The Effect of Sound-Based Intervention on Children With Sensory Processing Disorders and Visual–Motor Delays

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This study investigated the effects of a sensory diet and therapeutic listening intervention program, directed by an occupational therapist and implemented by parents, on children with sensory processing disorders (SPD) and visual–motor delays. A convenience sample was used of 10 participants, ages 5 to 11 years, with SPD and visual–motor delays. In the first phase, each participant completed a 4-week sensory diet program, then an 8-week therapeutic-listening and sensory diet program. The Sensory Profile was completed by the participants' parents before and after both study phases. The Draw-A-Person test, Developmental Test of Visual Motor Integration (VMI), and Evaluation Tool of Children's Handwriting (ETCH) were administered before and after each phase. Over 12 weeks, the participants exhibited significant improvement on the Sensory Profile, increasing a mean of 71 points. Parents reported improvements in their children's behaviors related to sensory processing. Scores on the VMI visual and ETCH legibility scales also improved more during the therapeutic listening phase. Therapeutic listening combined with a sensory diet appears effective in improving behaviors related to sensory processing in children with SPD and visual–motor impairments.

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Music has long been known to have therapeutic value (Ferguson & Voll, 2004; Sacks, 2006). In recent years, occupational therapists, speech-language pathologists, and psychologists have adopted the use of music and sounds as therapy, and a variety of auditory intervention techniques have become available. Occupational therapists use music as preparation for therapeutic activities on the basis of the belief that sensory input through the auditory and vestibular systems can be calming and organizing to children (Ayres, 1979; Frick & Hacker, 2001). The purpose of this study was to investigate the effectiveness of a therapeutic-listening home program in combination with a sensory diet on children with sensory processing disorders (SPDs) and visual–motor delays.

Sound-Based Interventions

The originator of sound-based treatment was French physician Alfred Tomatis, who in the mid-1900s developed the use of electronically altered music as a treatment modality for adults and children with differing conditions, including attention deficit disorders, developmental delays, autism, head injury, multiple sensory system disorder, and learning disabilities. Tomatis believed that the main role of the ear is to function as the "integrator," facilitating organization at all levels of the nervous system (Thompson & Andrews, 2000).

Studies on the Tomatis method have yielded mixed results. Neysmith-Roy (2001) found that 3 out of 6 boys with severe autism experienced major improvements in behavior. After the Tomatis treatment, 1 boy no longer met the criteria

for an autism diagnosis, 2 boys showed behaviors indicative of mild autism, and 3 boys continued to exhibit behaviors in the severe autism category. For 5 of the 6 boys, positive changes also were seen in the pre-linguistic areas (i.e., adaptation to change, listening response, nonverbal communication, emotional response, activity level). Kershner, Cummings, Clarke, Hadfield, and Kershner (1990) compared a group of children with learning disabilities who received treatment using the Tomatis approach in school and a control group of children with learning disabilities who received only direct instruction and found no differences in achievement gains at 1-year follow-up.

In the early 1960s, Guy Berard, who worked with Tomatis, developed another method of sound treatment, Auditory Integration Training (AIT), which was based on some of the Tomatis principles (Rimland & Edelson, 1994). AIT uses electronically enhanced popular or classical music that distorts or modulates sound frequencies at random intervals for random periods. AIT is typically used to correct hypersensitive or distorted hearing. This clinic-based treatment consists of 10 hours of listening to modulated music in 20 half-hour intervals over 10 consecutive days (Rimland & Edelson, 1995).

Research on AIT has produced mixed results as well. Some studies showed that children treated with AIT demonstrated fewer aberrant behaviors (Rimland & Edelson, 1994, 1995). Gillberg, Johansson, Steffenburg, and Berlin (1997) applied AIT to 9 children with autism. Changes in behavior were not observed other than a reduction in sensory problems as rated on the Autism Behavior Checklist (Krug, Arick, & Almond, 1980). Bettison (1996) completed a large randomized controlled trial using 80 children with autism and sound hypersensitivities. One group ($n = 40$) received filtered or modulated music, and the other ($n = 40$) received unprocessed music. When assessed 1 month after the listening treatment, both groups made clinically important but equal improvements on tests of behavior, verbal and performance intelligence, and language. A study by Mudford, Cross, Breen, and Cullen (2000) of 16 children with severe autism, using a crossover design, did not support AIT (twenty 30-min sessions). Mudford and colleagues compared AIT using headphones to the use of silent headphones and music in the room. After the AIT treatment, no differences were noted in children's aberrant behavior, cognitive functioning, or adaptive functioning. These findings suggest that evidence for the effectiveness of AIT is equivocal and inconclusive (Sinha, Silove, Wheeler, & Williams, 2004).

Advanced technology has made possible the development of home-based methods that allow people to participate in sound-based treatment. One such technique, Ther-

apeutic Listening® (Vital Links, 6613 Seybold Road, Suite E, Madison, WI 53719) uses electronically altered music on compact discs (CDs) (Frick & Hacker, 2001). The child listens to the music using high-quality headphones for two sessions per day for up to 30 min per session. Treatment is typically implemented as a home program for an average of 3 to 6 months. Occupational therapists have begun to use therapeutic listening as an adjunct to their intervention, particularly when applying a sensory integration approach (Frick & Hacker, 2001). The sound stimulation appears to calm and organize the child, in preparation for engagement in purposeful activity (Bettison, 1996; Rimland & Edelson, 1995). Ayres (1972, 1979) suggested that auditory input contributes to arousal, self-regulation, and emotions. She further theorized that well-organized sensory information helps children prepare for action. In addition to these potential effects on sensory processing and behavior, other scholars hypothesize that auditory stimulation influences spatial–temporal organization and visual–motor performance. Frick and Hacker (2001) explained that the therapeutic-listening program influences children's arousal and potentially enhances spatial–temporal organization. Through clinical observations, occupational therapists have reported that therapeutic-listening programs result in improvements in task attention, spatial–temporal organization, visual–motor skills, handwriting, and timing of coordinated movements (Frick & Hacker, 2001). As part of a sensory integrative approach, therapeutic-listening programs may prepare the child to attend to and focus on perceptual–motor activities.

Purpose

The purpose of this study was to investigate the effects of incorporating the therapeutic-listening program (Frick & Hacker, 2001) with a sensory diet on children with SPD and visual–motor delays. We hypothesized that children would demonstrate improved visual–motor integration after 8 weeks of therapeutic listening and sensory diet when compared to a 4-week sensory diet phase. We also hypothesized that children would demonstrate fewer behaviors indicative of SPD after the sensory diet and therapeutic listening interventions.

Methods

Participants

The study used a convenience sample of children between ages 5 and 11 years who exhibited moderate to severe SPD and visual–motor integration delays. Each child was referred to occupational therapy at an outpatient clinic associated

with a children's hospital. Inclusion criteria were visual–motor integration delays as indicated by a score of at least 1 standard deviation below the mean on the Beery Developmental Test of Visual Motor Integration (VMI) (Beery, Buktenica, & Beery, 2004) and SPD as indicated by a score of definite difference (i.e., 2 standard deviations below the norm) on at least three subtests of the Sensory Profile (Dunn, 1999). Exclusion criteria for the participants in this study included moderate to severe mental retardation, cerebral palsy, Down syndrome, visual impairment, hearing impairment, and severe autism as reported by the parents and judged by parent report and child's performance on the VMI. A participant's condition, as documented in the medical record, could include any of the following: attention deficit hyperactivity disorder (ADHD), sensory integration disorder, mild autism or pervasive developmental disorder, Asperger syndrome, developmental delay, coordination disorder, or motor delays. Children on medication and those whose dosage was anticipated to change during the study were excluded. Participants who were currently receiving other therapy services were asked to continue in these therapies during this study. The authors determined that a sample of 10 would have adequate power to find effects. Using an effect size of 1.0 (based on preliminary data from one child who completed a trial of the protocol), a sample size of 10 participants yields a power of .76. Based on an effect size of 1.4 (expected effect size based on the preliminary results on the Sensory Profile), 10 participants yield a power of .92. Twelve children were recruited into the study, and 2 dropped out in the first phase.

Research Design

The participants were individually admitted into the study over a 10-month period. Each participant acted as his or her own control, first receiving 4 weeks of traditional sensory diet and then receiving 8 weeks of the therapeutic-listening (Frick & Hacker, 2001) program combined with the sensory diet. In the sensory diet program, the first author gave each family strategies to implement at home that would help the child modulate his or her sensory responses and arousal throughout the day. These strategies included various activities, including exercise, slow rhythmic rocking, deep pressure massage, or gum chewing. After the 4-week sensory diet, the first author prescribed an individualized therapeutic-listening program (while continuing the sensory diet) for each participant. Each program included specific CDs and a schedule for daily listening that the family implemented. The first author met with the families after 4 weeks to update and monitor the program. Sensory motor assessments before and after the study's phases measured the treatment effects.

Instrumentation

Four standardized instruments were used to measure sensory responsiveness and visual–motor performance: the Sensory Profile (Dunn, 1999), the Draw-A-Person test (DAP; Vane, 1967), the VMI (Beery et al., 2004), and the Evaluation Tool of Children's Handwriting (ETCH; Admundson, 1995). The DAP, VMI, and ETCH were administered three times before and after each treatment phase. Because the Sensory Profile was not expected to change within a month, parents completed it only twice, during the first visit and 12 weeks later at the final visit. All tests were administered by the first author and were scored by other occupational therapists, blinded to the participants and to whether the tests were pretests or posttests.

The Sensory Profile (Dunn, 1999) is a standardized 125-item questionnaire that evaluates sensory processing, modulation of sensory input, and behavioral and emotional responses. The parent or caregiver who has daily contact with the child completes the questionnaire by reporting how often these behaviors occur. Reliability and validity are strong (Dunn, 1999). Raw scores for the Sensory Profile sections were used for statistical analysis.

The DAP test was used to measure integration of visual–motor skills (Short-Degraff & Holan, 1992; Vane, 1967). Mortensen's (1984) summary of research for the DAP found that test–retest reliability was .68 to .69 (1 week to 3 months) and interrater reliability was .68 to .96 (most found .80 to .90). Each participant was asked to draw a person on a blank sheet of paper. The test was scored by giving credit to each detail in the drawing according to specified criteria. The raw scores were used in statistical analysis.

The VMI (Beery et al., 2004) is a norm-referenced, evaluative measure of visual–motor integration for children ages 2–15 years. The test involves copying forms. In the VMI visual perception section, the child matches figures on the basis of their form, size, and position in space. In the motor coordination scale, the child draws lines within boundaries. Interscorer reliability is .94 for the VMI, .98 for the Visual, and .95 for the Motor. The VMI and its supplemental Visual and Motor tests had overall average reliability (interscorer, internal consistency, and test–retest) of .92, .91, and .89, respectively (Beery et al., 2004). In our study, the standard scores for the VMI and supplemental tests were used for data analysis.

The ETCH (Amundson, 1995) evaluates manuscript and cursive handwriting skills of children in Grades 1 through 6 who are experiencing difficulty with handwriting. Interrater reliability for total letters and numbers ranges from ICC = .82 to ICC = .84. For total letter legibility, test–retest reliability was $r = .77$, and for total number legibility, $r = .63$

(Diekema, Deitz, & Amundson, 1998). In our study, each participant wrote letters and numbers from memory. Only the first three subtests for manuscript handwriting were administered; these subtests included writing uppercase letters, lowercase letters, and numbers from memory. Tests were scored by an occupational therapist, blinded to the participant's identity and the study phase. Legibility raw scores were used for statistical analysis.

Intervention

Sensory diet phase. At the initial testing session, the first author developed a sensory diet to be implemented by the parents that was based on the initial Sensory Profile and the needs of the child. The sensory diet contained activities for the child to do at home that provided sensory input, such as movement, heavy work, or tactile stimulation. The researchers asked parents to fill out a daily checklist that recorded the type and frequency of the child's target behaviors as well as to track their use of sensory diet that was given to them at their first visit.

Therapeutic-listening and sensory diet phase. After 4 weeks of a sensory diet alone, the first author, who was trained in use of therapeutic-listening treatment, met with the families to develop a therapeutic-listening protocol. The parent was given the equipment needed to implement this treatment as an intensive home program. The equipment included a set of high-quality Sennheiser 500 headphones (Sennheiser Electron Corporation, 1 Enterprise Drive, Old Lyme, CT 06371) with a high resistance or impedance of at least 150 ohms and a frequency sensitivity to 23,000 Hz, and two to three CDs specifically selected for the child. Participants used their own portable CD players.

Modified CDs, altered by processing the music through an alternating high pass, low pass filter, were used in this study. When modified, the high and low frequencies of the music pass through at different intervals, creating a disruption in the sound of the music. Frick and Hacker (2001) explained the clinical significance of this type of modification:

> What appears to be created with the use of modulated music is an "exercising" effect of the muscles in the middle ear. Flexibility of these muscles is necessary to transmit sensory information to primary sensory processing centers that support sensory modulation. . . . Biomechanically, it is the function of the middle ear muscles to contract or focus on sounds and relax to monitor ambient environment. (pp. 3–13)

The therapeutic listening protocol required the participants to listen to the prescribed music for two sessions daily with at least 3 hr between sessions. Each session lasted from 20 min to 30 min depending on the type of music pre-

scribed. No one CD was used for longer than 3 weeks to prevent habituation. Participants were instructed to avoid activities that required intense focus and that would distract them from listening, such as watching TV or playing videogames during listening sessions.

Parents kept a listening log on their children to record the frequency of treatment and their children's response to the prescribed music. They were asked to continue documenting their use of a sensory diet and the frequency and severity of target behaviors throughout the treatment period. The researchers asked parents to document changes in target behaviors that reflected their goals for their child, such as increased eye contact, reduced outbursts, or decreased wetting accidents. After 8 weeks of protocol use, the researchers asked the parents open-ended questions in an interview to gather additional information about their child's behavior during the study period.

Statistical Analysis

The SPSS (version 13.0) computer program was used to analyze the scores of the instruments in this study. Means and standard deviations of the dependent variable were summarized to demonstrate the group's performance at each observation interval. Scores for the VMI, DAP, and ETCH at each testing time were compared using repeated-measures analysis of variance (ANOVA). Pretest and posttest scores for the Sensory Profile were compared using paired t tests. When results were significant, post hoc multiple comparisons (Tukey's and Scheffé) were performed to determine which testing times were most significant (Cohen, 1988). The level of significance was set a priori at $p = 0.05$.

Results

Participants

Ten out of 12 participants completed the full 12 weeks of the study. The age of those who completed the study ranged from 5 years, 8 months, to 10 years, 11 months. All had a sensory processing disorder as defined by at least three areas of definite difference on the Sensory Profile and had scored at least 1 standard deviation below the norm on the VMI. Their conditions, ages, and services received are presented in Table 1.

Participants were directed to complete two therapeutic listening treatment sessions per day for 8 weeks. According to the parents' logs, all but two parents were diligent in following the treatment protocol. These two implemented the treatment at least once per day and sometimes twice per day. All but one parent reported that their children did not change medications or therapy services during the 12-week

Table 1. Description of the Participants

Participant	Gender	Age*	Services	Condition
1	Male	7 years, 2 months	None. Previously received OT	Asperger syndrome
2	Male	7 years, 3 months	OT 2 times per month	Developmental delay, hypotonia
3	Male	7 years, 3 months	None. Previously received OT	Sensory integration dysfunction
4	Male	8 years, 4 months	None	ADHD, sensory integration disorders
5	Female	5 years, 8 months	OT weekly at school	Developmental delay
6	Male	10 years, 11 months	None. Previously received OT	High-functioning autism
7	Male	7 years, 0 months	OT once per month	Coordination disorder
8	Male	6 years, 1 month	OT consultation	Asperger syndrome, anxiety disorder
9	Male	8 years, 6 months	Previously received OT, PT once per week	ADHD, mild cerebral palsy
10	Male	8 years, 7 months	OT once per week	Arnold–Chiari malformation

Note. OT = occupational therapy; ADHD = attention deficit hyperactivity disorder; PT = physical therapy. *Age at baseline.

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study. One child's ADHD medication was reduced after 1 month of therapeutic listening because his behavior and attention had improved dramatically.

Using a paired t test, Sensory Profile means for 9 of 14 subscales improved significantly between pretest and posttest (see Table 2). One-way ANOVA with repeated measures using the Greenhouse–Geisser adjustment were computed for DAP and ETCH raw scores and for VMI standard scores (see Table 3). When the three measures were compared, scores differed significantly for the visual and motor scales of the VMI and the lowercase, number, and total legibility scales of the ETCH.

Post hoc multiple comparisons using Tukey's test for honestly significant difference were calculated to identify which phases were associated with significant improvement in scores (see Table 4). The Tukey's analysis reveals that scores improved significantly only when the two phases were combined (01–03).

Using Scheffé compound contrast procedure, the mean scores for posttest 03 were compared to the average of the mean scores for pretests 01 and 02. Both the VMI visual

Table 2. Paired *t*-Test Results of the Sensory Profile

Sensory Profile Total	367	10.6	439	15.1	−6.23	.001*
A. Auditory Processing	18.4	0.9	27.1	1.1	−6.78	.001*
B. Visual Processing	29.8	2.1	34.3	2.0	−1.97	.079
C. Vestibular Processing	40.1	1.2	43.0	2.4	−1.18	.265
D. Touch Processing	55.5	3.8	64.2	4.1	−2.78	.021*
E. Multisensory Processing	19.9	1.4	23.4	0.9	−2.86	.019*
F. Oral Sensory Processing	36.5	3.6	43.8	2.9	−2.75	.022*
G. Endurance and Tone	28.8	2.9	31.6	2.8	−1.54	.157
H. Body Position and Movement	31.5	1.3	35.3	2.0	−2.27	.049*
I. Movement Affecting Activity Level	19.4	1.2	21.3	1.3	−1.27	.235
J. Emotional Responses	10.1	1.0	12.7	0.7	−3.40	.008*
K. Modulation of Visual Input Affecting Emotional Responses	11.9	0.7	13.9	0.8	−2.23	.052
L. Emotional/Social Responses	41.1	2.5	54.0	3.4	−3.27	.010*
M. Behavioral Outcomes	13.6	0.7	17.7	0.9	−6.23	.001*
N. Items Indication Threshold Response	10.5	0.6	11.2	0.4	−1.35	.209

*$p < .05$.

Table 3. DAP, VMI, and ETCH One-Way Repeated-Measures ANOVA Results

Assessment	Pretest 01		Pretest 02		Posttest 03		
	Mean	SEM	Mean	SEM	Mean	SEM	Sig.
DAP–R	12.2	2.2	12.8	1.8	16.2	2.6	.119
VMI	83.5	1.8	83.8	2.6	88.3	5.4	.430
VMI–V	81.8	4.5	84.1	5.6	94.9	6.7	.022*
VMI–M	85.8	6.8	73.6	4.5	84.0	6.9	.036*
ETCH–LC	12.9	2.0	14.0	2.2	15.8	2.1	.046*
ETCH–UC	14.5	2.1	13.8	2.1	15.9	2.0	.186
ETCH–N	8.0	0.869	8.8	0.998	9.2	0.987	.002*
ETCH–T	52.6	7.9	53.5	7.9	60.8	7.8	.030*

Note. ANOVA = analysis of variance; sig. = significance; DAP = Draw-A-Person test (Vane, 1967); VMI = Visual Motor Integration test (Beery et al., 2004); VMI–V = VMI, Visual subtest; VMI–M= VMI, Motor subtest; ETCH = Evaluation Tool of Children's Handwriting (Amundson, 1995); LC = lowercase; UC = uppercase; N = numbers; T = total.

*$p < .05$.

Table 4. Results of Tukey's Test for Post Hoc Multiple Comparisons

Scales	01–02	02–03	01–03
VMI–V	NS	NS	S*
VMI–M	S (d)*	NS	NS
ETCH–LC	NS	NS	S*
ETCH–N	S*	NS	S*
ETCH–T	NS	NS	NS

Note. (d) denotes decrease of mean scores. NS = not significant; S = significant; VMI = Visual Motor Integration test (Beery et al., 2004); VMI–V = VMI, Visual subtest; VMI–M = VMI, Motor subtest; ETCH = Evaluation Tool of Children's Handwriting (Amundson, 1995); LC = lowercase; N = numbers; T = total.

*$p < .05$.

subscale and the ETCH total legibility subscale demonstrated significant improvement when posttest 03 scores were compared to the means for pretest 01 and 02 scores ($p < .05$).

Qualitative results were provided through logs that the parents kept during the therapeutic listening program and the interviews after the program. Parents of 4 of the 5 participants with reported auditory hypersensitivity stated that their children were more tolerant of noise. Of the 4 participants reported to have tantrums daily or weekly, the parents indicated that tantrums had either stopped completely or decreased dramatically in frequency, duration, and intensity. Five of 6 parents, who reported at baseline that their children were high energy or very active, stated that their children were calmer during the therapeutic listening program. During the 8 weeks of therapeutic listening, 4 parents reported that they received reports that their children's performance in school had improved, and 3 parents reported that their children's eye contact improved.

Discussion

The participants demonstrated remarkable improvement in behaviors that reflected sensory processing (the participants increased an average of 71 points on the Sensory Profile). The participants improved in 9 of 14 subtests (see Table 2), with the greatest differences in auditory processing and behaviors associated with sensory processing. Studies of AIT have demonstrated similar results in that children's sensory problems declined (Gillberg et al., 1997) and behaviors improved (Bettison, 1996; Rimland & Edelson, 1995). Other studies of AIT have not shown this dramatic reduction in sensory and behavioral problems (Mudford et al., 2000; Zollweg, Palm, & Vance, 1997). Intervention in the current study differed from these earlier studies in that the therapeutic-listening program, although therapist directed, was implemented by parents at home, whereas AIT programs are administered by trained specialists in the clinic. Additionally, each child had a sensory diet recommending specific sensory experiences throughout the day. The sensory activities provided an active component to the therapeutic-listening program, based on the concept that therapeutic listening helps prepare the child for purposeful activity.

Our results suggest that the therapeutic-listening program in combination with a sensory diet facilitated substantial improvement in children's behavior as measured by the Sensory Profile. The parent interviews at the end of the study provided insight into some of the behavioral changes. Parents stated that their children demonstrated improved attention, greater interaction with peers, decreased nightmares, improved transitions, better listening, greater self-awareness, better communication, improved sleep patterns, and more consistency in following directions. The interviews and logs also suggested that the therapeutic-listening program appeared to have differential effects according to the child's behavioral problems. One parent wrote,

> [My son] is now interacting with classmates. He [now] talks about [his friends]. His teacher said he used to walk outside the play area with his head down to avoid the other kids. Now he is playing beside the other kids. Eye contact is improved.

Therapeutic listening is believed to improve spatial–temporal organization (Frick & Hacker, 2001), and to examine this effect, we measured visual–motor and handwriting performance. Our findings offer minimal support that therapeutic listening improves temporal–spatial skill. Comparison of DAP mean scores did not support the treatment effect. Additionally, visual–motor integration and the VMI motor subscale did not change between baseline and treatment phases. However, improvements seen on the visual subscale were significant, indicating that therapeutic listening appears to affect visual perception. Participants' handwriting also improved over the course of the study. Post hoc analysis showed that the participants made considerable improvement in writing their lowercase letters over the entire 12-week period, although this improvement was not greater during the therapeutic-listening phase. Number writing showed greater improvement during the baseline phase, then gradual improvement over the treatment phase, thus not supporting a treatment effect. However, total legibility improved significantly during the treatment period (7%) compared to the baseline phase (1%). In the 2 of the 10 children who were receiving services for handwriting skills during the study, performance jumped when therapeutic listening was implemented. One scored 3% and 5% on the two pretests, respectively, and scored 17% on posttest, and the other scored 40% and 48% on the two pretests, respectively, and scored 61% on the posttest. The parent of the former noted that after her child started therapeutic listening, the child became more interested in writing.

Limitations and Recommendations

An important limitation of the study was use of a convenience sample. The children had a wide range of conditions, suggesting that behaviors reflecting sensory processing may improve with therapeutic listening regardless of condition. Because the therapeutic-listening program was administered by the parent as a home program, the authors were not able to closely monitor how well or consistently the parents followed the treatment. The parents, however, documented the duration and frequency of each session to track compliance with the treatment protocol. Most children who receive sound-based treatment typically continue with this treatment for an average of 3–6 months. This study examined the effect of a short duration of this treatment. Therefore, the full effects of this intervention may not be revealed given the 8-week duration.

Further study is needed to specifically analyze the effectiveness of therapeutic listening in conjunction with occupational therapy. Given evidence of robust effects on behavior, additional measures of behavior should be incorporated in future studies of therapeutic listening. In addition, research is needed to examine the long-term effects of therapeutic listening, perhaps targeting specific behaviors from the Sensory Profile.

Conclusion

The present study produced encouraging findings to support the use of therapeutic listening as part of an overall sensory integrative approach to occupational therapy in elementary school–age children. Therapeutic listening, along with sensory diet strategies, can be effective in reducing many behaviors associated with sensory integration disorder. To achieve optimal outcomes, we recommend that practitioners combine therapeutic listening with traditional occupational therapy approaches that elicit the child's active participation. ▲

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