RESEARCH ARTICLES

2013 AND 2014 RESEARCH RELATED TO SENSORY PROCESSING AND NEURAL STRUCTURES

The researchers in the 2013 study then did more work in the same area in 2014. Each study is showing neural differences in the sensory processing group that is distinct from other neurodevelopmental disorders.

Latest research articles on sensory processing:

1. Chang Y-S, Owen JP, Desai SS, Hill SS, Arnett AB, Harris J, et al. (2014) Autism and Sensory Processing Disorders: Shared White Matter Disruption in Sensory Pathways but Divergent Connectivity in Social-Emotional Pathways. PLoS ONE 9(7): e103038. doi:10.1371/journal.pone.0103038
   http://www.ucsf.edu/news/2014/07/116196/kids-autism-and-sensory-processing-disorders-show-differences-brain-wiring

   Over 90% of children with Autism Spectrum Disorders (ASD) demonstrate atypical sensory behaviors. In fact, hyper- or hyporeactivity to sensory input or unusual interest in sensory aspects of the environment is now included in the DSM-5 diagnostic criteria. However, there are children with sensory processing differences who do not meet an ASD diagnosis but do show atypical sensory behaviors to the same or greater degree as ASD children. We previously demonstrated that children with Sensory Processing Disorders (SPD) have impaired white matter microstructure, and that this white matter microstructural pathology correlates with atypical sensory behavior. In this study, we use diffusion tensor imaging (DTI) fiber tractography to evaluate the structural connectivity of specific white matter tracts in boys with ASD (n = 15) and boys with SPD (n = 16), relative to typically developing children (n = 23). We define white matter tracts using probabilistic streamline tractography and assess the strength of tract connectivity using mean fractional anisotropy. Both the SPD and ASD cohorts demonstrate decreased connectivity relative to controls in parieto-occipital tracts involved in sensory perception and multisensory integration. However, the ASD group alone shows impaired connectivity, relative to controls, in temporal tracts thought to subserve social-emotional processing. In addition to these group difference analyses, we take a dimensional approach to assessing the relationship between white matter connectivity and participant function. These correlational analyses reveal significant associations of white matter connectivity with auditory processing, working memory, social skills, and inattention across our three study groups. These findings help elucidate the roles of specific neural circuits in neurodevelopmental disorders, and begin to explore the dimensional relationship between critical cognitive functions and structural connectivity across affected and unaffected children.

2. Marco, E, Mukherjee, P, Owen, JP, et al. (2013) Abnormal White Matter Microstructure in Children with Sensory Processing Disorders. NeuroImage: Clinical, Volume 2, 844-853. http://www.sciencedirect.com/science/article/pii/S2213158213000776 2013

   …We find that the disrupted white matter microstructure predominantly involves posterior cerebral tracts and correlates strongly with atypical unimodal and multisensory integration behavior. These findings suggest abnormal white matter as a biological basis for SPD and may also distinguish SPD from overlapping clinical conditions such as autism and attention deficit hyperactivity disorder…

ADDITIONAL RESEARCH ARTICLES

Ayres, J. (1979). *Sensory Integration and the Child*. Los Angeles, California: Western Psychological Services.

Ayres, J. (1972). *Sensory integration and learning disorders*. Los Angeles, California: Western Psychological Services.

Baloh, R. W. (2001). *Clinical neurophysiology of the vestibular system.* Cary, NC: Oxford University Press

Bundy, A. C., Shia, S., Qi, L., & Miller, L. J. (2007). How does sensory processing dysfunction affect play? *American Journal of Occupational Therapy, 61,* 201-208.

Bundy, A., Lane, S., & Murray, E. (2002). *Sensory integration: Theory and practice*. Philadelphia, PA: Davis Company.

Cermak, S. (2001). The effect of deprivation on processing, play and praxis. In S. Smith, Roley, E. I. Blanche, & R. C. Schaaf (Eds), *Understanding the nature of SI with diverse populations* (pp. 385-420). Austin, TX: Pro-Ed.

Champagne, T. & Stromberg, N. (2004). Sensory approaches in inpatient psychiatric settings: Innovative alternatives to seclusion and restraint. *Journal of Psychosocial Nursing, 42*(9), 1-8.

Cheng, M. & Boggett-Carsjen, J. (2005). Considering sensory processing disorders in the explosive child: Case report and review. *Canadian Child and Adolescent Psychiatry Review, 14*(2), 44-48.

Cohn, E., Miller, L. & Tickle-Degan, L. (2000). Parental hopes for therapy outcomes: children with sensory modulation disorders. *American Journal of Occupational Therapy, 54*(1), 36-43.

Davies, P.L., & Gavin, W. J. (2007). Validating the diagnosis of sensory processing disorders using EEG technology. *American Journal of Occupational Therapy, 61,* 176-189

Dawson, G., & Watling, R. (2000). Interventions to facilitate auditory, visual, and motor integration in autism: A review of the evidence. *Journal of Autism and Developmental Disorders, 30,* 415–421.

Field, T. (2002). Preterm infant massage therapy studies. *Seminars in Neonatology, 7,* 487-494.

Field, T., Lasko, D., Mundy, P., Henteleff, T., Kabat, S., Talpins, S. & Dowling, M. (1997). Brief report: Autistic children's attentiveness and responsivity improve after touch therapy. *Journal of Autism and Developmental Disorders*, 27(3), 333-338.

Green, V. (2007). Parental experience with treatments for autism. *Journal of Developmental and Physical Disabilities,19*(2), 91-101.

Greene, R.W. (2005). *The explosive child: A new approach for understanding and parenting easily frustrated, chronically inflexible children.* New York: Harper

Goldstein, H. (2000). Comentary: interventions to facilitate auditory, visual and motor integration: "show me the data". *Journal of Autism and Developmental Disorders, 30*(5), 423-425.

Iarocci, G. & McDonald, J. (2006). Sensory integration and the perceptual experience of persons with autism. *Journal of Autism and Developmental Disorders, 36*(1), 77-90.

Kern, J. et al. (2007). Sensory correlations in autism. *Autism, 11*(2), 123-134.

Keuler, M. M., Schmidt, N. L., Van Hulle, C. A., Lemery-Chalfant, K., Goldsmith, H, H. (2011). Sensory Overresponsivity: Prenatal risk factors and temperamental contributions. *Journal of Developmental & Behavioral Pediatrics 32(7*), 533-541.

Lindley, F. & McDaniel, M. (2004). Using a sensory room as an adjunct therapeutic modality in an adolescent residential treatment center: An outcome study. Retrieved October 4, 2005, from http://www.aacrc-dc.org/public/docs/Using%20a%20Sensory%20Room1.doc

Miller, L. J., Schoen, S.A., James, K., & Schaaf, R. C. (2007). Lessons learned: A pilot study on occupational therapy effectiveness for children with sensory modulation disorder. *American Journal of Occupational Therapy, 61,* 161-169.

Olsen, L. & Moulten, H. (2004). Occupational therapists' reported experiences using weighted vests with children with specific developmental disorders. *Occupational Therapy International, 11*(1), 52-66.

Parham, L. D., Cohn, E. S., Spitzer, S., Koomar, J. A., Miller, L. J., Burke, J. P., et al. (2007). Fidelity in sensory integration intervention research. *American Journal of Occupational Therapy, 61,* 216-227.

Parham, L.D. & Mailloux, Z. (1996). Sensory Integration. In J. Case-Smith, A.S. Allen & P. Nuse Pratt (Eds.), *Occupational therapy for children* (3rd ed.) (307-356). St. Louis, MI: Mosby.

Pfeiffer, B. A., Koenig, K., Kinnealey, M., Sheppard, M., & Henderson, L. (2011). Effectiveness of Sensory Integration Interventions in Children with Autism Spectrum Disorders: A pilot study. American Journal of Occupational Therapy, 65, 76-85.

Schaaf, R. C., et al. (2010). Parasympathetic functions in children with sensory processing disorder. Frontiers in Integrative Neuroscience, 4(4), 1-11.

Schaaf, R. C., Nightlinger, K. M. (2007). Occupational therapy using a sensory integrative approach: A case study of effectiveness. American Journal of Occupational Therapy, 61, 239-246.

Schaaf, R. & Miller, L. (2005). Occupational therapy using a sensory integrative approach for children with developmental disabilities. Mental Retardation and Disabilities Research Reviews, 11(2), 143-148

Schneider, M. L., Moore, C. F., Gajewski, L. L., Laughlin, N. K., Larson. J. A., Gay. C. L., et al. (2007). Sensory processing disorders in a nonhuman primate model: Evidence for occupational therapy practice. The American Journal of Occupational Therapy, 61, 247-253.

Schoen, S. A., Miller, L. J., Brett-Green, B., Hepburn, S. A., (2008). Psychophysiology of children with autism spectrum disorder. Research in Autism Spectrum Disorder 2, 417-429.

Vargas, S. & Camilli, G. (1999). A meta-analysis of research on sensory integration treatment. The American Journal of Occupational Therapy 53(2), 189-198.

Walting, R. & Dietz, J. (2007). Immediate effect of Ayres's sensory integration-based occupational therapy intervention on children with autism spectrum disorders. The American Journal of Occupational Therapy, 61(5). 574- 583.

Walting, R., Dietz, J. & White, O. (2001). Comparison of sensory profile scores of young children with and without autism spectrum disorders. American Journal of Occupational Therapy, 55(4), 416-423.