Efficacy of Sensory Integration Strategies on School Performance

PICO Question:
Do classroom supports based on sensory integration principles (such as the Alert Program, Henry’s Tool Chest, Weighted Vests, Willbarger protocol) enhance learning outcomes for school-age children?

How was the review conducted?
Four consecutive literature searches were conducted on March 30, 2007 to search all pertinent databases (i.e., CINAHL, Medline, Eric and Psych Info). The search terms varied slightly for each databases secondary to which words the databases recognized. Search terms included (sensory integration, alert program, sensory diet, Wilbarger protocol, deep pressure, tool chest) AND (school) AND (child). From this search, 18 articles were found. The following four articles were chosen because they were describing research projects and, after cursory evaluation, were the highest level of evidence on this topic.


Section 1 – Summaries and Critiques of Articles Reviewed

The purpose of this study was to provide quantitative data regarding specific practice patterns of a sample of pediatric Occupational Therapists and to identify behavioral changes observed in children with developmental disorders who have used weighted vests. The study was intended to expand upon the findings from a prior mail survey (Olson and Moulton, 2004) about therapists’ practice patterns in the use of weighted vests. A sample of 51 occupational therapists from different geographic areas in the US were recruited at the 1999 Annual AOTA (American Occupational Therapy Association) Conference, AOTA listserves for special interest groups, through postcards publicizing the study that were mailed to all purchasers of weighted vests from a weighted vest supplier, and through snowball technique. Participants responded to a 22-item telephone questionnaire consisting of demographic items, dichotomous, rank ordered, Likert scale items, and open-ended questions about how they used weighted vests with specific children. Responses were audio taped and data was entered into the Sphinx Development Survey (1998), which allows for entry of both quantitative and qualitative survey data. Univariate statistics were calculated to describe the sample and summarize changes in key behaviors for children with specific diagnoses seen by therapists. The questionnaire was not included in the article. Results indicated that 62.7% of the therapist sample worked in public schools. Most had more than 10 yrs. experience; 56.8% used weighted vests with children for more than 4 years and 64.7% used weighted vests with 9 or more children. Most children were identified as having a diagnosis of ADHD, Autistic Spectrum Disorder and sensory integration dysfunction. Other diagnosis included cerebral palsy, developmental delay, Down’s syndrome and traumatic brain injury. Seventy percent of therapists reported that they noted behavior changes, which included increased attention and staying on task. Some therapists felt that some of the changes in behavior may have been due to other sensory techniques provided at the same time. Staying in seat and attention span were the most common behaviors that therapists reported improving when weighted vests were used. Of significance is that most of the therapists interviewed are using weighted vests for similar reasons and applying similar protocols. A limitation of the study is that it represents collected opinions of therapists. Neither characteristics of the children using vests, nor an operational definition of improvement were presented, thus further research is needed to confirm or challenge data that was provided in this study. This was not a specific study of whether or not an intervention, i.e. use of weighted vest, changed behavior, but rather, a study exploring how therapists use weighted vests with children and what they perceive as the outcome.

Davidson, T., & Williams, B. (2000).
The purpose of the study was to determine if a 10-week occupational therapy (OT) intervention of combined sensory integration (SI) and perceptual-motor training with subsequent school/home follow-up was effective after 12 months among children with Developmental Cord Disorder (DCD). The article describes a pre-post-single-group design study, with a convenient sample (n=37) who had been referred to a pediatric OT clinic and who met the DSM IV criteria for DCD. Pre and post intervention measures were reviewed retrospectively to compare progress in manual dexterity, ball skills, balance, and visual-motor integration using the Movement Assessment Battery for Children and the Berry Test of Visual Motor integration (VMI). Retrospective information was obtained from clinical data and assessments. The intervention involved an individualized treatment including sensory integration techniques and perceptual-motor training for selected skills. Treatment was provided by three occupational therapists with formal training in SI and 3 years of experience. The clinic-based intervention was followed by activity-based home and school programs carried out by parents and teachers, with support from OT as requested until the 12-month follow-up post-test. A Wilcoxon signed rank test (appropriate for non-parametric paired data) was used to identify significant differences in pre and post scores. There was a small, statistically significant increase in fine motor skills at follow up. Measures of ball skills and balance did not show statistically significant improvement. The authors conclude that a combined SI and perceptual-motor training, followed with a school or home program, may be relatively ineffective at 12-month follow-up. It was difficult to attribute the causes of the improvement to the specific 10 wk. intervention and/or follow-up. The improvements may have been due to natural progress in the condition or maturation. This study had several other limitations, which included possible biases in sample selection, lack of detail regarding the treatment regime and lack of functional skill description or criteria.
Frequency, length and specific modalities used in individualized treatment sessions and follow-up were not specified, and would be impossible to replicate in practice. The study did provide criteria for sample selection relative to a single diagnosis of DCD, which is a good step toward identifying results for specific groups of children.

The purpose of this study was to determine the effectiveness of SI therapy in treating children with learning disabilities (LD) as perceived by their parents, teachers and occupational therapists. The literature review was thorough, documenting the conflicting results and controversial nature of SI therapy for children with LD. The study involved a convenient sample of parents, teachers and therapists of 10 children with learning disabilities who received school-based SI therapy services from an occupational therapist in two Midwestern cities. The children received a variety of treatment frequencies and durations. In addition to occupational therapy, all of the children in the study received speech therapy, and may have received other specialized services as well. A 21-item questionnaire was mailed to all respondents, which addressed demographic information about the child and occupational therapist, and perceived effect of SI on 12 skill areas. An additional 2-7 questions were specifically directed to parents, teachers and therapists. Thirty surveys were sent with a response rate of 77%, with perceptions related to 8 children. There were discrepancies among respondents regarding the specific types of learning disability with which the child had been diagnosed. The most common sensory integrative techniques used by the therapists were linear activities, tactile stimulation, games and jumping/bouncing. The author states that results indicated that SI therapy was perceived by the adults as “extremely effective” or “somewhat effective” for helping children with LD in 12 different academic and life skills areas. Data analysis lacked depth, e.g. data indicate that a significant number of teachers indicated that SI was “not effective at all”, “not very effective”, or “not relevant” in academic skill areas of reading, math and reading. There was some confusion reported in the survey that caused respondent errors. There was a possible bias, as the treating therapists were using SI techniques. Other concerns about this study include a large number of intervention variables, small sample size, poorly defined diagnostic sample and a lack of definitions for reporting academic and life skill progress.

The purpose of this study was to determine the effects of physiotherapy on sensory-motor function, academic scores, learning behavior and social emotional status of school aged children with Developmental Cord Disorder (DCD) and learning difficulties. The study reported a pilot randomized controlled clinical trial of physiotherapy intervention. The population from which the sample was drawn was 16 grade 1 - 3 students who attended a local primary school's learning support program. 14 boys were identified as meeting criteria for DCD and they comprised the study sample. All 14 students participated in pre and post-testing with the Neuro-Sensory Motor Developmental Assessment (NSMDA) to assess sensory motor functioning; academic improvement was assessed through mid-year and final year exams; teachers completed surveys related to social/emotional behaviors. Seven students were placed in the treatment group; 7 students were in the control group. The treatment group received 12 weeks of physiotherapy while the control group did not receive any physiotherapy. Treatment was administered 2x/week with 8 individual session and 4 group sessions. Goals of treatment were to promote normal sensory responses while addressing muscle tightness and postural misalignment, e.g. reflexes, postural reactions, sensory tolerance, motor planning, strength and GM/FM function. Post-test and end of the year data indicated that the treatment group demonstrated a statistically significant increase in the NSMDA (sensory motor) results. Improvement in academic performance and learning behavior were also noted, however, they were not statistically significant. Although the goals of physiotherapy intervention were reported, specific activities were not, making the study difficult to replicate. The type of learning difficulties experienced by participants was not described. The specific criteria for assessing DCD was not reported. All participants were male, making it difficult to generalize to girls with DCD and learning problems. Co-occurring interventions were not addressed for either the control or intervention groups, and it is difficult to know if both groups received the same co-occurring interventions. The study does provide a strategy for assessing the effects of intervention using randomized control groups that may be helpful in future studies of children with specific diagnosis. This pilot study did not support physiotherapy intervention to improve social/emotional or academic/learning behaviors, but did indicate improvement in the area targeted in intervention, i.e. sensory motor skills.
Section 2 – Implications for Practice

1. Summary of Research Findings:
   1. These studies illustrate the complexity of research in this area. Only one study was related to application of SI classroom strategies. There are no studies of the Alert Program, Willbarger Protocol, or sensory diet found. The study related to weighted vests (Olson, & Moulton, 2004) represents the collected opinion of therapists who use weighted vests with a variety of children. This study suggests the need for further objective assessment of benefits with specific populations of children. Davidson and Williams (2000) addressed the effectiveness of SI and perceptual motor intervention with a specific well defined population of children with DCD for 10 weeks followed by classroom or home consultation, but concluded that there was little evidence to support effectiveness of the intervention. Chia and Chua (2000) was related to a population of children with DCD and LD that was poorly defined. They explored the benefit of a course of physiotherapy targeted to perceptual motor and GM/FM intervention, using a randomized control group. Results of this study indicated improvement in perceptual motor skills, but no significant improvement in academic/learning performance or social/emotional functioning as assessed by school testing and teacher questionnaire. Stonefelt and Stein (1998) studied the perceived effectiveness of SI treatment on children with LD. Characteristics of the population were not well defined. Perceptions of parents, teachers and therapists indicated a positive perception of the effectiveness of SI. Further study of the objective changes in child behaviors are needed to substantiate the opinions of adults. While each study offered a contribution to our understanding of the efficacy of SI based interventions on children’s classroom behaviors, the empirical evidence of treatment efficacy remains weak.

2. Trustworthiness of studies’ results:
   The reliability of the information from the studies is in question because the psychometric properties of the assessment tools are not known. Therapists’ perception of effectiveness of one technique, weighted vests, suggests that further study to determine functional outcomes of weighted vest for specific groups of children is warranted. The validity of the 2 intervention studies is questionable because the research study designs, specifically the nature of the interventions, were not clear or well developed enough to allow practitioners to replicate them.

3. Level of Evidence:
   Most of the studies were at level 5 for academic (expert opinion), with one study at level 2b for sensorimotor performance (case-control study). It is very difficult to ascertain what factor(s) is responsible for the changes noted in child performance.

TAKE-HOME MESSAGE

There is weak research evidence supporting the use of sensory integration strategies as accommodations in schools to enhance academic performance in school age children. Consequently, Individual Education Plan (IEP) teams deciding to include these types of strategies as part of a student’s IEP or instructional program, should identify the expected impact of the strategies, and collect and interpret data to ensure that the strategies are effective. IEP teams are also encouraged to consider other strategies that may support student’s academic performance and have greater research evidence. Therapists are invited to read other reviews prepared by CanChild (www.canchild.ca) and the American Occupational Therapy Association.