



Wilma L. West Library Resource Notes

**Outcome or the Effectiveness of
Sensory Integrative Therapy in Children**

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Several times in the last two years, this question has been directed to the library, mainly in response to reimbursement questions and the push for evidence-based practice. This last time, I pulled together as many references as I could from OT SEARCH and other sources to serve as my base on which I'll build as new literature appears. In the future, I'll look at sensory integrative therapy intervention for adults and the elderly.

Mulligan, S. (2003). Examining the evidence for occupational therapy using a sensory integration framework with children: part one. *Sensory Integration Special Interest Section Quarterly*, 26(1), 1-4.

No abstract available for this record

Mulligan, S. (2003). Examining the evidence for occupational therapy using a sensory integration framework with children: part two. *Sensory Integration Special Interest Section Quarterly*, 26(2), 1-5.

No abstract available for this record

Foss, A, Swinth, Y, McGruder, J & Tomlin, G. (2003). Sensory modulation dysfunction and the Wilbarger Protocol: an evidence review. *OT Practice*, 8(12), CE-1 - CE-8.

Occupational therapists have used brushing as an intervention technique for many years. More recently, the Wilbarger Protocol has been used by pediatric occupational therapists who use a sensory integrative framework within occupational therapy. Specifically, this protocol has been recommended for use with children who have sensory modulation dysfunction (SMD) with manifestations of overresponsiveness to sensory stimuli, also called sensory defensiveness. This article reviews relevant literature, provides an overview of some of the issues surrounding the application of this intervention technique, and provides strategies for applying this material to clinical practice. Implications for future research are discussed.

Uyanik M, Bumin G, & Kayihan H. (2003). Comparison of different therapy approaches in children with Down syndrome. *Pediatric International*, 45(1):68-73.

BACKGROUND: Children with Down syndrome have sensory integrative dysfunction as a result of limited sensory experience from lack of normal motor control. The aim of the present study was to compare the effects of sensory integrative therapy alone, vestibular stimulation in addition to sensory integrative therapy and neurodevelopmental therapy, on children with Down syndrome. **METHODS:** The present study was carried out at the Occupational Therapy Unit,

School of Physical Therapy and Rehabilitation of Hacettepe University. Forty-five children who were diagnosed as having Down syndrome by the Departments of Paediatric Neurology and Medical Genetics at Hacettepe University were assessed and randomly divided into three groups. Sensory integrative therapy was given to the first group (n=15), vestibular stimulation in addition sensory integrative therapy was given to the second group (n=15) and neurodevelopmental therapy was given to the third group (n=15). All children were evaluated with Ayres Southern California Sensory Integration Test, Pivot Prone Test, Gravitational Insecurity Test and Pegboard Test. The hypotonicity of extensor muscles, joint stability, automatic movement reactions and locomotor skills were tested. Treatment programs were 1.5 h per session, 3 days per week for 3 months. RESULTS: When these groups were compared, statistically significant differences were found in subjects' performance of balance on right foot-eyes open, pivot prone position-quality score and locomotor skills-front tests ($P < 0.05$). There were no significant differences in the other tests ($P > 0.05$). CONCLUSIONS: The results of the present study showed that sensory integration, vestibular stimulation and neurodevelopmental therapy were effective in children with Down syndrome. It was concluded that when designing rehabilitation programs for children with Down syndrome, all treatment methods should be applied in combination, and should support each other according to the individual needs of the child.

Baranek GT. (2002). Efficacy of sensory and motor interventions for children with autism. *Journal of Autism and Developmental Disorders*, 32, 397-422.

Idiosyncratic responses to sensory stimuli and unusual motor patterns have been reported clinically in young children with autism. The etiology of these behavioral features is the subject of much speculation. Myriad sensory- and motor-based interventions have evolved for use with children with autism to address such issues; however, much controversy exists about the efficacy of such therapies. This review paper summarizes the sensory and motor difficulties often manifested in autism, and evaluates the scientific basis of various sensory and motor interventions used with this population. Implications for education and further research are described.

Salokorpi T, Rautio T, Kajantie E, & Von Wendt L. (2002). Is early occupational therapy in extremely preterm infants of benefit in the long run? *Pediatric Rehabilitation*, 5(2):91-98.

A total of 126 infants with extremely low birth weight (ELBW; < 1000 g) were enrolled in a prospective case-control study in order to examine the effect of occupational therapy based on sensory integration (SI) and neurodevelopmental therapy (NDT) on neurological development. The children were grouped as matched pairs on the basis of determined developmental risk scores assessed at the age of 3 months. The intervention children had a 6-month period of weekly occupational therapy from the corrected age of 6-12 months. The follow-up showed that the social development of the intervention children was significantly better at the age of 12 months, but at the age of 2 years the groups had equal developmental scores in neurological, neuropsychological and speech therapy assessments. The Miller assessment for pre-schoolers (MAP) performed in a total of 96 (92%) of the study children at the age of 4 years failed to demonstrate any significant differences between the groups. It is concluded that this amount of occupational therapy in ELBW infants does not have any detectable effect on long-term neurological development.

Zbytniewski, R. (2002). The effects of sensory integration's Wilbarger technique on engaging behaviors. Bay Shore, NY: Touro College. (Master's project)

The short term effects of Wilbarger's brushing Protocol was the focus of this research project. Three different types of engaging behaviors were examined including visual, motor, and both visual and motor combined. This investigation used the quasi-experimental, one group, and subjects serving as their own control design. Each subject also served as a single case study subject. Seven children, two girls and five boys, with Sensory Integrative Dysfunction, especially sensory defensiveness, were observed in a pre-school classroom for five minutes pre-brushing treatment and five minutes post-brushing treatment. However, the data from this research project was unable to support the Wilbarger Protocol. Although the data was not significant, boys may show a greater response to the Wilbarger technique than girls. Research has now been started and other occupational therapists may want to continue a different perspective on this topic.

Bumin, G & Kayihan H. (2001). Effectiveness of two different sensory-integration programmes for children with spastic diplegic cerebral palsy. *Disability and Rehabilitation*, 23(9), 394-399.

PURPOSE: This study was planned to investigate the effects of individual and group approaches to sensory-perceptual-motor (SPM) training on children with cerebral palsy. **METHOD:** This study was carried out at the School of Physical Therapy and Rehabilitation of Hacettepe University, Occupational Therapy Unit. Forty-one children who were diagnosed as having spastic diplegic cerebral palsy by the Department of Paediatric Neurology of Hacettepe University were assessed. Forty-one children with cerebral palsy were randomly divided into three groups. Individual and group SPM training were given to first group (IND) (n = 16) and second group (GRP) (n = 16) respectively. The third group was determined as a control group (n = 9) and only the home programme was given. All children were evaluated with Ayres Southern California Sensory Integration Test and Physical Ability Test before and after training. The SPM training programmes were applied for 1.5 hours, 3 days per week for 3 months. **RESULTS:** Estimates of effect sizes were calculated for group, individual and control treatments. Results indicated that both group and individual treatments had a measurable effect that was consistently greater than that of controls. **CONCLUSIONS:** This study shows that programmes of SPM training in individuals and group treatments affect children with cerebral palsy. It was concluded that SPM training in children with cerebral palsy will be applied to combined programmes and the relationship with individual and group treatments developed.

Cohn, ES. (2001). Parent perspectives of occupational therapy using a sensory integration approach. *The American Journal of Occupational Therapy*, 55, 285-294.

This qualitative study explored parents' points of view regarding their children's participation in occupational therapy using a sensory integration approach. Data were collected through parent interviews and were analyzed using grounded theory methods. The parents' perceptions of the benefits of therapy for their children were categorized into three interrelated constructs: abilities, activities, and reconstruction of self-worth. For themselves, parents valued understanding their children's behavior in new ways, which facilitated a shift in expectations for themselves and their children, having their parenting experience validated, and being able to support and advocate for their children. Implications for family-centered intervention and future research are proposed.

Nackley, VL. (2001). Sensory diet applications and environmental modifications: A winning combination. *Sensory Integration Special Interest Section Quarterly*, 24(1), 1-4.
No abstract available for this record

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(5):415-421.

Evidence is reviewed on the prevalence of sensory and motor abnormalities in autism and the effectiveness of three interventions designed to address such abnormalities--sensory integration therapy, traditional occupational therapy, and auditory integration training. Although sensory processing and motor abnormalities are neither universal nor specific to autism, the prevalence of such abnormalities in autism is relatively high. There is, however, little controlled research on the effectiveness of interventions designed to address these abnormalities. Four objective outcome studies of sensory integration therapy were identified. These were of such small scale that no firm conclusions regarding efficacy could be made. No empirical studies of traditional occupational therapy in autism were found. Five studies of auditory integration training were found. Results of these studies provided no, or at best equivocal, support for the use of auditory integration training in autism.

Miller, L J & Lane, SJ. (2000). Toward a consensus in terminology in sensory integration theory and practice: Part 1: Taxonomy of neurophysiological processes. *Sensory Integration Special Interest Section Quarterly*, 23(1), 1-4.

No abstract available for this record

Lane, SJ, Miller, LJ & Hanft, BE. (2000). Toward a consensus in terminology in sensory integration theory and practice: Part 2: Sensory integration patterns of function and dysfunction. *Sensory Integration Special Interest Section Quarterly*, 23(2), 1-3.

No abstract available for this record

Hanft, BE, Miller, LJ & Lane, SJ. (2000). Toward a consensus in terminology in sensory integration theory and practice: Part 3: Observable behaviors: Sensory integration dysfunction. *Sensory Integration Special Interest Section Quarterly*, 23(3), 1-4.

No abstract available for this record

Davidson, T & Williams, B. (2000). Occupational therapy for children with developmental coordination disorder: A study of the effectiveness of a combined sensory integration and perceptual-motor intervention. *The British Journal of Occupational Therapy*, 63, 495-499.

Developmental coordination disorder (DCD) is a problem for a significant proportion of children during school years and may result in more enduring social and emotional problems. Both occupational therapists and physiotherapists provide services for children with DCD. However, there are few studies examining the effectiveness of interventions for this client group. This has resulted in continuing uncertainty over the most effective treatment for this condition. This paper examines past problems with regard to definitions of the disorder, research design and ethical barriers. The results of a pre-test, post-test single-group study of an occupational therapy intervention for DCD are then presented. Outcomes were measured by the Movement ABC and the Beery-Buktenica Developmental Test of Visual-Motor Integration (Beery 1982) at one-year follow-up. The results are discussed in relation to the shortcomings of research design used in the study. It is concluded that the intervention, consisting of combined sensory integration and perceptual-motor training, is likely to be ineffective at 12-month follow-up.

Joshi, AS. (2000). Single-system design: An effective strategy for evaluating clinical change. *The British Journal of Occupational Therapy*, 63, 283-287.

Documentation and research are two essential factors for the growth of any profession and, therefore, have priority in occupational therapy. Documentation is the key to the communication of the clinical services rendered by the occupational therapist to clients and to other members of the professional team (Gillette 1982, Ottenbacher and York 1984). Single- system research, sometimes referred to as single-subject research, is a quantitative research method. In single-system research, the efficacy of a certain intervention can be evaluated in a systematic way by studying one subject in a single setting (Ottenbacher 1984). A therapist can make use of any therapeutic technique to work in a single-system design. Gillette (1982, p499) stated: "Each occupational therapy clinic is a virtually untouched laboratory, a storehouse of evidence that, properly recorded, analyzed and published, would serve to confirm the value of occupational therapy as a health care service." This article describes the application of single-system design in a clinical setting. The client discussed was treated using sensory integrative therapy. The purpose of this article is to show how a selected behavior can be recorded and measured effectively using a single-system design.

Leemrijse C, Meijer OG, Vermeer A, Ader HJ, Diemel S. (2000). The efficacy of Le Bon Depart and Sensory Integration treatment for children with developmental coordination disorder: a randomized study with six single cases. *Clinical Rehabilitation*, 14(3), 247-259.

OBJECTIVE: Evaluation of the efficacy of Le Bon Depart (LBD) treatment and Sensory Integration (SI) treatment on motor performance of children with developmental coordination disorder. **DESIGN:** A single subject design with multiple baseline and alternating treatments. Order of treatment and length of phase were randomized. Measurements were blinded. **SETTING:** Department of Occupational Therapy at the Academic Hospital Vrije Universiteit Amsterdam, The Netherlands. **SUBJECTS:** Five boys and one girl with developmental coordination disorder (age: 6.0-8.1 years). **INTERVENTIONS:** Baseline condition, Le Bon Depart treatment and Sensory Integration treatment. **MAIN OUTCOME MEASURES:** The Movement ABC, Praxis Tests, a rhythm test and visual analogue scales. With the exception of the Praxis Tests, lower scores indicate better performance. **RESULTS:** During both treatments, the performance on the Movement ABC ($x = 7.21$) and the scores on the visual analogue scales ($x = 46.64$) were significantly better than in the baseline (Movement ABC (baseline): $x = 17.38$; visual analogue scales (baseline): $x = 68.18$). After treatment 2, performance on the Praxis Tests and scores on the visual analogue scales were significantly better than after treatment 1 (Praxis Tests: 113.54 versus 104.68; visual analogue scales: 34.74 versus 58.54). All six children performed better on the Movement ABC during treatment as compared to the baseline. Le Bon Depart led to significant improvement on all dependent variables, Sensory Integration on the visual analogue scales only. The improvements after Le Bon Depart were larger than the improvements after Sensory Integration treatment. On the rhythm test this difference was significant: LBD led to an improvement of 43.01 points, while the improvement after SI was 17.59 points ($p < 0.05$). **CONCLUSION:** Motor performance of children with developmental coordination disorder improved significantly on all dependent variables after the combination of treatments. Le Bon Depart led to more improvement than Sensory Integration. LBD appears to be a valuable treatment method for children with developmental coordination disorder.

May-Benson, T Reeves, GD Young, SB. (2000). Creating a consensus on terminology in Sensory Integration: Comments and reflections. *Sensory Integration Special Interest Section Quarterly*, 23(4), 1-3.

No abstract available for this record

Cicchino, C & Monteleone, V. (2000). The efficacy of sensory integration therapy on pre-school children with autism and its effects on verbalization and engagement. Bay Shore, NY: Touro College. (Master's thesis)

This multiple case study design explored the efficacy of a sensory diet coupled with individual occupational therapy intervention with six preschool children with autism. Within this design two behaviors were measured, engagement and verbalization. The factors of engagement analyzed for results included adult interaction, peer interaction, mastery play, and non-engagement. Comparisons were made of baseline and intervention phases for the six children. All four children analyzed for verbalizations demonstrated an increase in frequency of verbalizations during post- sensory diet activity from baseline to final month. Of the four children analyzed for engagement in the baseline, middle, and final months three demonstrated an increased frequency of adult interaction by the final month during the post-sensory diet activity. Whereas, the other two children were analyzed only during the pre-sensory diet activity for a beginning and an end month in which they both demonstrated an increased frequency of mastery of play and a decreased frequency of non-engaged behaviors. Individual gains were observed for all children in the many behavior areas analyzed, however, it is difficult to categorize these gains as a whole for the group due to individual differences. Overall, these children appeared to have demonstrated an increased tolerance to sensory stimulation and positive experiences during the sensory motor play as evidenced through higher engagement levels and higher frequency of verbalizations.

Case-Smith, J & Bryan, T. (1999). The effects of occupational therapy with sensory integration emphasis on preschool-age children with autism. *The American Journal of Occupational Therapy*, 53, 489-497.

OBJECTIVE. Using single-subject research design, the effects of an occupational therapy intervention emphasizing sensory integration with five preschool children with autism were examined. **METHOD.** In the AB design, nonengagement, mastery play, and interaction were measured, using videotape clips of each child's free play in the preschool. Following a 3-week baseline, an occupational therapist provided one-on- one sessions and consultation to teachers for 10 weeks. **RESULTS.** When baseline and intervention phases were compared, four children demonstrated decreased frequency on nonengaged behavior, and three demonstrated increased frequency of mastery (goal-directed) play. Improvements in frequency of interaction were minimal. **CONCLUSION.** The results support descriptions in the literature regarding the behavioral changes that children with autism can make when participating in intervention using a sensory integration approach.

Clark, GF & Ward, S. (1999). Charting results: Evaluating progress of children with sensory processing disorder. *OT Practice*, 4(10), 12-16.
No abstract available for this record

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

OBJECTIVE. The purpose of this study was to find whether existing studies of treatment using sensory integration approaches support the efficacy of these approaches. **METHOD.** With meta-analysis, the results of sensory integration efficacy research studies published from 1972 to the present were synthesized and analyzed. Sixteen studies were used to compare sensory integration effect with no treatment (SI/NT), and 16 were used to compare sensory integration

effect with alternative treatments (SI/ALT). Overall average effect sizes, comparisons of the effect sizes for different dependent variables, and secondary factors associated with effect size variation were examined. RESULTS. The weighted average effect size of SI/NT studies was .29. However, there was a significant difference between the average effect sizes of the earlier studies (.60) and the more recent studies (.03). Of the outcome measures, larger effect sizes were found in the psychoeducational category (.39) and motor category (.40). Of SI/ALT studies, the average effect size was .09, not significantly different from zero. CONCLUSION. Three central conclusions can be made. First, in the SI/NT comparison, a significant effect was replicated for sensory integration treatment effects in earlier studies, but more recent studies did not show overall positive effects. Second, larger effect sizes were found in psychoeducational and motor categories. Third, sensory integration treatment methods were found to be as effective as various alternative treatment methods.

Linderman, TM & Stewart, KB. (1999). Sensory integrative-based occupational therapy and functional outcomes in young children with pervasive developmental disorders: A single- subject study. *The American Journal of Occupational Therapy*, 53, 207-213.

OBJECTIVE. This single-subject study explored the effects of sensory integrative- based occupational therapy provided in an outpatient clinic on the functional behaviors of two young children with pervasive developmental disorder (PDD) at home.

METHOD. The participants were two 3-year-old boys with PDD. Before the study, the participants had not received a consistent program of sensory integrative-based occupational therapy. Before the baseline phase, three target behaviors were identified for each child, using an adapted version of Cook's revised Functional Behavior Assessment for Children with Sensory Integrative Dysfunction. These target behaviors were operationalized and used as repeated measures taken in the home during both the 2-week baseline and treatment phases. The treatment phase was 11 weeks for Participant 1 and 7 weeks for Participant 2.

RESULTS. Both participants displayed significant improvements in the areas of social interaction, approach to new activities, response to holding or hugging, and response to movement. Decreases were noted in the frequency and duration of disruptive behaviors (e.g., high activity levels, aggressive behaviors), with an increase in functional behaviors, such as spontaneous speech, purposeful play, and attention to activities and conversation. Concurrent interventions that were not part of this study (e.g., initiation of speech therapy, preschool, vitamins) may have confounded these results.

CONCLUSIONS. These findings support the application of sensory integrative-based occupational therapy as a part of the services provided to some children with PDD. Further research is needed to replicate these findings and to isolate the effects of sensory integrative-based occupational therapy because both participants were receiving other interventions at the time of this study.

Cohn, ES & Cermak, SA. (1998). Including the family perspective in Sensory Integration outcomes research Approach. *The American Journal of Occupational Therapy*, 52, 540-546.

Occupational therapy, along with other health and rehabilitation professions, is experiencing an increased emphasis on measurement of intervention outcomes. The results of outcomes research are being used to develop practice guidelines, set standards for reimbursement, and justify health care policy. The outcome assessments used by therapists reflect our belief systems and the assumptions about behaviors we expect to influence. Using a sensory integration perspective to illustrate key points, we present a conceptual framework that is based on the disablement framework and Coster's occupational functioning for children model. We

highlight the need to examine each of the multiple levels at which intervention may influence child and family function and the links among levels. Sensory integration theory and efficacy studies are reviewed to identify assumptions relative to how sensory integration affects the everyday occupations of children in the context of their families. Potential research methods and assessments are suggested to include the family perspective in outcome studies.

Belsky, MM. (1998). Parents' Perceptions of the Effectiveness of Sensory Integration and Behavior Modification in Autistic Preschool Children. NY, NY: Touro College. (Master's thesis)

Autism is a developmental disorder of brain function that interferes with reasoning, communication, and social interaction. There are a number of behavioral problems associated with this disorder and they include the following: tantrums, aggression, self-stimulatory, and property destruction.

This study focused on parents' perceptions of the effectiveness of combining two occupational therapy treatments, sensory integration and behavior modification, in reducing the self-injurious and self-stimulatory behaviors of autistic preschool children. Data was obtained from 57 returned questionnaires sent to parents attending support groups in the New York and New Jersey area.

Questions asked were to determine their perceptions of these treatments by noting changes in these behaviors exhibited by the children at the end of the school year (June 1998) as compared to the beginning of the school year (September 1997). The hypothesis assumed that parents would perceive the effectiveness of combining sensory integration and behavior modification.

Results supported the hypothesis and indicated that future research is needed to validate the effectiveness of these two treatment approaches.

Sokol, A. (1998). Occupational therapists' perception of the effectiveness of neurodevelopmental, sensory integration, and behavior modification treatments in decreasing self-stimulatory and self-injurious behaviors in children with autism. NY, NY: Touro College. (Master's thesis)

This study investigated the perceptions of 30 NBCOT certified occupational therapists in the New York City area who belong to AOTA's school-based special interest section. Three treatment methods (NDT, SI, and BM) were investigated in their effectiveness of decreasing self-stimulatory and self-injurious behaviors in children with autism. Questionnaires consisted of demographic data information and 15 descriptors of the three treatment methods. The results of the data examined three different aspects, if therapists perceive a combined approach is more effective, if there are clusters within each of the three treatment methods, and if there are clusters within all

three-treatment methods. Results of the data revealed that occupational therapists may not be using a single approach for intervention but in fact are using a holistic approach. Ideally, a holistic approach, such as occupational genesis, which focuses on the entire individual, should be employed in treatment settings. However, many factors, such as a small sample population and slight distinctions of treatment methods may have influenced the results of this study.

Stonefelt, LL & Stein, F. (1998). Sensory integrative techniques applied to children with learning disabilities: An outcome study. *Occupational Therapy International*, 5, 252-272.

Learning disabilities are the most frequently reported causes of functional limitation among school-age children (McNeil, 1995). Many children with learning disabilities have an underlying

sensory integrative dysfunction (Hoehn and Baumeister, 1994); therefore sensory integration therapy has been widely used in treating those children. Research on the effectiveness of sensory integration therapy in treating children with learning disabilities has shown conflicting results; many studies supported the use of sensory integration therapy in treating children with learning disabilities, as perceived by their parents, teachers and occupational therapists. Thirty surveys were sent to participants in the Midwest; 10 each to parents, teachers and occupational therapists. Twenty-three surveys were returned, giving a response rate of 77%. Most of the respondents identified that sensory integration therapy was extremely or somewhat effective in helping the children improve function in 12 skill areas. All parents reported doing activities in the home to help their child and all teachers reported making adaptations in the classroom to better accommodate the child. The sensory integrative techniques most frequently used by the therapists were linear activities, tactile stimulation, games and jumping/bouncing. Seven of the therapists reported using another treatment method in addition to sensory integration. These seven noted that a combination of treatments, a multimodel approach, was more effective than sensory integration alone. This study was consistent with previous research showing that sensory integration is an effective treatment method for children with learning disabilities. However, further research is needed using prospective designs involving single-subject or group studies where extraneous variables are rigorously controlled.

Dunkerley, E, Tickle-Degnen, L & Coster, WJ. (1997). Therapist-child interaction in the middle minutes of sensory integration treatment. *The American Journal of Occupational Therapy*, 51, 799-805.

The purpose of this study was to describe the management of challenge during therapist-child interaction in sensory integration treatment. This descriptive and relational study of the middle minutes of treatment sessions partially replicated an earlier study of the beginning minutes. One-minute videotape clips taken from the middle minutes of 38 treatment sessions were shown to therapist judges who rated qualities of therapist and child behavior. Two patterns emerged from the correlations of ratings: work and playfulness. Work for the child involved trying hard, cooperating, and seeking assistance, whereas work for the therapist involved assisting and guiding the child. Play for the child included enjoying the activity, being successful and confident, and trying hard. For the therapist, play involved being creative and behaving playfully. Patterns of work and play were different across different levels of challenge to the child.

Cross, LA & Coster, WJ. (1997). Symbolic play language during sensory integration treatment. *The American Journal of Occupational Therapy*, 51, 808-814.

OBJECTIVE. Clinical writings on sensory integration treatment and theory have long professed that play serves as an important means of implementing treatment goals. However, to date, there has been little research that examines this aspect of the intervention. With the use of play language as an indicator for the occurrence of play, this study examined the frequency and characteristics associated with symbolic play language that therapists and children use during sensory integration therapy. This study is part of an ongoing research program designed to examine therapist-child interactions.

METHOD. The frequency of symbolic play language observed in 41 videotaped treatment sessions of therapist-child dyads (21 children, 12 therapists) was recorded with the Challenge Coding System. The presence of symbolic play language was recorded if the child or therapist used language that incorporated the child, therapist, equipment, or activity into a symbolic or pretend play theme. The frequency of symbolic play language and percentage of time spent

using play language were calculated. Associations among frequency of play language, child age, and behavior during the session (e.g., seeking assistance, cooperation) were also examined.

RESULTS. Symbolic play language proved to be a major feature of sensory integration treatment sessions. It also correlated with child age and with some features associated with therapeutic interactions (i.e., child tries hard, child seeks assistance, therapist assists child, therapist modifies activity, therapist structures activity).

CONCLUSION. The results suggest that these therapists used play language frequently and that this usage may support children in sensory integrative therapy to successfully accomplish activities.

Leary PM. (1997). Interventions for children with neurodevelopmental delay. *South African Medical Journal*, 87(12), 1680-1684.

OBJECTIVES: To review studies in the scientific literature of five physical interventions commonly recommended for children with neurodevelopmental delay. **DESIGN:** A literature search for and a review of the results of controlled and other studies conducted in the course of the last 25 years. **SETTING:** Institute of Child Health, University of Cape Town. **SUBJECTS:** Patterning; neurodevelopmental therapy; sensory integrative therapy; optometric visual training; auditory integration therapy. **OUTCOME MEASURES:** Findings and conclusions drawn in the studies reviewed. **RESULTS:** Controlled studies fail to provide evidence to support claims made for the five interventions examined. **CONCLUSIONS:** In the absence of scientific evidence for efficacy patterning, neurodevelopmental therapy, sensory integrative therapy, optometric visual training and auditory integrative therapy cannot be recommended for children with neurodevelopmental delay.

Kemmis, BL & Dunn, WL. (1996). Collaborative consultation: The efficacy of remedial and compensatory interventions in school contexts. *The American Journal of Occupational Therapy*, 50, 709-717.

OBJECTIVE. This study examined the intervention success of weekly collaborative consultation between therapists and teachers.

METHOD. Ten therapist-teacher pairs consulted for 60 minutes weekly throughout the school year about students identified as having sensory integration dysfunction with learning problems. Each week, the pairs identified a specific functional classroom goal then designed either a remedial or compensatory intervention and set criteria for intervention success. At each successive weekly meeting, the pairs determined whether the goal was met. Intervention success was analyzed across 10 students (for a total of 213 goals).

RESULTS. There was a positive effect for overall intervention success. Although remedial and compensatory interventions were equally successful across student performance areas, therapist-teacher pairs demonstrated a preference for compensatory and academic goals.

CONCLUSION. The overall positive effect for intervention success suggests that when occupational therapists and teachers collaborate on behalf of students, they can facilitate student success in a variety of performance areas. Therapist- teacher preference for compensatory and academic goals indicates that therapist- teacher collaboration can be useful for occupational therapists to link interventions to academic goals in school contexts.

DeGangi, GA, Sickel, R, Wiener, AS & Kaplan, EP. (1996). Fussy babies: to treat or not to treat. *The British Journal of Occupational Therapy*, 59, 457-464.

In this prospective study, the developmental outcomes of 39 infants with high irritability and sensory processing problems, also described as regulatory disorders, were examined at 7-30 months and at 3 years using clinical interdisciplinary assessment. Infants with regulatory disorders were defined as being behaviorally difficult with disturbances in sleep, feeding, state control, self-calming, mood regulation and sensory processing. The performance of samples of infants with regulatory disorders, 13 untreated and 26 treated, and 11 normal children were compared at 3 years. All subjects in the clinical sample were offered 12 weeks of intervention after the initial

assessment to address regulatory problems. Of the 39 subjects, 26 chose treatment, thus resulting in a self-selected treated sample. Post hoc analysis revealed that, at 7-30 months, untreated subjects had more sleep problems and were more irritable whereas treated subjects had more feeding problems and their mothers reported feeling depressed. At 3 years, the children with regulatory disorders differed from their normal counterparts in sensory integration, mood regulation, attention, motor control, sleep and behavioral control. Untreated subjects showed more emotional and behavioral problems than treated subjects. Treated subjects had more motor and sensory integrative problems than untreated subjects but, despite the fact that they had more constitutional problems, they did not show the emotional and behavioral problems that were found in the untreated group. The clinical importance of these findings for occupational therapists is discussed.

Coster, W, Tickle-Degnen, L & Armenta, L. (1995). Therapist-child interaction during sensory integration treatment: development and testing of a research tool. *The Occupational Therapy Journal of Research*, 15, 17-35.

Although Ayres (1972) identified the interaction between therapist and child as an essential feature of successful sensory integration treatment, this aspect of the treatment process has not been examined in efficacy studies to date. In part, this omission may be explained by the lack of adequate measurement tools for this purpose. This paper reports on the development and reliability testing of the Challenge Coding System, a quantitative research tool designed to examine the collaboration of therapist and child in the sensory integration treatment process. Data from three studies are reported that collectively demonstrate that important aspects of the therapeutic interaction can be measured reliably. Potential uses of the new instrument in research are discussed.

Allen, S & Donald, M. (1995). The effect of occupational therapy on the motor proficiency of children with motor/learning difficulties: a pilot study. *The British Journal of Occupational Therapy*, 58, 385-391.

A pilot study was undertaken to consider the effect of occupational therapy on the motor proficiency of children with motor/learning difficulties. Intervention was based on Ayres' model of sensory integration. Motor proficiency was assessed before and after 10 sessions of occupational therapy. The assessment tool used was the Bruininks-Oseretsky Test of Motor Proficiency. The subjects were five children attending mainstream primary schools. Change was noted in all cases: four subjects improved whilst one deteriorated. Further data are required for statistical analysis; however, the mean standard score improved. Age appeared to be a factor in the level of improvement attained. Recommendations for future studies are made in relation to assessment techniques and study design.

Wilson, BN & Kaplan, BJ. (1994). Follow-up assessment of children receiving sensory integration treatment. *The Occupational Therapy Journal of Research*, 14, 244-266.

Following the completion of a study of the efficacy of sensory integration (SI) treatment compared with tutoring, the question raised was whether a greater difference between the two groups would exist after a period of time had elapsed after treatment ended. Twenty-two of the original 29 subjects completed follow-up assessment two years after the completion of their treatment. Only one significant difference between the two groups was seen at follow-up: The gross motor performance of the group who received SI treatment was significantly greater than that of children who received tutoring. There was no difference between the groups on measures of reading skills, fine motor skills, visual motor skills, or behavioral factors. There were no significant correlations between the amount of improvement a child made during treatment and the maintenance of the gains.

Daems, J. (Ed.). (1994). *Reviews of Research in Sensory Integration*. Torrance, CA: Sensory Integration International.

No abstract available for this record

Hoehn TP, & Baumeister AA. (1994). A critique of the application of sensory integration therapy to children with learning disabilities. *Journal of Learning Disabilities*, 27, 338-350.

Sensory integration (SI) therapy is a controversial--though popular--treatment for the remediation of motor and academic problems. It has been applied primarily to children with learning disabilities, under the assumption that such children (or at least a subgroup of them) have problems in sensory integration to which some or all of their learning difficulties can be ascribed. The present article critically examines the related issues of whether children with learning disabilities differentially exhibit concomitant problems in sensory integration, and whether such children are helped in any way by means specific to SI therapy. An overview of theoretical contentions and empirical findings pertaining to the first issue is presented, followed by a detailed review of recent studies in the SI therapy research literature, in an effort to resolve the second issue. Results of this critique raise serious doubts as to the validity or utility of SI therapy as an appropriate, indicated treatment for the clinical population in question--and, by extension, for any other groups diagnosed as having "sensory integrative dysfunction." It is concluded that the current fund of research findings may well be sufficient to declare SI therapy not merely an unproven, but a demonstrably ineffective, primary or adjunctive remedial treatment for learning disabilities and other disorders.

Humphries, TW, Snider, L & McDougall, B. (1993). Clinical evaluation of the effectiveness of sensory integrative and perceptual motor therapy in improving sensory integrative function in children with learning disabilities. *The Occupational Therapy Journal of Research*, 13, 163-182.

After 72 1-hour therapy sessions for 3 hours per week, significantly more subjects, aged 58-107 months, receiving sensory integration therapy (n=35) and perceptual motor training (n=35) than those receiving no treatment (n=33) showed improvement in their sensory integrative functioning. The same effect was found for a subgroup of children exhibiting vestibular dysfunction only. Improvement could include an increase of all test scores defining a child's particular dysfunction into the normal range with associated clinical observations indicating no problem, or a reduction in the severity of a child's dysfunction, the number of their dysfunctional systems, or both severity and dysfunctional systems. The groups did not differ in the incidence of any one of these individual types of improvement but only in their overall improvement represented by the total of all types. Discussion focused on the type and degree of improvement therapists can...

DeGangi, GA, Wietlisbach, S, Goodin, M & Scheiner, N. (1993). A comparison of structured sensorimotor therapy and child-centered activity in the treatment of preschool children with sensorimotor problems. *The American Journal of Occupational Therapy*, 47, 777-786.

His study compared the benefits of a child-centered therapy approach emphasizing child-initiated play interactions within a structured therapy environment to those of a therapist-directed, structured sensorimotor therapy approach in 12 preschool children with sensorimotor dysfunction. Each child received a pretest, 8 weeks of intervention (A or B) provided once weekly for a 1-hour session, a retest, 8 weeks of intervention (B or A) provided once weekly, and a final retest. A case study methodology was used to evaluate outcome data. Structured sensorimotor therapy was more useful than child-centered therapy in promoting gross motor skills, functional abilities (i.e. self-care), and sensory integrative functions. Child-centered therapy appeared to promote fine motor skills better. Although there were no differences in the two therapies for gains in play, attention, and behavior, variables such as temperament, attentional abilities, family stress, severity of sensorimotor delay.

Horowitz LJ, Oosterveld WJ, & Adrichem R. (1993). Effectiveness of sensory integration therapy on smooth pursuits and organization time in children. *Pediatric und Grenzgebiet*, 31(5), 331-44.

In this study the effect of sensory integration (SI) therapy on smooth pursuit eye movements, tracking and learning time was evaluated in 21 children diagnosed with sensory integration dysfunction. A control group of 11 normal children, matched for age and sex was also tested. Electrooculograph (EOG) recordings were inspected for number of saccadic intrusions during smooth pursuit movements. Prior to therapy the children in the SI treatment group exhibited significantly more saccadic intrusions during smooth pursuit movements and took significantly longer to perform the task than the normal control group. After 6-9 months of SI therapy one hour a week, there was a significant reduction in the number of saccades in the treatment group. The treatment group demonstrated a reduction in the time necessary to accomplish smooth pursuits and organizational time. The etiology of these improvements may be related to the subcortical substrated utilized in SI therapy as well as in the generation of smooth pursuit eye movements.

Kadmas, CJ. (1993). Is sensory integration therapy an effective treatment for children with learning disabilities. *Journal of Occupational Therapy Students*, 7, 15-22.

This article presents a position on the efficacy of sensory integration therapy in the treatment of children with learning disabilities. In addition to Ayres' pioneering work, six studies supporting the effectiveness of the therapy are cited. The coexistence of sensory integration dysfunction with learning disabilities is suggested in these studies. In opposition to the effectiveness of the therapy, four studies and two research reviews are referenced. The opposing research does not find a notable relationship between sensory integration dysfunction and learning disabilities, and sensory integration therapy was found to have no influence on areas of cognitive and academic performance. Areas of concern within the research indicate a need for methodological strength and suggest a revision of sensory integration theory. After examination of the available research, I have concluded that sensory integration therapy does not have enough supporting evidence...

Kaplan BJ, Polatajko HJ, Wilson BN, & Faris PD. (1993.) Reexamination of sensory integration treatment: a combination of two efficacy studies. *Journal of Learning Disability*, 26(5), 342-347.

Little empirical support exists for the application of sensory integration treatment (SIT) to assist children with learning problems. Treatment efficacy studies are expensive and difficult to carry out, and they have necessarily employed small samples that are inevitably heterogeneous. We have reanalyzed the efficacy of SIT by combining the data from one study involving 29 children in Alberta and a second study involving 67 children in Ontario. The results from each individual study, and now the results from the combined study, lead one to the conclusion that the therapeutic effect of SIT on children with learning deficits is not greater than other, more traditional methods of intervention.

Miller, LJ & Kennealey, M. (1993). Researching the effectiveness of sensory integration. *Sensory Integration Quarterly*, 21(2), 1, 3-5, 7.

Humphries T, Wright M, Snider L, McDougall B. (1992). A comparison of the effectiveness of sensory integrative therapy and perceptual-motor training in treating children with learning disabilities. *Developmental and Behavioral Pediatrics*, 13(1), 31-40.

This study compared the effect of sensory integration therapy (SI), perceptual-motor training (PM) and no treatment (NT) on the performance of 103 children with learning disabilities and sensory integrative dysfunction, aged 58 to 107 months, who were randomly assigned to one of the two treatment groups or to no treatment. After receiving a total of 72 1-hour sessions of therapy for 3 hours per week, PM-treated subjects showed significant gains over the other two groups, primarily in gross motor performance. SI-treated subjects showed an advantage in motor planning. There were no accompanying group differences in visual perception, handwriting readiness, copying ability, cognitive, academic, language and attentional skills or in self-concept. These findings demonstrate motor gains resulting from motor treatments without carry-over to functional skills and abilities more directly associated with school performance.

Polatajko, HJ, Kaplan, BJ & Wilson, BN. (1992). Sensory integration treatment for children with learning disabilities: its status 20 years later. *The Occupational Therapy Journal of Research*, 12, 323-341.

Ayres' seminal paper in 1972 reported that Sensory Integration (SI) Treatment was a promising method for improving the academic scores of children with learning disabilities. Ottenbacher's (1982a) review of research reported during that first decade indicated that SI treatment was worthy of further investigation. In this report, we reviewed randomized, controlled trials conducted primarily in the second decade, and conclude that the status of the literature 20 years after Ayres' original article does not support SI treatment as an effective treatment for the academic problems of learning disabled children. With respect to sensory or motor variables, it is not clear whether or not SI treatment is more effective than perceptual-motor approaches. Future research also must determine whether SI treatment is more effective than maturation alone.

Wilson, BN, Kaplan, BJ, Fellowes, S, Gruchy, C & Faris, P. (1992). The efficacy of sensory integration treatment compared to tutoring. *Physical & Occupational Therapy in Pediatrics*, 12(1), 1-36.

Controversy surrounds the use of sensory integration (SI) treatment for children with motor difficulties and learning disabilities. The efficacy of 75 sessions of individual SI therapy was compared to equal amounts of individual tutoring with 29 subjects, aged 5-9 years. Assessments by people blind to group assignment occurred at pre-test and after 6 and 12

months of treatment, using academic, motor and behavioral measures. No significant differences were noted between the two treatment groups after 6 or 12 months of treatment. The fact that the SI group improved as much in reading and other academic measures as the tutoring group who received extensive work in those areas supports the theory that SI may be as effective as tutoring in improving academic functioning. Tutoring, however, was as effective as SI in improving motor functioning, which was unexpected.

Law, M, Polatajko, HJ, Miller, J, Schaffer, R & Macnab, J. (1991). The impact of heterogeneity in a clinical trial: motor outcomes after sensory integrative therapy. *The Occupational Therapy Journal of Research*, 11, 177-189.

The effect of a therapeutic intervention in a clinical trial may be obscured by heterogeneity in the study subjects. This paper examines the results of a randomized clinical trial to evaluate the effects of 6 months of sensory integration therapy, perceptual-motor treatment, and no program (control) on learning disabled children with sensory integrative dysfunction. Contrary to expectations, Polatajko, Law, Miller, Schaffer, and Macnab (1991) found no significant differences between the groups on motor performance. However, overall, the children made motor gains; indeed, some children made very large gains. Others did not make gains or deteriorated. Change scores indicated that approximately half of the children improved more than can be expected by maturation alone while half did not. The heterogeneity of the response of individual children to treatment appeared to have led to an overall non-significant result...

Danos, J. (1990). Review of early intervention practices with preterm infants. *Journal of Occupational Therapy Students*, 5, 15-22.

Preterm infants have had higher mortality rates than full-term infants in the past, but now more of them are reaching adulthood. This paper reviews the current literature on the use of early sensory intervention approaches with preterm infants and their success in facilitating normal growth and development. The role of the occupational therapist in the neonatal nursery is examined and recommendations are made for further research in sensory intervention programs.

Humphries T, Wright M, Snider L, McDougall B, & Vertes, J. (1990). The efficacy of sensory integration therapy for children with learning disability. *Physical & Occupational Therapy in Pediatrics*, 10(3), 1-17.

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Schaaf, RC. (1990). Case Report: Play Behavior and Occupational Therapy. *The American Journal of Occupational Therapy*, 44, 68-75.

No abstract available for this record

Werry JS, Scaletti R, & Mills F. (1990). Sensory integration and teacher-judged learning problems: a controlled intervention trial. *Journal of Pediatric Child Health*, 26(1), 31-35.

Seventy-four children from 21 schools referred because of teacher-perceived learning difficulties and prescreened for sensory integration (SI) deficits were given tests of SI, reading, vocabulary, perceptuo-motor function and motor development, and their teachers rated their classroom behavior. The results showed that the children suffered primarily from attention deficit disorder without hyperactivity, and from mild deficits of SI. They were then divided into two groups matched approximately for sex, school and degree of SI deficits. One group received no

treatment while the other was given about 13 weekly SI sessions, each of 1 h duration. All children were then reassessed on the same set of measures. There were significant improvements with time in both treated and untreated groups on most measures except classroom behavior. Only one measure showed a treatment effect, though this one was most reflective of SI theory.

Densem JF, Nuthall GA, Bushnell J, Horn J. (1989). Effectiveness of a sensory integrative therapy program for children with perceptual-motor deficits. *Journal of Learning disabilities*, 22, 221-229.

This study was an evaluation of the sensory integrative therapy (SIT) program (Ayres, 1972a) for children at the Christchurch Hospital. Fifty-five children were randomly assigned to the SIT program, a parallel physical education program, or to a no-treatment condition. The children were assessed before and after treatment on measures of perceptual-motor development, language and reading development, self-concept, and handwriting skills. Covariance analysis, with age and pretest scores as covariates, found no significant differences between groups on any of the measures except reading progress among those children who could already read at the beginning of the program. Children who made the least progress during therapy were those who (a) had epilepsy, (b) were from a low-income, single-parent family, or (c) had behavioral problems.

Arendt RE, MacLean WE Jr, & Baumeister AA. (1988). Critique of sensory integration therapy and its application in mental retardation. *American Journal of Mental Retardation*, 92(5):401-429.

Studies on the use of sensory integration therapy with mentally retarded persons were critically reviewed. Experimental design and statistical procedures were found inadequate to support the use of this therapy on an empirical basis. In addition, certain methodological and design problems seriously cloud interpretation of research results on this topic. Alternative explanations of positive outcome as well as equivocal findings among studies appear related, in part, to the conceptual foundation of sensory integration therapy. Recommendations for future directions in research and restraint in application were discussed.

Pettit, KA. (1987). Sensory integration and ego development in a schizophrenic adolescent male. *Occupational Therapy in Health Care*, 4(2), 87-100.

This single case study of a schizophrenic adolescent presents a detailed analysis of gains in ego functions and clinical observations. A time out record was retrospectively compiled. The purpose of the time out record was to evaluate the generalized effects of sensory integrative treatment procedures on the client's ability to deal with anger and frustration in his living environment. Statistical analysis did not yield a significant difference between pre- and post-treatment data. The results of this study demonstrate the usefulness of statistical analysis versus visual comparison of pre- and post-treatment data in the validation of treatment effectiveness. Visual inspection might support a conclusion of a significant difference, when statistic analysis will not. Although marked decreases were noted in the client's time out record as he mastered hypersensitivity to movement, development of protective extension, and gravitational security no...

Schaaf, RC, Merrill, SC & Kinsella, N. (1987). Sensory integration and play behavior: a case study of the effectiveness of occupational therapy using sensory integrative techniques. *Occupational Therapy in Health Care*, 4(2), 61-75.

This paper presents a case study describing a developmentally delayed child and examines the changes in environmental interactions that occurred during a study period in occupational therapy in which sensory integration (SI) techniques were applied. Its purpose is to discuss the use of play observation as a means of measuring change in individuals involved in SI treatment and to demonstrate the relevance of qualitative research methodologies to the collection of data on play behavior. The study is a first step in a process of developing methods to evaluate the effectiveness of SI treatment in occupational therapy through collecting qualitative data on play and other behavioral measures of environmental interactions.

Hamill, JS. (1987). Sensory integrative dysfunction: parental participation in the child's therapy program. *Occupational Therapy in Health Care*, 4(2), 47-59.

Parental participation in the occupational therapy program for the child with sensory integrative dysfunction may significantly improve the achievement of therapy goals, as well as adaptive behaviors within the home. An individual plan for effective parent involvement is developed with consideration given to levels of parent/child interaction and to the parents' ability to accept their child's difficulties. Purposes of parental participation are outlined in conjunction with an existing model for evaluation and intervention. A case presentation is presented which illustrates optimal parental involvement and the resulting positive outcomes.

Larrington, GG. (1987). A sensory integration based program with a severely retarded/autistic teenager: an occupational therapy case report. *Occupational Therapy in Health Care*, 4(2), 101-117.

ABSTRACT: This case report illustrates occupational therapy based on sensory integration philosophy and treatment principles with a severely mentally retarded/autistic fifteen year old boy. Evaluation, treatment and results are outlined and discussed retrospectively. An oral stimulation and feeding program is presented as an additional and integral part of his occupational therapy program. The integration of his occupational therapy program into his daily group home and school life is presented and the contribution of these other caregivers assessed.

Shuer, J & Weiner, L. (1985). Developing pediatric programming in a private occupational therapy practice. *Occupational Therapy in Health Care*, 2(2), 53-67.

The purpose of this paper is to suggest to occupational therapists some introductory guidelines which might be followed in developing a private occupational therapy practice. Elements of a treatment program are discussed and examples drawn from a currently successful pediatric program which uses a sensory integrative approach in offering services. Components of program development addressed in this paper include the purpose and content of screening as a recruitment device, how to structure an initial evaluation and parent conference, general treatment planning and goal setting, incorporating a theoretical frame of reference into practice, as well as clinic equipment in the private setting, documentation, discharge planning and finally, concepts of marketing for the beginning practice.

Carte E, Morrison D, Sublett J, Uemura A, Setrakian W. (1984). Sensory integration therapy: a trial of a specific neurodevelopmental therapy for the remediation of learning disabilities. *Developmental and Behavioral Pediatrics*, 5, 189-194.

In the population of learning-disabled (LD) children, there appears to be a subsample who demonstrates basic dysfunction in sensory integration. Previous research suggested that sensory integration (SI) therapy may be effective in improving the academic performance of this subsample of LD children. This study is a systematic replication of previous research on the effects of SI therapy on LD children. The 87 LD children in this study manifest moderate SI dysfunction, a vestibular processing disorder, perceptual deficits, and reading retardation. Data on a subgroup of 45 children with markedly depressed postrotary nystagmus are presented. After nine months of individual SI therapy, no systematic effects on any of the dependent variables were discernible. The implications of these findings for further research are discussed.

Schaffer, R. (1984). Sensory integration therapy with learning disabled children: a critical review. *The Canadian Journal of Occupational Therapy*, 51(2), 73-77.

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Goldstein, PK. (1983). Sensory integration groups: an effective treatment modality in child psychiatry. *Sensory Integration Special Interest Section Newsletter*, 6(1), 1-2.

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Jenkins JR, Fewell R, & Harris SR. (1983). Comparison of sensory integrative therapy and motor programming. *American Journal of Mental Deficiency*, 88, 221-224.

The relative effects of individualized sensory integrative therapy vs. small group, gross-motor programs were examined with a group of preschool children with mild to moderate motor delays. Children in the sensory integrative therapy group received one-to-one treatment twice weekly. Children in the motor-programming group received intervention four times weekly in small groups of three to four. Both intervention programs were carried out simultaneously for 17 weeks. No significant between group differences were observed in gross-motor gains on the Peabody Developmental Motor Scales or in sensorimotor gains on the Assessment of Sensory Integration in Preschool Children. Results of this study compared to results of similar previous studies were discussed.

Wells, ME & Smith, DW. (1983). Reduction of self-injurious behavior in mentally retarded persons using sensory integrative techniques. *American Journal of Mental Deficiency*, 87, 664-666.

Four profoundly mentally retarded, multiply handicapped institutionalized subjects with extensive histories of self-injurious behavior (SIB) received daily sensory-integrative treatment sessions that included vestibular and tactile stimulation delivered noncontingently. Frequency of SIB, as documented by direct-care staff members throughout the day, decreased significantly for all subjects.

Ottenbacher K. (1982). Sensory integration therapy: affect or effect. *The American Journal of Occupational Therapy*, 36(9):571-578.

The results of studies examining the effectiveness of sensory integration therapy were reviewed, using recently developed quantitative methods that treat the literature review process

as a unique type of research. Forty-nine studies were located initially. Eight of these studies met the following criteria: (a) they investigated the effect of sensory integration therapy; (b) they included dependent measures of academic achievement, motor or reflex performance, and/or language function; (c) they included a comparison between at least two groups; and (d) they reported quantitative results of the effect of sensory integration therapy. The 8 studies contained a total of 47 statistical hypothesis tests that evaluated the effectiveness of sensory integration therapy. An analysis of these tests, using quantitative reviewing methods, revealed that subjects participating in sensory integration therapy performed significantly better than members in the control groups who did not receive sensory integration therapy. The application of sensory integration therapy to various client populations is discussed in relation to the existing empirical support revealed in the studies reviewed. The advantages of quantitative reviewing procedures are discussed, and use of the procedures with the developing occupational therapy research literature is recommended.

Schoeder, E. (1982). Improvement in academic achievement through enhancement of perceptual and sensory integrative functioning. *School Psychology International*, 3, 97-104.
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Van Kampen-Horowitz, L.J. (1982). Effectiveness of sensory integrative therapy on vestibular & ocular function in children: intermediate report on eye tracking. The Netherlands: University of Amsterdam.
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Ziviani, J, Poulsen, A & O'Brien, A. (1982). Effect of a Sensory Integrative/Neurodevelopmental Programme on Motor and academic performance of children with learning disabilities. *Australian Occupational Therapy*, 29, 27-33.
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Ottenbacher, K, Scoggins, A & Wayland, J. (1981). The effectiveness of a program of oral sensory-motor therapy with the severely and profoundly developmentally disabled. *The Occupational Therapy Journal of Research*, 1, 147-160.

The efficacy of a program of oral-motor therapy designed to facilitate feeding patterns and thus produce increases in body weight in the severely developmentally disabled was explored. Twenty severely and profoundly retarded subjects with neuromotor disorders participated in a pretest/posttest control group design. The experimental group received a 9-week program of oral therapy designed to normalize oral motor functions and reduce pathological oral reflexes. Analysis of covariance revealed no statistically significant difference in body weight gains between the experimental and control group over the treatment period. A post hoc power analysis was computed and revealed a power of approximately .35, indicating a degree of insensitivity in the experimental manipulations and statistical analysis and suggesting the possibility of a Type II experimental error. The need for continued research in this area to establish the effectiveness of sensory and motor facilitation procedures in developing feeding patterns in the severely and profoundly disabled is discussed.

Ottenbacher, K , Short, MA & Watson, PJ . (1981). The effects of a clinically applied program of vestibular stimulation on the neuromotor performance of children with severe developmental disability. *Physical & Occupational Therapy in Pediatrics*, 1(3), 1-11.

The effects of a program of controlled vestibular stimulation on the gross motor, fine motor, and reflex development of 38 severely and profoundly retarded, nonambulatory, developmentally delayed children were investigated employing a pretest/posttest control group design. Data analysis revealed that subjects receiving a combined program of sensorimotor therapy and controlled vestibular stimulation made significantly greater gains on measures of reflex, integration, gross motor, and fine motor development than control subjects receiving a program of sensorimotor therapy alone. Neuromotor improvements followed the progression of normal motor development and appeared to be related to the age of subjects and to the presence or absence of identifiable neuromotor spasticity.

Semmler, C.J. (1981). Commentary: "The effectiveness of a program of oral sensory-motor therapy with the severely and profoundly developmentally disabled". *The Occupational Therapy Journal of Research*, 1, 161-163.

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Grimwood, LM & Rutherford, EM. (1980). Sensory integrative therapy as an intervention procedure with grade on "at risk" readers - a three-year study. *Exceptional Child*, 27(1), 52-61.

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Ayres, A.J. (1979). *Sensory integration and the child*. Los Angeles, CA: Western Psychological Services.

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White M. (1979). A first-grade intervention program for children at risk for reading failure. *Journal of Learning Disabilities*, 12(4), 231-237.

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Ayres, A.J. (1977). Cluster analysis of measures of sensory integrative therapy. *The American Journal of Occupational Therapy*, 31, 362-366.

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Montgomery, P & Richer, E. (1977). Effect of sensory integrative therapy on the neuromotor development of retarded children. *Physical Therapy*, 57, 799-807.

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Ayres, A.J. (1977). Effect of Sensory Integrative Therapy on the Coordination of Children with Choreoathetoid Movements. *The American Journal of Occupational Therapy*, 31, 291-293.

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Ayres, A.J. (1976). *The effect of sensory integrative therapy on learning disabled children : The final report of a research project supported by The Center for the Study of Sensory Integrative Dysfunction and the Valentine-Kline Foundation 1974-1975-1976*. Los Angeles, CA: University of Southern California.

Ayres, A.J. (1972). Improving academic scores through sensory integration. *Journal of Learning disorders*, 5, 339-343.

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Morrison D, & Pothier P. (1972). Two different remedial motor training programs and the development of mentally retarded pre-schoolers. *American Journal of mental Deficiency*, 77(3): 251-8.

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