization.
- Can add input (weighted products, vibration, music, fidgets, lights)

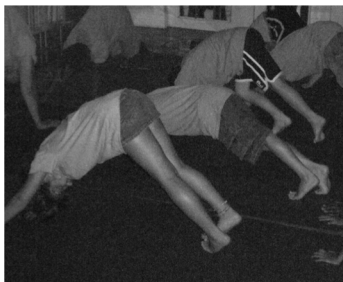


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Yoga/Pilates



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Dolphin Therapy



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Aroma Therapy

- Aroma Therapy
 - eg., Peppermint is alerting, lavender is calming



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continued

- Teach older children how to self-modulate
 - Alert Program
 - <https://www.alertprogram.com/>

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Predictable schedules/routines

- Eliminates stress or anxiety from thinking about “what’s next.”
- Eases transitions when a child can mentally prepare for what’s coming next and throughout the day.



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continued

- Rewards
- Social Stories

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continued

Providing physical and visual boundaries



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Sensory Diet

- A series of sensory meals and snacks throughout the day to help the child modulate/regulate to maintain optimum level of arousal.
- Should be incorporated into daily life
- Should be planned in collaboration with family
- Should be based on child's needs/preferences

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continued

continued

- Is based on assumption that certain sensory modalities will have a modulating effect that will last a certain period of time, and need to be repeated to have a maximum effect.
 - Most last 1 ½ to 2 hours, some vestibular can last 4-8 hours.
 - Prepare for scheduled activities and transitions throughout the day.

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continued

- Jaden is 4 years old and attends a preschool less than a mile from her home. Her mom describes her as clumsy because she frequently falls and bumps into objects. Her mom also says Jaden is always moving, and likes to run, jump, and play hard. Her teacher says she is a little too physical when playing with other kids (she shoves them to the ground when playing “tag”). Jaden also has a hard time resting quietly during “nap time” at school. Her teacher describes her as impulsive and states that she often takes risks on the playground (climbing to the top of the play apparatus and jumping off). Her mother says Jaden has a hard time settling down when she gets home from school, and that she takes a long time to go to sleep. She is just “all wound up.”

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Time	Place	Activity	Duration
7:00am	As waking up-in bed	Pillow "sandwich" Brushing protocol Jumping on bed 25 times	10 minutes
8:20	In car before walking into school.	Brushing protocol. Wear weighted backpack walking into school	3 minutes
10:00	School before/after recess	Wear weighted backpack on way out to playground, and on way back to classroom. Lila will be door holder, must walk at front of line.	3 minutes before/after recess
10:20	In classroom	Immediately after returning to class from playground: brushing protocol	3 minutes
12:00	Naptime/classroom	Brushing protocol (3 minutes) Wear weighted blanket at naptime. Listen to calming music (not sound therapy) on headphones.	
2:00	Pick-up from school	Wear weighted backpack walking out of school.	
2:15	Home	Brushing protocol (3 minutes) Go to 'quiet place' ('clubhouse' space in room). Lie under beanbag, play with fidgets	10 minutes
4:15	Before dinner	Go to playground. Start with monkey bars, walk up slide, climb mini rock wall, jump off small platform into sand, play tag with brother. Then enjoy playground additional 10 minutes.	30 minutes
7:00	After dinner	Warm bath with lavender, blow bubbles with special bubble blowers.	
7:30	After bath	Pillow sandwich or massage by mom/dad. Read book in quiet place.	20 minutes
8:00	Go to sleep	Can start with weighted blanket.... Remove once asleep.	

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Questions?

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continued

- Interview with Sibling

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continued

Jefferson is an 8 year old who was referred for a school evaluation by OT and PT because of his difficulty in controlling his emotions and his motor performance. According to his mother, Jefferson is very picky about the foods that he eats and the clothes that he wears. He spends a lot of time by himself at home because he can't ride a bike or play ball sports which are the primary activities the kids in the neighborhood do. At school, Jefferson gets in arguments with his peers on the playground if they get close to him. He is able to imitate motor actions but has great difficulty problem solving through new motor activities. The teacher reports that he becomes very frustrated with activities which require ball play and never seems to get his clothes on correctly.

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continued

continued

Remember!

- Treat sensory integration dysfunction first. Then address function, movement, motor planning.

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continued

Product Resources

- Southpaw. *Online Catalog of Sensory Integration and Developmental Products*. Southpaw Enterprises. <https://www.southpaw.com/>
- Abilitations. *Online Catalog of Pediatric Rehabilitation products*. https://store.schoolspecialty.com/OA_HTML/xxssi_ibeCategoryPage.jsp?docName=V700839&minisite=10206
- Professional Development Programs. Courses and Product Catalog. www.pdppro.com
- Frick SM & Kavar MJ. *Core Concepts in Action*. Available through Vital Sounds at www.vitalsounds.com
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