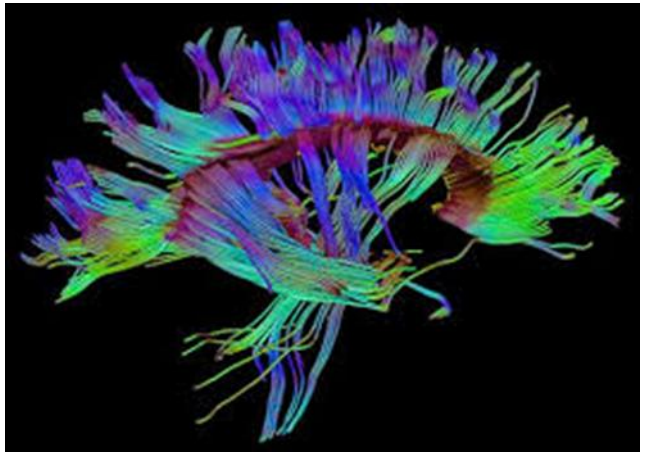
Sensory Regulation and Brain Research



Children Come First Conference

November 11, 2014

11:30-12:45

Deb Buchanan MS, OTR

Kids Discover Success Therapeutics, LLC

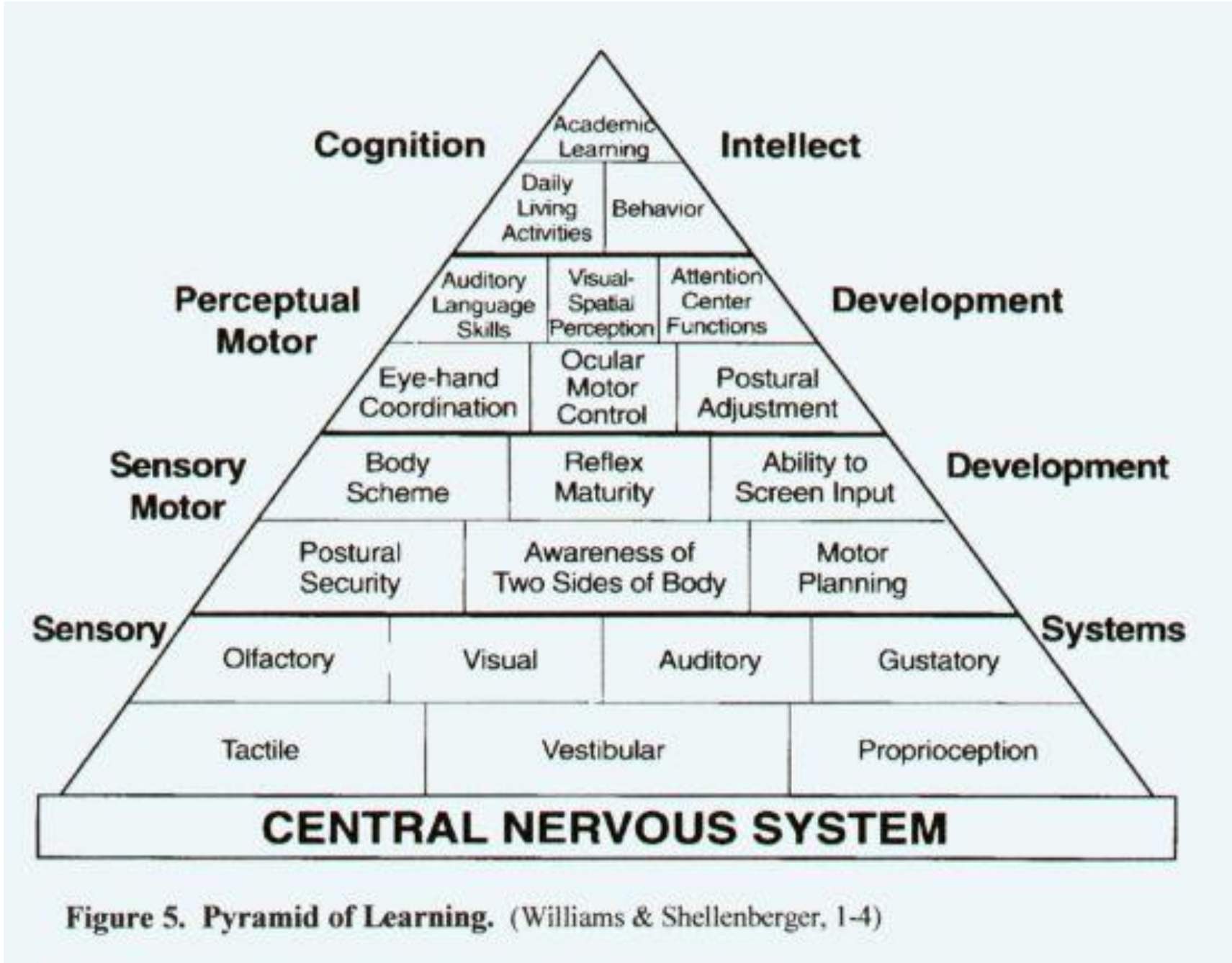
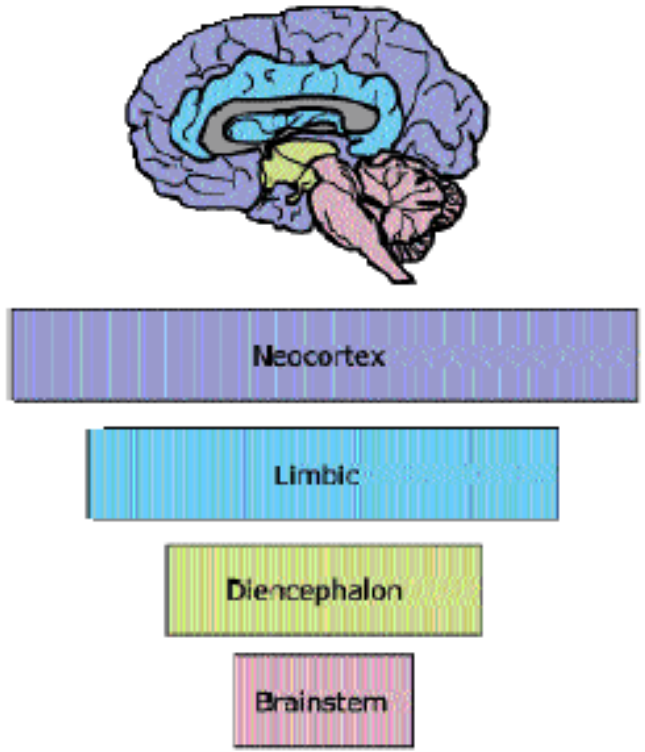
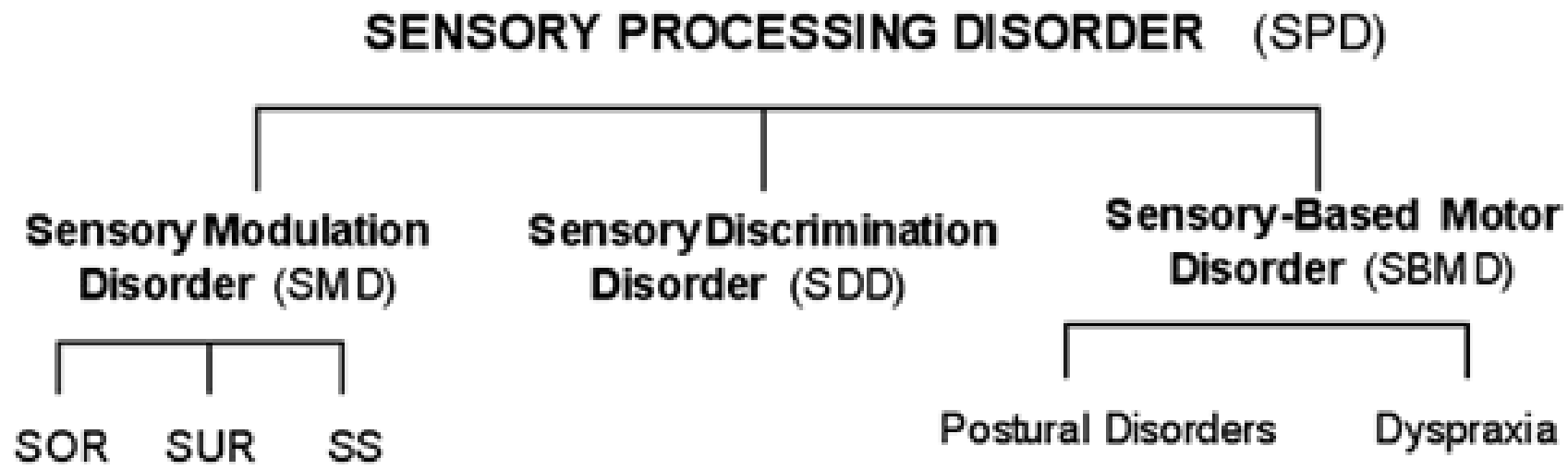


Figure 5. Pyramid of Learning. (Williams & Shellenberger, 1-4)



The brainstem controls heart rate, body temperature, and other survival-related functions. It also stores anxiety or arousal states associated with a traumatic event. Moving outward towards the neocortex, complexity of functions increases. The limbic system stores emotional information and the neocortex controls abstract thought and cognitive memory.



SOR = Sensory Over -Responsivity
SUR= Sensory Under -Responsivity
SS= Sensory Seeking / Craving

Sensory Processing Disorder Study 2013

- 16 boys with SPD (age 8-11) compared to 24 neuro-typical boys with matched age, IQ, handedness
- Diffusion tensor imaging (DTI), Sensory Profile
- Quantifiable differences in brain structure
- Sensory scores correlated with microstructural differences
- May be distinct from Autism and ADHD
- Support for hypothesis that SPD is a spectrum disorder

Sensory Processing Disorder Study

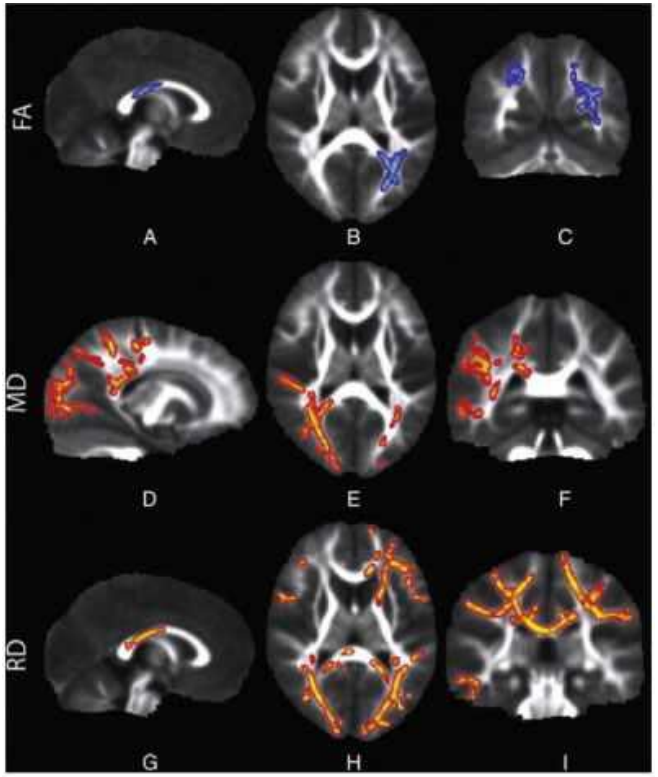
http://www.sciencedirect.com/science/article/pii/S2213158213000776

Abnormal white matter microstructure in children with sensory processing disorders

Julia P. Owena, b, 1,
Elysa J. Marcoc, 1,
Shivani Desaic,
Emily Fouriea,
Julia Harrisc,
Susanna S. Hillc,
Anne B. Arnettd,
Pratik Mukherjeea, b,

NeuroImage: Clinical
Volume 2, 2013, pp. 844-853

Row FA: The blue areas show white matter where water diffusion was less directional than in typical children, indicating impaired white matter microstructure. Row MD: The red areas show white matter where the overall rate of water diffusion was higher than in typical children, also indicating abnormal white matter. Row RD: The red areas show white matter where SPD children have higher rates of water diffusion perpendicular to the axonal fibers, indicating a loss of integrity of the fiber bundles comprising the white matter tracts. (Source: UCSF)



Comparison of ASD and Sensory Modulation Disorder

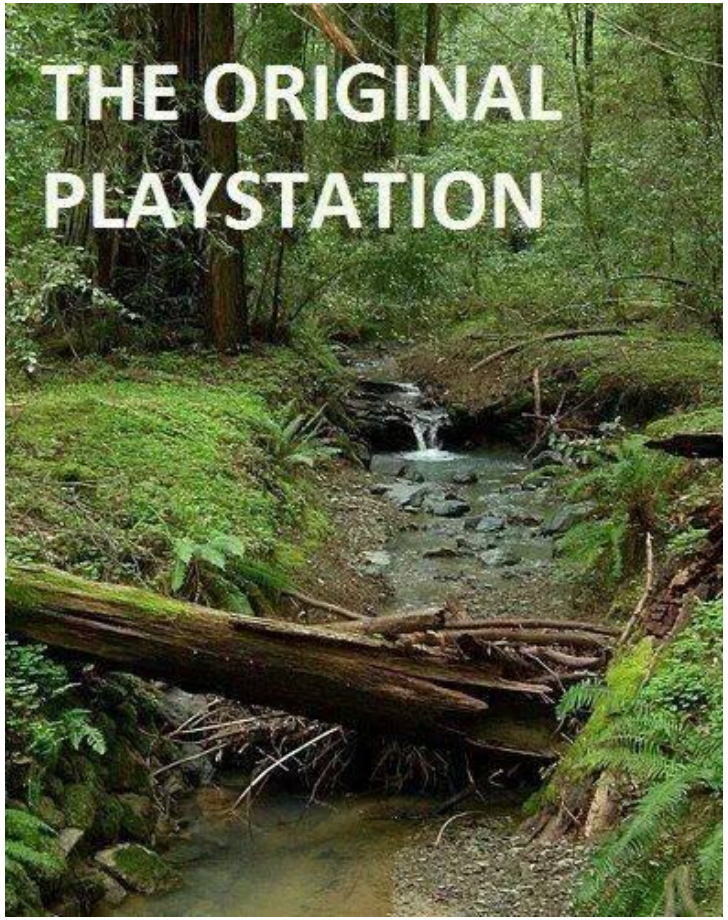
- 40 children with ASD and 31 children with SMD
- Electro-dermal activity (EDA) and Short Sensory Profile
- Children with ASD demonstrated less reactivity to passive stimuli in a simulated space ship
- Children with SMD demonstrated more reactivity to passive visual/auditory stimuli
- Children with ASD had atypical physiological arousal and children with SMD had atypical physiological reactivity

A few trees and some clothesline . . .

Potential Outcomes of Sensory Diets

- Slow rhythmic rocking, chewing gum, deep pressure massage and exercise combined with therapeutic listening in study by Leah Hall & Jane Case-Smith (2007)
- 4 weeks daily sensory diet; next 8 weeks daily sensory diet + therapeutic listening twice a day 20-30 minutes
- Improved outcomes: auditory, touch, multisensory and oral processing; body position and movement, emotional/social responses, behavioral, and handwriting legibility
- 12 week program
- Ages 5-11, ten participants, one girl; all had SPD and visual motor impairments
- Home-based delivered by parents

Nurtured brains through Nature



Snoezelen elements used to reduce self injury

- Use of scents
- Vibratory and tactile
- Nature sounds and soft music
- Visual: fiber optics
- Rockers, swings, mats
- 10 week study, one hour per day
- 15 participants with profound cognitive disability/mental illness
- General sensory room without customization for individual preferences

Your Brain On Music

- Less anxiety and lower cortisol
- Music strongly associated with the brain's reward system
- "Brain regions involved in movement, attention, planning and memory consistently showed activation when participants listened to music -- these are structures that don't have to do with auditory processing itself." This is your brain on music By Elizabeth Landau, CNN updated 12:09 PM EDT, Mon April 15, 2013
- http://www.cnn.com/2013/04/15/health/brain-music-research/

Single session foot massage study

- Adult study, 42, using *f*MRI viewing resting state brain regions
- Four conditions: Swedish massage, reflexology, massage with an object, resting control condition
- 5 point Likert scale addressing current well-being
- Outcome-two brain regions had increased resting state activation from one Swedish foot massage

Brain regions have also been shown to play a role in diverse processes that might be affected by massage, including the modulation of somatosensory information and episodic memory formation

http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3282900/

Massages Reduce Stress and Anxiety

- MRI, blood pressure, glucose, insulin used as indicators
- Touch contact, gloves worn by masseuse less impact
- The massage treatment activated area of reward in brain
- http://sciencenordic.com/massages-reduce-stress-and-anxiety

Plasticity in the Brain
"Life experiences change the brain"

- 22 male adults, age 18-29, who typically did not play violent video games divided into two groups in a two week study
- Shooting game group played total of 10 hours in 1 week, 2nd week did not play
- No games during the two weeks for second group
- fMRI pre, at week 1, after 2 weeks
- After 1 week, less activation observed in areas of brain for controlling emotion and aggressive behavior in shooting game group
- Changes diminished after the 2nd week of no game
- http://www.medicalnewstoday.com/articles/284341.php

Resilience Framework (Children & Young People) Oct 2012 – adapted from Hart & Blincow 2007 www.boingboing.org.uk					
	BASICS	**BELONGING**	**LEARNING**	**COPING**	**CORE SELF**
SPECIFIC APPROACHES	Good enough housing	Find somewhere for the child/YP to belong	Make school/college life work as well as possible	Understanding boundaries and keeping within them	Instil a sense of hope
	Enough money to live	Help child/YP understand their place in the world		Being brave	
	Being safe	Tap into good influences	Engage mentors for children/YP	Solving problems	Support the child/YP to understand other people's feelings
	Access & transport	Keep relationships going		Putting on rose-tinted glasses	Help the child/YP to know her/himself
	Healthy diet	The more healthy relationships the better	Map out career or life plan	Fostering their interests	
	Exercise and fresh air	Take what you can from relationships where there is some hope		Calming down & self-soothing	Help the child/YP take responsibility for her/himself
	Enough sleep	Get together people the child/YP can count on	Help the child/YP to organise her/himself	Remember tomorrow is another day	Foster their talents
	Play & leisure	Responsibilities & obligations		Lean on others when necessary	
		Focus on good times and places	Highlight achievements	Have a laugh	There are tried and tested treatments for specific problems, use them
		Make sense of where child/YP has come from	Develop life skills		
		Predict a good experience of someone or something new			
		Make friends and mix with other children/YPs			
NOBLE TRUTHS					
ACCEPTING		**CONSERVING**	**COMMITMENT**	**ENLISTING**	

MINDFULNESS

- To focus, on purpose

Use your senses to...

- Notice
- Describe
- Fully participate

SHIFT GEARS & CHANGE HOW YOU FEEL!

Vestibular and Proprioceptive Input

- Wheelbarrow and animal walks
- Jumping games with trampoline, hopscotch, jump rope
- Build forts with blankets and furniture
- Visit neighborhood park for climbing and swinging
- Pillow fights or tug-of-war
- Help with household chores & yard work

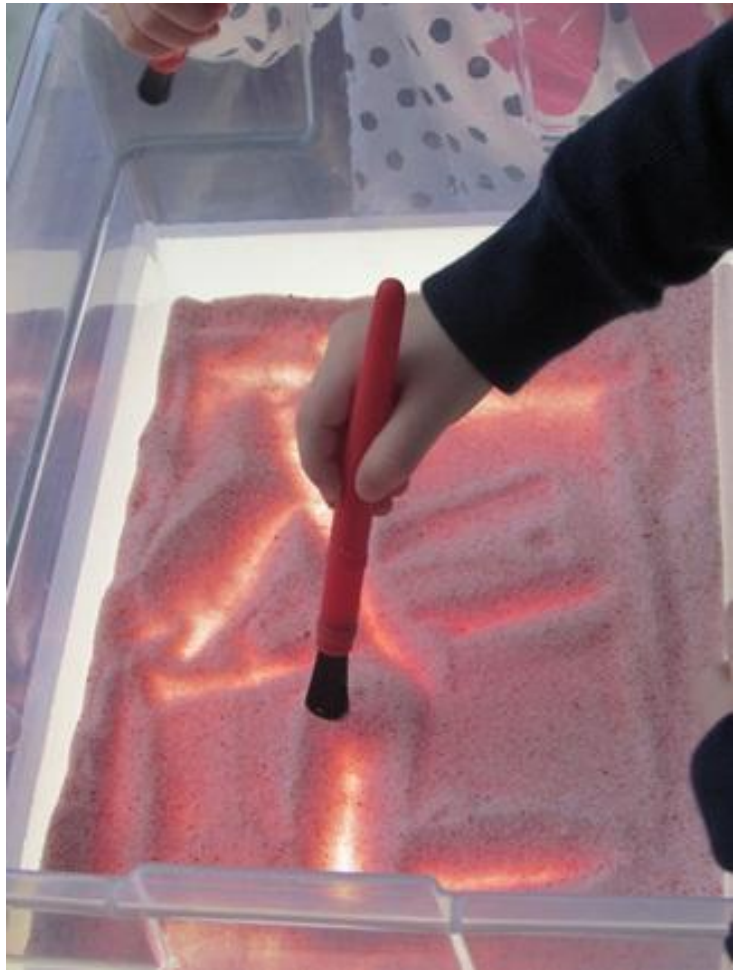
Finding a Therapist in Wisconsin

- http://spdfoundation.net/spdfoundation-cgi-bin/search
- http://www.dsaw.org/Data/Sites/3/media/resources/sitherapistswi.pdf
- http://www.uwhealthkids.org/pediatric-rehabilitation/sensory-integration/34328
- http://www.ctn-madison.com/
- http://www.campavanti.com/about.html
- http://www.wauwatosatherapies.com/

Finding a Therapist in Wisconsin

- http://www.wpspublish.com/store/Training/TherapistIndex?letter=40357&isTerritory=0
- https://www.vitallinks.net/pages/Evidence-Based-Brief-on-Effectiveness-of-Therapeutic-Listening.php
- https://www.vitallinks.net/pages/Provider-Search.php?state=WI
- http://www.specialtherapies.com/

Questions & Discussion



References

- Hall, L., Case-Smith J., (2007). The Effect of Sound-Based Intervention on Children With Sensory Processing Disorders and Visual-Motor Delays, *The American Journal of Occupational Therapy,* Vol. 61, Number 2, 209-215.
- Singh, N., Lancioni, G., Winton, A., Molina, E., Sage, M., Brown, S., Groeneweg, J., (2005). Effects of Snoezelen room, Activities of Daily Living skills training, and Vocational skills training on aggression and self-injury by adults with mental retardation and mental illness, *Research in Developmental Disabilities, 25, 285-293.*

Resources

- Schoen, S., Miller, L., Brett-Green, B., Nielsen, D., (2009). Physiological and behavioral differences in sensory processing: a comparison of children with Autism Spectrum Disorder and Sensory Modulation Disorder, *Frontiers in Integrative Neuroscience,* Vol. 3, Article 29, 1-11. www.frontiersin.org