# Effectiveness of the Integrated Listening System for Children with Autism and Sensory Processing Disorder

**Teresa A. May-Benson, ScD, OTR/L, FAOTA and Sarah A. Schoen, PhD, OTR.**
**Spiral Foundation, Newton, MA, USA; Sensory Processing Disorder Foundation, Greenwood Village, CO, USA.**

**American Occupational Therapy Association Conference**
**San Diego, CA**
**April 25, 2013**

## Need for the Study

Sound based interventions are theorized to be a cost effective and efficient method to help children with autism and sensory (SPD). Effectiveness research on sound therapy programs has been mixed. Children with autism and SPD present with challenges thought to respond positively to sound-based therapies, particularly those such as iLs which incorporate auditory, visual and vestibular sensory activities. The following studies examine outcomes which previous research has suggested may improve with sound-based programs.

## Methods

**Method:** Three related studies were conducted: (1) survey of iLs practitioners on perceived efficacy of the iLs home and clinic programs with children with autism; (2) iLs effectiveness study with children with SPD; (3) iLs Focus multi-site effectiveness study with children with autism.

**Participants-** (1): 1174 iLs associates were surveyed. A 12.2% response rate represented approximately 1304 children with ASD who had completed iLs programs; (2): 7 children age 4 to 18 years with SPD; (3): 18 children with ASD 5 to 8 years of age.

**Design/Setting-** (1) survey distributed to iLs practitioners across the country; (2) & (3) repeated measures single case series with pre and post testing; (2) A-B design with 4 - 5 week no-treatment baseline and 40 sessions therapy over 8 weeks. Program completed 4 days at child's home and 1 day per week at a private OT clinic; (3) ABA design with 6-8 week multiple baselines, 60 sessions over 12 weeks therapy. Multi-site program conducted 5 days per week at child's home with 1 hour monthly visits at a private OT clinic.

**Measures**- (1): 19 question practitioner survey on perceived improvement of auditory processing and sensitivity, social skills, sensori-motor skills, and behavioral abilities; (2): Physiological data via electrodermal activity. Behavioral data on individualized goals, adaptive behavior, emotional behavior and sensory processing from parents; (3): Standardized & observational measures of functional behavior, social skills and auditory processing, vestibular processing, praxis, self-regulation, and atypical behaviors from parents and therapists.

**Intervention-** (1): Practitioners reported on perceived efficacy of home and clinic-based iLs programs; (2) & (3): iLs Focus program consisting of processed classical music using headphones with air and bone conductions combined with visual and movement activities for 60 minute sessions 5 days/week with 10-30 minutes simultaneous visual and motor activities from the iLs playbook.

## Results Study 1

Respondents were typically experienced occupational therapists who used clinic and/or home iLs programs for over one year. Associates indicated they often or always saw improvements when using iLs with preschool, school-aged, middle school and high school children with ASD, with mean scores in the often to always range.

Associates were asked how often they noted improvements in 24 specific outcomes categorized in three different functional areas: sensory-motor/ behavioral skills, social-emotional skills and functioning, and language/ academic skills. All 24 outcomes had mean scores in the sometimes or often range. In general 70-80% of responses were in the often and always range with an additional 10-30% in the sometimes category. The most frequent changes were seen in motor coordination, sensory integration/ sensory processing, and auditory processing with self-regulation and ability to make transitions having similar levels of change. Responses for each functional area are summarized below.

| Outcome Measure | Perceived Frequency of Improvements | | | | |
|---|---|---|---|---|---|
| | Never | Rarely | Sometimes | Often | Always |
| Sensory-Motor/ Behaviors | 1% | 2% | 22% | 42% | 33% |
| Social-Emotional Skills | - | 2% | 18% | 52% | 28% |
| Language/ Academics Skills | - | 2% | 20% | 48% | 29% |

## Results Study 2

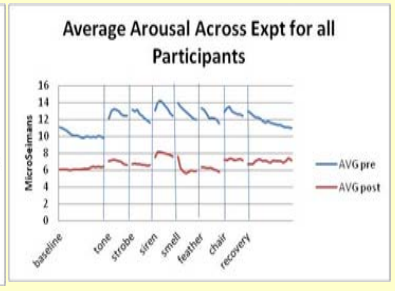
Common across all participants was over-responsivity in the tactile and auditory domains. Parent interview revealed one problem area identified in all participants, “Difficulty following directions”.

All families reported significant improvement on individualized goals. Improvement also noted on standardized measures of sensory processing (Sensory Processing Measure), behavior and emotional disturbance (Behavior Assessment System for Children), adaptive functioning (Adaptive Behavior Assessment System) and participation (Miller Function and Participation Scales).

Following intervention, a reduction in arousal and reactivity to sensory stimuli was reflected in the Sensory Challenge Protocol across all participants.

### Individualized Goal


### Sensory Challenge Protocol




## Results Study 3

All repeated measures outcomes demonstrated significant time effects. Effect sizes of the time effects were generally large. Of eighteen measures, eleven (Clinical Observations – therapist, Miller Function and Participation Scales – therapist and parent, Emotional Regulation, Social Skills, Auditory Listening Skills, Atypical Behaviors Severity and Number , Auditory Processing, Social Skills and Emotional Regulation ratings– all parent observations) demonstrated significant intervention effects with non-significant pre-intervention baseline effects.

All therapist pre-post measures showed statistically significant improvements $p < .01$ or greater (SCAN3:C composite, TAPS total score, MFUN Visual, Fine and Gross Motor and test observations, Clinical Observations, and two Behavior ratings). Significant gains were made in parent-report observations of sensory processing skills via the SPM home form. The largest gains reported by parents were in social skills as reported in the Social Responsiveness Scale (SRS) and Social Skills Intervention System (SSIS), parents also reported significant improvements in number and severity of autistic behaviors. Parents, however, did not report gains in functional and adaptive behaviors as measured by the ABAS except the Health & Safety and Social Skills subsections.

## Discussion

These three studies provide diverse evidence that the Integrated Listening System (iLs) is an effective intervention for children with autism and SPD that may be used in isolation, in combination with a comprehensive OT program or in advance of individualized OT to promote improved functioning in a variety of areas including sensory processing, emotional regulation, social-communication interaction skills, and behavioral regulation. These studies contribute significantly to the science and practice of occupational therapy and suggests that iLs is an effective and efficient intervention to promote functional goals.

## References

Carley, K. (2013, March). Sound therapy: A complementary intervention for individuals with sensory integration and processing disorders, part 1. Sensory Integration Special Interest Section Quarterly, 36(1), 1–4.

Labbe, E., Schmidt, N., Babin, J., & Pharr, M. (2007). Coping with stress: the effectiveness of different types of music. *Appl Psychophysiol Biofeedback 32*, 163-168.

May-Benson, T. A., Carley, K., Szklut, S., & Schoen, S. (2013, June). Sound therapy: A complementary intervention for individuals with sensory integration and processing disorders, part II. *Sensory Integration Special Interest Section Quarterly, 36*(2), 1–4.

Rauscher, F. H., Shaw, G. L., Levine, L. J., Wright, E. L., Dennis, W. R., & Newcomb, R. L. (1997). Music training causes long-term enhancement of preschool children's spatial-temporal reasoning. *Neurol Res, 19*, 2-8.

Sarnthein, J., VonStein, A., Rappelsberger, P., Petsche, H., Rauscher, F. H., & Shaw, G. L. (1997). Persistent patterns of brain activity: an EEG coherence study of the positive effect of music on spatial-temporal reasoning. *Neurol Res, 19*, 107-116.

**Acknowledgements:** Thank you to Alison Teasdale, Spiral Foundation, Senior Research assistant. We would like to acknowledge the children and families who participated in this study. We would also like to thank and acknowledge the therapists who participated at Kids Kount Therapy Services, Daphne, AL; Children's Therapy of Woodinville, Woodinville, WA; OTA the Koomar Center, Newton, MA; Witwer Children's Therapy. Hiawatha, IA. This study was financed by a contract agreement with Integrated Listening Systems in a private 'work for hire" agreement. There is no conflict of interest for any investigator or study associate involved in this study.