

Evidence Brief for SI Intervention with Children with Autism		
Summary Conclusions for SI Intervention for Children with Autism:		
The results of this review suggest that occupational therapy using a sensory integrative approach and use of some selected sensory integrative-based intervention strategies result in positive gains in children and adolescents with autism. Positive gains are noted in increases in engage and interactive social behavior, decrease in self-stimulatory and self-injurious behaviors, and increased vocalizations. Inconsistent gains were noted in areas of sensory processing and fine and gross motor skill performance.		
Article	Results	Study Strengths/ Limitations
Level I	Systematic Review	
(Baranek, 2002)	Sensory integration therapy resulted in improvements in mastery of play, engaged behaviors, increased adult and general social interaction, improved response to movement and affection, and improved approach to new activities. Children with hyperresponsivity to touch and movement had better outcomes than hypo-responsivity. There was no change in peer interactions.	Limited studies were found with individual studies frequently methodologically weak with small sample sizes and lack of controls. Heterogeneity of the autism population may contribute to mixed results in these studies. Generalizability and long term effects of the intervention are unclear. Comprehensive review of information on autism available at the time.
(Dawson & Watling, 2000)	There is little controlled research on the effectiveness of interventions designed to address sensory abnormalities in autism. Those that have been done are of small scale and no firm conclusions regarding efficacy may be reached. No empirical studies of traditional OT are found.	Highly questionable whether this study qualifies as a systematic review. No indication of specific research question or search strategies. Only examined auditory studies and sensory integration interventions. Bulk of article on identifying sensory and motor problems in autism.
Level I	Randomized Controlled Trials	
(Inamura, Wiss, & Parham, 1990)	4 of 9 subjects showed indications of positive results including decreased activity level, increased socialization, and decreased behavior problems	
Level III	Cohort Studies/ Pre-Post	
(A. J. Ayres & Tickle, 1980)	Sensory integration procedures were more effective with hyperreactive and hyporeactive children	
Level IV	Single-Case Studies/Series	
(Candler, 2003)	9 out of the 10 families that participated in post-intervention interviews reported an improvement in performance and/or satisfaction for at least one of their goals. The results indicate that 5 days at a summer camp designed for children with sensory issues led to an improved sense of competence and increased satisfaction with performance of self-selected goals by the children and their families.	Results cannot be generalized to other populations due to small study size, lack of randomization and lack of a control group. The modifications to the COPM influenced families' identification of goals. Almost half of the 116 goals were generated following review of a behavioral outcome lists. This introduced a risk that the interviewer influenced the responses.
(Case-Smith & Bryan, 1999)	4 children decreased frequency of non-engagement. 3 increased frequency of mastery (goal directed play). Improvements in frequency of interaction were minimal. Less involved children made greater progress.	Generalizability of case studies a question. Well designed study with good attention to types of behaviors that were realistic to change in the amount of intervention given. AB design provided baseline control data.
(Linderman & Stewart,	Significant improvement in social interaction, approach to new activities, response to	AB design but only 2 subjects and 7-11 weeks of therapy. Results may have been confounded by

1999)	holding and hugging, response to movement Significant gains did not occur in functional communication during mealtime. The child who more poorly registered sensory input made fewer observable gains.	other treatment added during the study. Generalizability is limited. Although results suggest those who have more difficulty registering sensory input may be less responsive to SI/OT, clinically important to note that this response can change over time with greater length of treatment or intensity of treatment.
(Reilly, Nelson, & Bundy, 1993)	Increased variety of speech and average length of utterances in Fine motor activities; Increase in autistic speech during sensory motor activities	Counter-balanced: random assignment to tx order; subjects own controls
(Slavik, Kitsuwa-Lowe, Danner, Green, & Ayres, 1984)	Significantly increased duration of eye contact during movement activities for all subjects. Five autistic boys ages 5-1 to 5-10 were studied to determine whether stimulation of the macular receptors of the inner ear through linear motion influences the boys' eye contact with the investigators. The duration of eye contact was measured during linear motion on a motor-driven oscillator and on two hand-operated swings and compared to the duration of eye contact when the macular receptors were not stimulated. Four of the five boys showed longer eye contact while on the motor driven oscillator (p less than .0005), and two of these also showed longer contact when on a manually operated swing (p less than .025). The fifth child resisted the use of the oscillator and did not show longer eye contact while on it (p greater than .05), but did so when on two different swings (p less than .005).	Random assignment to treatment condition, subject served as own controls. Because the boys varied in cooperation, the tests could not be performed using the same apparatus with each child; therefore results were analyzed separately for each child.
(Wolkowicz, Fish, & Schaffer, 1977)	All subjects had increased scores on clinical observations. 2 of 4 showed increased attention span, inconsistent improvements in aggression to others and self-aggression.	Quasi-experimental design with Pre-post testing.
Level V	Case Reports	
(A. J. Ayres, 1972c)	15 point increase in verbal score on WISC; average of 1.4 standard deviation improvement in auditory-language and sensory integrative functioning; greater than 1 year gain in reading; Subjective gains in postural skills, tolerance for tactile input and decreased gravitational insecurity.	Pre-Post testing.
(A. J. Ayres & Mailloux, 1983)	Initial significant decrease of amount of self-stimulation. Return to near baseline condition following 10 week absence from therapy for surgery and onset of menarche.	ABB; baseline data and repeated measures every six weeks;
(Karsteadt, 1983)	Marked increase in spontaneous verbal language during vestibular stimulation activities versus fine motor. Inconclusive results on attending behavior and language production in other settings.	Alternate days of ABA and ACA treatment; baseline and posttesting in condition A.
(Kwass, 1992, April 1)	Subjective improvements in self-care, gross and fine motor skills, language and social	Descriptive case report.

	responsiveness. Elimination of tantrum behaviors.	
(Larrington, 1987)	Improved motor control, calmness, sitting posture, and manipulation skills. Improved eating and bowel/ bladder control. Decreased self abuse and aggression. Increased interest in social interaction and appropriate attention and engagement on task.	Descriptive case report
(Ray, King, & Grandin, 1988)	Significantly greater percentage of vocalizations during the stimulation period versus non-stimulation. Spontaneous acquisition of 13 new words during 4 week period.	Pre-post testing each treatment session.
(Stallings, 1981)	Increased hand gazing and jumping during treatment phase but decreased rates of behaviors in second baseline condition.	ABA, experimental design with repeated measures.
(Zissermann, 1992)	Phase 1- five, 30 min treatments resulted in overall decrease of 46% in self-stimulating behaviors while wearing gloves; Phase 2- following 9 week baseline, nine 30 minute sessions had inconclusive results of decrease in one hand slapping the other but increase in table slapping.	Repeated measures.
Compiled by: T. May-Benson, 2008, contributions by J. Koomar.		

Additional Autism Reference:

- Case- Smith, J & Arbesman, M. (2008). Evidence-Based Review of Interventions for Autism Used in or of Relevance to Occupational Therapy, *AJOT*, 62, 416-429.
- Kennedy, D. (Nov 2008). The effectiveness of sensory strategies used in the classroom to increase productivity of students with autism.
- Dawson, G. & Watling, R. (2000). Interventions to facilitate auditory, visual & motor integration in autism: a review of the evidence. *Journal of autism and developmental disabilities*, 30 (5), 415- 421.
- Sinha, H., Silove, N., Wheeler, D. & Williams, K. (2005). Auditory integration training and other sound therapies for autism spectrum disorders. *The Cochran Library*, 4, 1-36.

III. What is the evidence that other strategies are effective interventions for sensory/motor problems?

A. Systematic Reviews- LD

- Swanson, H. & Sachse-Lee (2000). A meta-analysis of single-subject-design intervention research for students with LD. *Journal of Learning Disabilities*, 33(2), 114-136.

B. Systematic Reviews – Motor Disorders

- Hiller, S. (July 2007). Intervention for children with developmental coordination disorder: a systematic review. *The Internet Journal of Allied Health Sciences and Practice*, 5 (3).
- Kavale, K. & Mattson, P. (1983). One jumped off the balance beam: Meta-analysis of perceptual-motor training, *Journal of Learning Disabilities*, 16(3), 165-173.
- Pless, M. & Carlson, M. (2000). Effects of motor skill intervention on developmental coordination disorder: A meta-analysis, *Adapted Physical Education Quarterly*, 17(4), 381-401.

C. Narrative Reviews – DCD

- Mandich, A. (2001). Treatment of children with developmental coordination disorder: What is the evidence? *Physical and Occupational Therapy in Pediatrics*, 20, 51-68.
- Sigmundsson, H., Pedersen, H., Whiting, T., & Ingvaldsen, R. (1998). We can cure your child's clumsiness: A review of intervention methods. *Scan J Rehab Med*, 30, 101-106.

D. Narrative Review – Speech

- Griffer, M. (1999). Is sensory integration effective for children with language-learning disorders? A critical review of the evidence. *Language, Speech & Hearing Services in Schools*, 30, 393-400.