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# Sensory Interventions in Schools: A Literature Review and Knowledge Translation Project

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Sensory Interventions in Schools: A Literature Review and Knowledge Translation Project

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This evidence project, submitted by  
Cordelia Nwogu  
Kelly Peterson  
has been approved and accepted  
in partial fulfillment of the requirements for the degree of  
Master of Science in Occupational Therapy from the University of Puget Sound.

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### **Abstract**

A literature review of sensory interventions that are possible in a school setting by occupational therapists was completed based on Jennifer Burke's, a Franklin Pierce Public Schools occupational therapist, question. Her question was what sensory interventions have been shown to be effective for decreasing negative behaviors and/or increasing participation that could be used in a school setting. Most sensory based interventions (SBI) had only weak evidence in support. Sensory integration therapy (SIT) showed more promise for achieving individual goals. Because of the mix of evidence it was recommended that if a clinician chooses to use SBI or SIT they should clearly state what goal they hope to attain with its use and take data to determine if it is effective for that specific child or not.

Because many children who may have sensory issues do not qualify for occupational therapy in schools, commercially available sensory kits for classrooms were researched and presented in a table format that included information on each kits pros and cons, as well as what sensory areas the kits are able to target. Burke used the table in conversation with her school counselor who is interested in purchasing a sensory kit. The table was also distributed to the other members of the therapy team for them to use in discussion with other counselors and teachers.

### **Executive Summary**

Sensory processing disorders are estimated to affect 5% of children (Ahn, 2004). This substantial population implies the need for school occupational therapists to successfully treat sensory issues to allow students to successfully participate in schooling. The clinician, Jennifer Burke an occupational therapist for the Franklin Pierce School district and her team, wanted to learn more about interventions that can be provided by a school therapist to treat sensory issues and best practice in this area. This led to the researchable question, “What school based sensory interventions are effective to increase participation in school activities or decrease negative behaviors at school for students with sensory processing disorder, ADHD, or autism?” Seven databases were searched for articles published in the past 15 years relating to treatment of sensory issues for the diagnoses of SPD, ADHD, and Autism.

From the literature review, there is moderate evidence that sensory integration therapy (SIT) is effective in achieving individualized goals in children with autism and sensory modulation disorder (Case-Smith, Fristad, & Weaver, 2015; Miller, Coll, & Shoen, 2007; Pfeiffer, Koenig, Kinnealey, Sheppard, & Henderson, 2011; Schaaf, et al. 2014; Watling & Hauer, 2015). There is only weak evidence overall supporting sensory based interventions (SBI) (Case-Smith, et al.; Watling & Hauer ; Yunus, Liu, Bissett & Penkala, 2015). Most evidence does not support the use of weighted vests to increase participation or decrease maladaptive behaviors (Collins & Dworkin, 2011; Cox, Gast, Luscre & Ayres 2009; Davis, et al. 2013; Hodgetts, Magill-Evans, & Misiaszek, 2010; Reichow, Barton, Sewell, Good, & Wolery, 2010; Stephenson & Carter, 2009). Dynamic seating had mixed results for better in-seat behaviors for children with autism (Bagatell, Mirigliani, Patterson, Reyes, & Test, 2010; Umeda & Deitz 2011). One study did find significantly improved behavior in children with ADHD, though the study is limited because of a small sample size (Vandenberg, 2001). Because of the mixed

evidence, it was recommended that if sensory based interventions are going to be used in treatment they should be applied at the individual level with clinical reasoning guiding the treatment. It would be prudent for occupational therapists to track the results of the treatment so treatment can be ended if no effects or negative effects are seen.

From the presentation of the literature review and from information Burke received earlier about sensory issues in children, she showed her interest in making sensory strategies more accessible for children who may not qualify for occupational therapy services in the schools. Having the understanding that much of the research she was presented with only gives weak evidence for sensory based interventions, but mostly did not reveal negative effects, she concluded that they do work with some children and she would like to make sensory strategy resources accessible to more students. She knows that there are children that do not qualify for occupational therapy services in the school district but would benefit from the use of sensory strategies in the classroom. She believes that some sensory methods could be brought into the classroom and benefit certain students. However, she is concerned that sensory methods may be given to students with no instruction on how and when to use each item or follow-up on if the item is achieving its purpose for a particular student.

This led to researching what sensory kits are already available that are meant for people within the schools who do not have an occupational therapy background. Five commercially available sensory kits were identified for teachers to use, and a table was made of the pros and cons of each kit. A data form was created for non-occupational therapy personnel to track a child's response when a sensory strategy is used.

Monitoring of the clinician use of the information was done through an open ended survey that was filled out by Burke with input from her colleagues. The table on sensory kits

was distributed to the entire therapy team of the school district and so far has been used in conversation with a school counselor who is interested in having a sensory kit available for use.

### **Critically Appraised Topic: Addressing Sensory Issues in Schools**

**Focused question:** What school based interventions are effective in treating sensory issues to increase participation in school activities and decrease negative behaviors at school in students with sensory processing disorder, attention deficit hyperactivity disorder, or autism spectrum disorder compared to no intervention?

**Prepared By:** Cordelia Nwogu and Kelly Peterson

**Date Review Completed:** November 19<sup>th</sup>, 2015

**Updated:** January 29<sup>th</sup>, 2016

**Clinical Scenario:** A school occupational therapist works at a school with several students on her case load with autism spectrum disorder (ASD), sensory processing disorder (SPD), or attention deficit hyperactivity disorder (ADHD). The therapist is interested in implementing more sensory interventions with her students to increase their participation in school and decrease undesired behaviors but her administrator wants more information on the evidence behind the interventions, particularly new evidence.

**Clarification:** SI or SIT refers to sensory integration techniques based off Jean Ayre's sensory intervention methods. SBI refers to sensory based intervention techniques that are aimed at addressing sensory issues but are not based off of Jean Ayre's SI methods; Examples of SBI include dynamic seating, weighted vests, or environmental changes.

**Review Process**

**Inclusion Criteria**

- A. For experimental, outcome, qualitative, and descriptive studies:
  1. Published by a peer reviewed journal
  2. Published in the last 15 years ( January 2000- November 2015)
  3. Population diagnosed with ASD, SPD, or ADHD
  4. Population at least partially 5-18 years old
  5. Intervention targeted at maladaptive behaviors or participation using sensory strategies
- B. For meta analyses and literature review:
  1. Published by a peer reviewed journal
  2. Published in the last 10 years (January 2005- November 2015)
  3. Majority of population diagnosed with ASD, SPD, or ADHD
  4. Majority of populations in studies between 5-18 years old
  5. Majority of interventions targeting maladaptive behaviors or participation using sensory strategies

**Exclusion Criteria**

1. Intervention not possible in school setting
2. Intervention performed by a music therapist
3. Lack of details about intervention (not replicable)
4. For meta analyses and literature reviews: More than 75% of articles included in study are from before 2000
5. Results focused on analyzing methodology of study, not outcome measures

**Search Strategy**

Categories	Key Search Terms
Population: students with sensory processing disorder, ADHD, or autism	children, students, youth, autism spectrum disorder, autism, sensory processing disorder, ADHD, attention deficit hyperactivity disorder, school, education, kindergarten, classroom
Sensory Intervention	intervention, treatment, therapy, occupational therapy, sensory, sensory integration, sensory behavior, effect, impact
Outcomes	participation, involvement, social skills, maladaptive, distracting, disrupting, disturbing, defective, atypical

**Databases and Journals Searched:**

Psych Info, Professional Development Collection, ALT- HealthWatch/CINAHL/ERIC, American Journal of Occupational Therapy (AJOT), Education Journals, ProQuest

### **Quality Control/Peer Review Process**

Two second-year occupational therapy students completed the identification and review of articles for their research project. Their topic was inspired by school occupational therapist Jennifer Burke. They have consulted with Professor Tomlin, Professor Swinth, and Professor Zylstra of the University of Puget Sound and have received feedback from peers regarding search strategy. The initial searches yielded many results and so inclusion and exclusion criteria were made to collect information that would best provide Jennifer Burke meaningful information. Five databases were searched.

The search of Psych Info yielded 165 results initially. That was narrowed down to 26 based on title and then 14 based on abstract. 11 of the articles were included in the final review. One article was dismissed because it was a case study whose data was a part of a larger study that was included. One article was dismissed because it did not fit inclusion criteria A5. One article was dismissed because it did not fit inclusion criteria B2.

The search of the Professional Development Collection yielded 27 results initially. That was narrowed down to 11 based on title and then 2 based on abstract. One of the two articles was included in the final review. The article dismissed did not meet inclusion criteria B5.

The search of ALT- HealthWatch/CINAHL/ERIC yielded 74 results initially. That was narrowed down to 18 articles based on title. 15 of the articles did not fit inclusion criteria. 3 articles were found in earlier searches. No article from this search was added to the final review.

The search of AJOT yielded 30 results initially. That was narrowed down to 5 based on title. 2 of the 5 were already found in other searches. One study was not included because it did not fit criteria A4. One study was not included because it fit exclusion criteria 4. One article was added to the final review.

The search of the Educational Journals database yielded 1,640 results initially. That was narrowed down to 102 based on title and then 37 based on abstract. 12 of the results were already found in prior searches. 6 articles were dismissed because they did not fit inclusion criteria A5 or B5. 2 articles were dismissed because they did not fit inclusion criteria A4. 3 articles were dismissed because of exclusion criteria 2. 2 articles were dismissed because of exclusion criteria 5. One study was excluded because of exclusion criteria 4. 11 studies were added to the final review.

In total, 24 articles were included in the review.

**Results of Search**

<b>Pyramid Side</b>	<b>Study Design/Methodology of Selected Articles</b>	<b>Number of Articles Selected</b>
Experimental	_2_ Meta-Analyses of Experimental Trials _6_ Individual Blinded Randomized Controlled Trials ___ Controlled Clinical Trials _10_ Single Subject Studies	18
Outcome	___ Meta-Analyses of Related Outcome Studies ___ Individual Quasi-Experimental Studies ___ Case-Control Studies __1_ One Group Pre-Post Studies	1
Qualitative	___ Meta-Syntheses of Related Qualitative Studies ___ Small Group Qualitative Studies ___ brief vs prolonged engagement with participants ___ triangulation of data (multiple sources) ___ interpretation (peer & member-checking) ___ a posteriori (exploratory) vs a priori (confirmatory) interpretive scheme ___ Qualitative Study on a Single Person	
Descriptive	_5_ Systematic Reviews of Related Descriptive Studies ___ Association, Correlational Studies ___ Multiple Case Studies (Series), Normative Studies ___ Individual Case Studies	
Comments:		24

**Literature Reviews**

<b><i>Author, Year</i></b>	<b>Study Objectives</b>	<b>Study Design/ Level of Evidence</b>	<b>Number of Papers Included, Inclusion and Exclusion Criteria</b>	<b>Interventions &amp; Outcome Measures</b>	<b>Summary of Results</b>	<b>Study Limitations</b>
Case-Smith, Weaver, Fristad (2015)	Examine the effectiveness of SIT and SBIs for children with ASD and co-occurring sensory processing problems on self-regulation and behavior.	RCTs and single case studies  Literature Review  E1 w/o meta-analysis	19 studies (5 SIT, 14 SBI) 5 databases searched  Search terms: psychology, self-regulation, mental health, occupational therapy, developmental disorder, and autism  Inclusion criteria: participants 3-21 y/o and diagnosis of autism, SIT or SBI intervention studied, intervention targets arousal state and self-regulation, article published between 2000-2012. Exclusion criteria not addressed	I: SIT, SBI (including therapy balls, weighted vests, etc) OM: varied greatly. (Vineland Adaptive Behavior Scale, self-injurious behavior, etc)	Two RCTS found positive effects of SIT on child performance using GAS. Other studies found positive effects of SIT on reducing negative behaviors. Few positive effects were found in SBIs and were limited by methodology. More rigorous studies are needed.	Only 3 RCTs included. Many studies did not include blinded evaluation.
Lang, O'Reilly, Healy, Rispoli, Lydon, Streusand, Davis, Kang, Sigafoos, Lanxioni, Didden, Giesbers (2012)	Identify, analyze, and summarize research involving the use of SIT in the education and treatment of individuals with ASD.	Literature review  RCTs Case studies One group pre-post  D1	25 studies included 4 databases searched  Search terms: sensory, sensorimotor, weighted vests, brushing, swinging, deep pressure, vestibular stimulation, proprioceptive stimulation, developmental disabil*, autis*, Asperger  Inclusion criteria: one participant diagnosed with ASD and SIT intervention	I: weighted vests, rocking stimulation, brushing, joint compression or stretching, alternative seating, bouncing, body socks, sensory tables, and chewing on a rubber tube  OM: self-stimulating behaviors, communication and language skills, social and emotional skills	14 studies were classified as no benefit to any participant (including 4 that suggested the effect could be negative). 8 studies were classified as mixed benefits. 3 studies were classified as positive with a level of certainty.	Broader than usual definition of SIT is confusing when comparing to other articles. Only 3 of the studies included were RCTs and many of the other studies had weak study designs.

			Exclusion: not addressed			
Yunus, Liu, Biessett, Penkala (2015)	Examine evidence of SBI with children with behavior problems	6 RCTs 8 single case designs  Literature Review  E1 w/o meta-analysis	14 articles included 7 databases searched  Search terms: sensory integration, sensory stimulation, SBI, children, adolescent, behavior, stereotypical, aggressive, tantrum, hyperactive  Inclusion criteria: participants 2-19 y/o w/ behavior problems, SBI or sensory interventions, evidence level 3 or higher by Centre for Evidence Based Medicine Exclusion criteria: not addressed	I: tactile, proprioceptive, or vestibular sensory stimulation  OM: behavior in school, social, or daily activities	The most evidence for positive results in behavior for sensory based interventions is in tactile interventions, particularly massage. The other areas have more mixed evidence.	Did not discuss participants of studies in detail. Only included studies targeting negative behaviors.
Watling, Hauer (2015)	Examine the evidence for SI interventions and SBI treatments for people with autism within the scope of OT practice	(based on AOTA levels of evidence)  8 Level I studies 1 Level II study 2 Level III studies 12 Level IV studies  Literature Review  D1	23 articles included 5 Databases searched  Search terms not listed Inclusion criteria: Published between January 2006 and April 2013, within scope of OT practice, direct service to participants with ASD, study in English, peer reviewed	I: Sound therapies, dynamic seating, weighted vests, other sensory methods  OM: Greatly varied from study to study. Less rigorous studies used observation of operationalized definitions of target behaviors. More rigorous studies used standardized assessments such as Vineland Adaptive Behavior Scale.	The evidence included in this study does not support the use of weighted vests or sound therapies for outcomes relevant to OT. There is a moderate amount of evidence supporting Ayres Sensory Integration. Future research should use larger samples and clear definitions of different words related to treatments involving sensory.	Over half of the studies were the lowest level of evidence. Many studies did not assess if participants were appropriate candidates for SBI.

<p>Hodgetts, Hodgetts (2007)</p>	<p>Provide occupational therapists a better understanding of somatosensory stimulation interventions for children with autism by evaluating and summarizing the current state of literature</p>	<p>3 case studies 1 single subject design 2 RCT  Literature Review  D1</p>	<p>6 studies included 4 databases searched  Search terms: occupational therapy, intervention, effectiveness, evidence-based practice, autism, autism spectrum disorder, pervasive developmental disorder, sensory integration, sensory modulation, sensory processing, sensory stimulation, habituation, arousal, attention, touch, pressure  Inclusion criteria: published between 1985-2005, somatosensory intervention Exclusion: not peer reviewed</p>	<p>I: somatosensory stimulation (deep pressure, massage, etc)  OM: task behavior, stereotypical behavior, attention, self-stimulating behavior</p>	<p>Massage therapy had the most evidence for effectiveness in increasing on-task behavior and reducing stereotypic behaviors. The other interventions had positive effects but study design limits ability to make conclusions. More rigorous research needed in this area.</p>	<p>The majority of studies were case studies and so generalizability is limited. Only 6 studies were included in the review. Does not address severity of autism.</p>
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**Articles looking at sensory integration therapy**

Author Year	Study Objective	Study Design/ Level of Evidence	Participants: Sample Size, Inclusion and Exclusion Criteria	Interventions & Outcome Measures	Summary of Results	Study Limitations
Schaaf, Benevides, Mailloux, Faller, Hunt, van Hooydonk, . . . , Kelly (2014)	Evaluating the effectiveness of SI in comparison to usual care in children (ages 4-8) with ASD and evaluating the influence of the approach on sensory, functional and adaptive behaviors of the children.	RCT  E2	N = 32 n = 17 (Treatment group) n = 15 (Usual care group) <b>Inclusion Criteria:</b> Autism diagnosis using the Autism Diagnostic Interview – Revised (ADI-R) and the Autism Diagnostic Observation Schedule (ADOS, non-verbal cognitive level of greater than 65, demonstrate difficulty in processing sensory information <b>Exclusion Criteria:</b> not addressed	Manualized SI intervention (individually planned treatment activities) for 3x/wk in 1 hour sessions for 10 wks. <b>Outcome Measures:</b> GAS, Pediatric Evaluation of Disability Inventory (PEDI), Pervasive Developmental Disorders Behavior Inventory (PDDBI), and Vineland Adaptive Behavior Scales II (VAB-II)	Treatment group had significantly higher score on GAS than the Usual Care group ( $p = 0.003$ ), with a large effect size. Also treatment group had significant improvement in both self-care caregiver assistance ( $p= 0.008$ ) and the social function caregiver assistance ( $p=0.039$ ).	The use of convenience sample could affect the replication of the research. Intensity of intervention received by Usual Care group was not discussed. Very specific participant group may lessen generalizability.
Pfeiffer, Koenig, Kinnealey, Sheppard, & Henderson (2011)	Investigating the effectiveness of SI interventions in children with autism, establishing a model for rct research and identifying appropriate outcome measures with this population.	RCT  E2	N = 37 children (21 diagnosed autism and 16 with PDD-NOS) between ages 6 – 12 n = 20 (SI intervention group) n = 17 (control group) <b>Inclusion Criteria:</b> Diagnoses autism or PDD-NOS SPD as determined through a T score of $\geq$ to 60 on the sensory processing measure. <b>Exclusion Criteria:</b> Diagnoses of Asperger syndrome or another PDD	Summer therapeutic activities/interventions based on individual needs of each child. 18 treatment interventions (3 sessions per wk of 45min each for a 6-wk period) <b>Outcome Measures:</b> GAS, Vine adaptive behavior scales, 2 <sup>nd</sup> edition (VAB-2), Sensory Processing Measure (SPM), the Social Responsiveness Scale (SRS) and the adaptability scale of the Carey Temperament Scales.	From the ratings of both the parents ( $p < .05$ ) and teachers ( $p < .01$ ), the SI group showed more significant improvement than the control group in the attainment of goals. They also showed fewer autistic mannerisms than the control group ( $p < .05$ ) through a subscale of SRS. However, there was no significant difference between the two groups on SPM.	Small sample size. Interventions were not specific and this could affect generalizability.

<p>Delvin, Healy, Leader, &amp; Hughes 2010</p>	<p>To investigate and compare the effects of SI therapy and behavioral intervention on rates of challenging behavior in children with autism.</p>	<p>Multiple baseline single subject.  E4</p>	<p>N = 4 Children with autism (ages 6-11) <b>Inclusion Criteria:</b> Diagnosis of Autism Spectrum Disorder, history of engaging in challenging behavior (form of aggression and self-injury)<b>Exclusion Criteria:</b> Not addressed.</p>	<p>SI Therapy: Vestibular, proprioceptive, &amp; tactile input. Behavioral intervention, 15 min/session. 5 days of baseline and 10 days of intervention. <b>Outcome Measure:</b> Frequency challenging behavior. The Questions About Behavioral Function (QABF). Stress Level Measure with salivary cortisol.</p>	<p>Behavior intervention was found to be more effective in reducing challenging behaviors than SI therapy.</p>	<p>Small sample size. Lack of blinding. Period of intervention was short.</p>
<p>Miller, Coll, &amp; Schoen (2007)</p>	<p>Evaluating whether sensory integration approach(OT-SI) is better in ameliorating attention, cognitive/social, sensory, or behavioral problems than placebo treatment (Activity Protocol) or no treatment.</p>	<p>RCT  E2</p>	<p>N = 24, children with sensory modulation disorders (SMD), between 3 and 11.6 years old n = 7 (OT-SI group), n = 10 (Activity Protocol group) n = 7 (no treatment group) <b>Inclusion Criteria:</b> Clinical diagnosis of SMD, hyperactive electrodermal reactivity (EDR) to stimuli in <math>\geq 2</math> sensory domains on Sensory Challenge Protocol, short sensory profile (SSP) total z score of <math>\geq -3</math>,. <b>Exclusion Criteria:</b> Having other condition on than ADHD, younger than 3 and older than 11.6 years, IQ &lt; 85, previous outside OT treatment, serious confounding life</p>	<p>OT-SI (manualized intervention), active placebo for activity protocol intervention (tabletop activities), and passive placebo (no treatment)- 2x/wk for 10 wks. <b>Outcome Measure:</b> Leiter International Performance Scale-Revised (Leiter-R), Vine landAdaptive Behavior Scale, SSP, Child Behavior Checklist (CBCL), GAS, and Electrodermal reactivity (EDR).</p>	<p>OT-SI group showed significant gains compared to the other two groups on GAS (<math>p &lt; 0.001</math>), attention, and cognitive/social substests.</p>	<p>Small convenience sample limits generalizability. Medication not included under inclusion or exclusion criteria. Occupational therapists provided intervention for OT-SI group but non during active placebo sessions, can affect validity.</p>

			events (e.g. death of parents), and special education (resulting in pull out services).			
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**Articles looking at weighted vests/massage**

<b>Author Year</b>	<b>Study Objective</b>	<b>Study Design/ Level of Evidence</b>	<b>Participants: Sample Size, Inclusion and Exclusion Criteria</b>	<b>Interventions &amp; Outcome Measures</b>	<b>Summary of Results</b>	<b>Study Limitations</b>
Davis, Dacus, Strickland, Copeland, Chan, Blenden, Scalzo, Osborn, Wells, & Christian (2013)	determine long term effects of weighted vest use on self-injurious behavior	Single subject design  ABAB conditions  E4	N=1 9 year old with severe autism with self-injurious behavior	I= wearing 5lb weighted vest Outcome measures= percentage of time biting (himself or others)  Observed on afternoons 2 to 3 times a week for 6 weeks in 15 minute intervals. Wore vest entire school day during intervention condition.	Similar levels of biting in both conditions (no significant difference)	Participant had been using vest for 7 months before study. Sensory profile not completed to identify sensory pattern. Only one weight of vest trialed. Observers not blinded.
Piravej, Tangtrongchitr, Chandarasiri, Paothong, & Sukprasong, (2009)	Investigating effects of Thai traditional massage (TTM) on major behavioral and emotional disturbances in Thai autistic children. SI was compared to SI with TTM.	RCT  E2	N = 60, ages 3 – 10years n = 30 (SI & massage group) n = (control/SI group) <b>Inclusion Criteria:</b> Diagnosis of autistic disorder by a psychiatrist based on DSM IV criteria. <b>Exclusion Criteria:</b> Contraindication for TTM (hematological disorders, fractures, arthritis, joint dislocation, fevers, cardiovascular, and pulmonary diseases). Inability to complete 80% of treatment program or receive a total of 13 massage sessions. Patients with non-cooperative parents or guardians.	2 sessions/wk, 1 hr/session for 8 weeks. <b>I= TTM</b> <b>Outcome Measures:</b> Conners’ Parent Rating Scales (CPRS), Conners’ Teacher Rating Scale (CTRS), and Sleep Diary (SD) by parents.	The CTRS showed that both groups had significant improvement in hyperactivity, conduct problem, and inattention-passivity ( $p = 0.00$ in all). The CPRS showed significant pre - post improvement in anxiety for the massage group only. Massage group showed greater improvement on conduct problem ( $p= 0.03$ ) and anxiety ( $p < .01$ ) compared to control group.	The use of participants from the same center might affect generalizability. Not being able to provide the qualification of the masseuse might make the generalization difficult. Parents might be biased in using the CPRS.

<p>Reichow, Barton, Neely Sewell, Good, Wolery (2010)</p>	<p>Extend literature on use of weighed vests using a more rigorous research methodology than most previous studies</p>	<p>Single Case Study E4</p>	<p>N=3 Ages:4-5 Inclusion: diagnosis of autism or developmental delay, current use of weighted vest during school day, enrollment in university-affiliated early childhood center, teacher's judgement of perceived advantages of weighted vest Exclusion: not adressed</p>	<p>I: no vest, weighted vest (~5% of body weight), vest without weight, 2 days of each vest condition, one day of no vest condition  Video recorded for first 10 minutes of daily morning table-time activity  OM: engagement, nonengagement, stereotypic behavior, problem behavior, also coded if they could see child or not on in video</p>	<p>No child significantly improved in any of the outcome measures. One child's graph suggested a possible negative effect. Weighted vests are not an effective intervention for increasing engagement in table based activities.</p>	<p>Small sample size. Small number of observations. No formal measurement of sensory profile of the participants.</p>
<p>Vandenberg (2001)</p>	<p>Measure on-task behavior during fine motor activities of children with attentional difficulties while wearing a weighted vest</p>	<p>Quasi-experimental single system AB design  E4</p>	<p>4 Children receiving school-based OT diagnosed with ADHD or scoring in the problem range of hyperactivity and attention scales of the Conners' Teacher Rating Scales, attended special education or at-risk preschool academic year before  Age 5y/o -6 y/o</p>	<p>I= weighted vests (5% of body weight) 6 baseline and 6 intervention 15 minute sessions Outcome measures= time of on task behaviors and time of off task behaviors during intervention session</p>	<p>3 out of 4 participants had significant change from baseline to intervention in on task behavior (p&lt;.05) 3 out of 4 participants wanted to wear the vest after the study was done. Positive reports from classroom staff members for all children.</p>	<p>Observers not blinded/ could have bias. Limited age range. Small sample size.</p>

<p>Lin, Lee, Chang, Hong (2014)</p>	<p>determine whether wearing a weighted vest would improve attentional, impulse, and on-task behavioral difficulties during the CPT task for children with ADHD</p>	<p>Randomized, two-period crossover design (RCT) E2</p>	<p>N=110 Taiwanese children Inclusion criteria: IQ &gt;80, diagnosis of ADHD, no other neurological disorder diagnosis, normal or corrected visual problems, normal hand function.  Exclusion criteria: taking regular medication</p>	<p>Completion of Conner’s Continuous Performance Test (CPT) once in each condition (14-minute computer based test)  IV: vest without weights, vest with ~10% of body weight  OM: inattention, impulsivity, speed of processing and responding, and consistency of executive management measured by CPT. On task behavior measured through observation and coding.</p>	<p>Significantly better scores in inattention, speed of processing and responding and consistency in executive management in weighted vest condition (p&lt;.05). Significant improvement on task behavior specifically in looking away, leaving the seat, and exhibiting extraneous movements (p&lt;.05). No improvement in making meaningful or meaningless utterances.</p>	<p>Study done in Taiwan limits generalizability. Only looked at immediate effects of weighted vest use. No no-vest condition. Subtypes of ADHD not considered. Study not done in naturalistic environment (clinic room with minimum distractions opposed to class room).</p>
<p>Cox, Gast, Luscre, &amp; Ayres (2009)</p>	<p>To investigate the effect of weighted vest on the amount of time elementary –age students with autism and intellectual disabilities engage in appropriate in-seat behavior</p>	<p>Multiple baseline single subject. E4</p>	<p>N= 3 (ages 5-9) <b>Inclusion Criteria:</b> Sensory processing abnormalities as measured by the Short Sensory Profile. <b>Exclusion Criteria:</b> Not addressed</p>	<p>No vest (A), vest without weight (B), and weighted vest (BC). Non-contingent reinforcement (NCR). 10 sec interval recording during 30min group circle time for five sessions <b>Outcome Measure:</b> Frequency count of in-seat behaviors through observation of 10 min of video.</p>	<p>No vest, vest-no-weight, and weighted vest all had no effect on appropriate in-seat behavior.  There was higher levels of in-seat behavior for all the participants when NCR was used.</p>	<p>Convenient sample. Small sample size. Participants were not diagnosed by the same institution and were not tested by the same diagnostic instruments. Evaluators were not blinded. Effects of weighted vest after first 10 min was not known.</p>

<p>Collins &amp; Dworkin 2011</p>	<p>Examining the effectiveness of weighted vest on increasing attention to task.</p>	<p>RCT E2</p>	<p>N = 10, ages 7 years 5months – 10 years 3 months. n = 7 (Intervention group) n = 4 (Control group) <b>Inclusion Criteria:</b> Meeting three of the following (1) has more difficulty staying in own seat than peers; (2) has more difficulty than peers keeping eyes on teacher, board, or own work; (3) needs more frequent reminders to work on task than peers; and (4) more frequently asks irrelevant questions or talks off topic than peers. <b>Exclusion Criteria:</b> Not meeting inclusion criteria above.</p>	<p>Wearing of weighted vest for 15min/session. Videotaping for 10min for 9 days. 9 sessions recorded for 3 – 6 weeks. <b>Outcome Measure:</b> Observation of on-task behavior, teacher follow-up survey.</p>	<p>No statistical significant difference in on-task behavior between the intervention group and the controls.</p>	<p>Use of convenience sample. Small sample size.  Not specific about diagnoses of participants. No verification of selected sample before data collection. Unequal sample size</p>
<p>Hodgetts, Magill-Evans, &amp; Misiaszek (2010)</p>	<p>Examining the effectiveness of weighted vest on children with autism and effects on heartrate</p>	<p>Multiple baseline single subject E4</p>	<p>N = 6 (ages 4-6) <b>Inclusion Criteria:</b> Confirmed diagnosis of autism, stereotyped behaviors that interfered with classroom participation based on teacher report, and sensory modulation dysfunction as identified by a total score more than 2 standard deviations below mean on the parent Short Sensory Profile. <b>Exclusion Criteria:</b> Not addressed</p>	<p>Wearing of weightless vest and weighted vest (5% - 10% of child’s weight). 20 min/day for 2 weeks. 1wk baseline. <b>Outcome Measures:</b> Coding the first 5 minutes of video sessions for stereotyped behaviors. Heartrate monitor.</p>	<p>There was 18% decrease in stereotyped behaviors for one child on wearing weighted vest and no effect on others. Also, there was no effect on heart rate except for one participant who had 7 bpm increase though his stereotyped behaviors did not decrease.</p>	<p>No detailed explanation of selection of participants. No functional analysis of behaviors. Not having uniform weight on vest could impact generalizability and result.</p>

<b><u>Author, Year</u></b>	<b>Study Objectives</b>	<b>Study Design/ Level of Evidence</b>	<b>Number of Papers Included, Inclusion and Exclusion Criteria</b>	<b>Interventions &amp; Outcome Measures</b>	<b>Summary of Results</b>	<b>Limitations</b>
Stephenson, Carter (2009)	Investigate if there is good research supporting the use of weighed vests in increasing attentive, on-task behavior and reducing distractibility and self-stimulatory behaviors in children with disabilities	Case studies only included  Literature Review  D1	5 peer reviewed papers, 1 non-peer reviewed paper, 1 poster presentation  Searched ERIC, CINAHL, Google Scholar, and PsychInfo.  Search terms: “weighted vest” and “weighted vests”  Included if presented empirical data and weighted vest was used to target behavior of children with disabilities.	I: weighted vests (no standard weight), all but one study 11-25 sessions, wearing vest for varying amounts of time  Observation periods range from 5-15 min  OM: self-stimulatory behavior, attention to or engagement in task, off task behavior, problem behavior  Compared studies in table	Studies included did not demonstrate strong evidence of positive effects of weighted vest use. More research should be done with more rigorous study methods (address inter-rater reliability, blinding, etc.). Currently weighted vest use is not recommended for clinical application.	Studies included not rigorous design. Not all studies included peer reviewed papers. Limited search terms. Variance of weighted vest intervention and outcome measures used.
Morrison (2007)	Review literature on use of weighted vests with students with ASD	3 experimental studies, 1 qualitative study, 1 critical appraisal of the literature  Literature Review  D1	5 articles included  Searched 5 journals/magazines, 7 databases  Search terms: weighted vest, autism, AND deep pressure, autism AND proprioception	I: the 3 experimental studies used weighted vests of varying amounts for varying amounts of time.  OM: on-task behavior, stereotypical behavior, ability to stay seated.	School occupational therapists think weighted vests are useful and use them frequently. There is limited evidence for their use with students with ASD. More research needs to be done with larger samples and a standardized protocol.	Included proprioception and deep pressure as search terms which could limit results. Narrow focus of population.

**Other**

<p>Bagatell, Mirigliani, Patterson, Reyes, Test (2010)</p>	<p>Effect of therapy ball chairs in classrooms by children with autism on in-seat behavior</p>	<p>Single subject design ABC E4</p>	<p>N= 6 boys with moderate to severe ASD in a specialized first grade /kindergarten classroom  Inclusion criteria: member of classroom Exclusion criteria: not addressed</p>	<p>Video recordings of sessions I= therapy ball chair during 16 min circle time C condition children chose if they wanted to use the seat or not <b>Outcome measures</b>= in-seat behavior (measured in time doing correct behavior), engagement (measured in time doing correct behavior), teacher perception, child preference  Data taken daily over 4 weeks (19 days total)</p>	<p>Participants had varying results in in-seat behavior, engagement, and preference. Some children had small improvements in in-seat behavior some of the time while others did not. The teacher perception of results was negative for all 6 participants</p>	<p>Confounding variables (i.e. participants occasionally sitting next to disruptive classmates). Participants had varying sensory processing needs/patterns that were not well discussed. Therapy balls only used in one class activity so not generalizable. Limited age range (K – 1<sup>st</sup> grade).</p>
<p>Fedewa &amp; Erwin (2011)</p>	<p>Investigating the effects of stability balls on the frequency of on-task and in-seat behaviors.</p>	<p>Single-subject A-B continuous time-series. E4</p>	<p>N = 8, 4<sup>th</sup> and 5<sup>th</sup> grades (mean age 9 y, 11mo.) <b>Inclusion Criteria:</b> Students with composite score &gt;= 120 (very high probability of ADHD) were observed though all students in the in the classrooms received stability balls. <b>Exclusion Criteria:</b> None</p>	<p>Sitting on stability balls. 30min, 3x/wk for 2 wk baseline and 12 wks intervention period. <b>Outcome Measure:</b> Attention Deficit/Hyperactivity Disorder Test (ADHDT), CTRS, and frequency count of on-task and in-seat behaviors.</p>	<p>Increased levels of attention, decreased levels of hyperactivity and increased time on on-task and in-seat with sitting on stability ball.</p>	<p>Small and convenience sample limiting generalizability. No feedback from students.</p>

<p>Umeda &amp; Deitz (2011)</p>	<p>Investigating the effectiveness of using therapy cushions in promoting in-seat and on-task behavior in kindergarten students with ASD and sensory processing differences.</p>	<p>Single subject, A-B-A-B-C  Level IV  E4</p>	<p>N = 2 (ages 5 and 6)  <b>Inclusion Criteria:</b> Current educational diagnosis of ASD, functional challenges with on task behavior and sensory processing differences.  <b>Exclusion Criteria:</b> Not addressed.</p>	<p>Sitting on therapy cushions against sitting on chair during Maths class. Video recording of students for 6 minutes 4 days/wk for 13.5 wks.  <b>Outcome Measure:</b> Frequency counts of in-seat and on-task behaviors.</p>	<p>No substantial changes in the in-seat and on-task behaviors of both participants.</p>	<p>Small sample. No randomization. The scores during the first baseline for the participants varies. No statistical analysis was done with the data collected.</p>
<p>Hall, Case-Smith (2007)</p>	<p>Investigate effects of therapeutic-listening program with sensory diet on children with SPD and visual-motor delays</p>	<p>Single group pre-post study  O4</p>	<p>N=10 Diagnosis of SPD (defined by at least 3 subtest scores at least 2 SD below mean on the Sensory Profile) and visual-motor integration delays 5-11 years old Exclusion: moderate to severe mental retardation, cerebral palsy, Down syndrome, visual impairment, hearing impairment, or severe autism. Medication anticipated to change.</p>	<p>I= 4 wks traditional sensory diet at home, 8 weeks 2x day for 20-30min therapeutic-listening program with sensory diet at home  Outcome Measures=Draw-A-Person test, Developmental Test of Visual Integration, Evaluation Tool of Children’s Handwriting, Sensory Profile, parent interview</p>	<p>Significant improvement on 9 out of 14 Sensory Profile subscales, with auditory processing and behavioral outcomes being the highest.  4 parents received information from their teacher that student was doing better in class  DAP, VMI and ETCH overall no significance.</p>	<p>Used convenience sample. Not random. Therapists scoring assessments blinded but giving the assessments not blinded. Participants receiving other services. No accounting for expected improvements due to time.</p>
<p>Kinnealey, Pfeiffer, Miller, Roan, Shoener, &amp; Ellner (2012)</p>	<p>To examine the effects of sound dampening walls and halogen lighting on students with autism and to explore how the modification affect attending and learning from the students’</p>	<p>Multiple baseline single subject.  E4</p>	<p>N=4 (ages 13-20)  <b>Inclusion Criteria:</b> Demonstrate classroom-ready behaviors as defined by school, free of special health concerns, cognitive impairment, or a psychiatric condition.  <b>Exclusion Criteria:</b> Not addressed</p>	<p>Installation of sound-absorbing walls and halogen lighting in classroom. Sixteen 10 min video segments (2 days/wk) of each student per phase for 6 weeks  <b>Outcome Measure:</b> Decibel meter, frequency of attending and non-attending behaviors through analysis of video, student’s journals,</p>	<p>There was decrease in non-attending behaviors for each of the participants. Also, from the journals, perceived positive change in classroom environment was reported.</p>	<p>Small convenience sample will limit generalizability. No randomization. Parents could be biased in filling out the sensory profile.</p>

	perspective.			and Sensory Profile.		
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## **Summary of Key Findings**

### **Summary of Experimental Studies**

There is evidence that sensory integration therapy is effective in achieving individualized goals in children with autism and sensory modulation disorder (a type of sensory processing disorder) (Miller, Coll, & Shoen, 2007; Pfeiffer, Koenig, Kinnealey, Sheppard, & Henderson, 2011; Schaaf, et al. 2014). There is evidence that SIT may not be as effective as behavioral based interventions in reducing challenging behaviors (Devlin, Healy, Leader, & Hughes, 2010).

Most evidence does not support the use of weighted vests to increase participation or decrease maladaptive behaviors (Collins & Dworkin, 2011; Cox, Gast, Luscre & Ayres 2009; Davis, et al. 2013; Hodgetts, Magill-Evans, & Misiaszek, 2010; Reichow, Barton, Sewell, Good, & Wolery, 2010; Stephenson & Carter, 2009). However, there is one study of children with ADHD that provides strong evidence for weighted vests of roughly 10% body weight for reducing inattention and improving on-task behavior (Lin, Lee, Chang, & Hong, 2014). However the study was very controlled and not in a naturalistic environment and so the results should be interpreted with caution. There is some evidence that massage may decrease problem behaviors and anxiety in children with autism ( Piravej, Tangtrongchitr, Chandarasiri, Paothong, & Sukprasong, 2009).

Alternative seating for children with autism did not result in better in-seat behaviors (Umeda & Deitz 2011). Alternative seating for children with a high probability of ADHD did result in better in-seat behaviors though the study is limited in generalizability because of sample size (Fedewa & Erwin 2011). Installing sound-absorbing walls and halogen lights in classrooms did have a positive effect on attending behavior in youth with autism (Kinnealey, et al. 2012).

### **Summary of Outcome Studies**

Outcome studies regarding weighted vest use had roughly the same results as discussed earlier in the experimental studies summary. A study on the effects of a therapeutic-listening program provides some evidence for its use with children with sensory processing disorder (Hall & Case-Smith, 2007). It did not specify well what the functional results were.

### **Summary of Literature Reviews**

The literature reviews of SIT suggested that there is moderate evidence for SIT for achieving individual goals for children with autism (Case-Smith, Fristad, & Weaver, 2015; Watling & Hauer, 2015). The literature reviews for sensory based interventions concluded that there is not strong evidence for most sensory based interventions (excluding SIT in the definition of SBI) (Case-Smith et al.; Hodgetts and Hodgetts; Watling & Hauer; Yunus, Liu, Bissett & Penkala, 2015), particularly weighted vests (Watling & Hauer). More studies with more rigorous design and larger sample sizes are needed to give conclusive evidence on the treatment effects. Massage was brought up as one area that has more evidence for a beneficial treatment effect than other types of sensory based intervention (Hodgetts & Hodgetts, 2007). One study concluded that weighted vests could have a negative effect (Lang et al. 2012).

## **Implications**

### **For the Practitioners**

Because of the number of children being diagnosed with disorders involving sensory challenges, occupational therapists should be aware of current treatments for individuals with sensory problems. Evidence supports the use of sensory integration techniques, therapeutic listening, massage therapy, and lighting changes for positive classroom effects. Practitioners should investigate the feasibility of these interventions in their setting and how they could be beneficial for their clients. The approaches listed earlier can improve on-task behavior, reduce anxiety, and decrease aversive behaviors. There is little evidence at this time to support the use of weighted vests and dynamic seating; however, one case study reported positive feedback from students with ADHD who used a weighted vest in the classroom. If either of these options are used practitioners should be prepared to justify their decision and track effects. Using sensory strategies that have evidence fits with best practice for clients. Practitioners can also advocate for clients when they are aware of positive and new treatments as well as share the knowledge with co-workers.

### **For the Consumers**

The consumers are school children who have problems processing sensory information and their parents. This information would help parents become more knowledgeable about current best practice. Based on this information parents should question the use of weighted vests with their children. Parents might ask for teachers to explore alternate seating with their child with ADHD. Massage is a treatment that will likely not become popular in schools but from this information parents may investigate learning massage for their child or paying for massage therapy. Because SIT is not a popular intervention in schools, the success of it might lead a parent to advocate for it in their child's individualized education plan or seek outside occupational therapy services.

### **For the Researcher**

The first step for every research project involving sensory treatments should be to clearly define different terms based on what is the current common definition (SIT vs. SBI, definition of SPD). Hopefully eventually there will be clear definitions of sensory related terms.

More research should be done on interventions involving sensory treatment in schools. New literature should focus on identifying which children benefit from what treatment (e.g., do children with ADHD who seek vestibular stimulation benefit from dynamic seating more than children who seek auditory stimulation?). Practitioners now have access to a plethora of literature about sensory interventions but the gap still exists between identifying which intervention is appropriate for which child. Future research addressing individualized treatments should more explicitly state what individualized goals were worked on so that the results are more generalizable. There is also a lack of follow-up after treatment in studies and this should be an element in future studies.

**Bottom Line for Occupational Therapy Practice**

There is only weak evidence overall supporting sensory based interventions in schools. There is some evidence supporting SIT. If sensory based interventions are going to be used in treatment they should be applied at the individual level with clinical reasoning guiding the treatment. It would be prudent for occupational therapists to track the results of the treatment so treatment can be ended if no effects or negative effects are seen.

**Frequently Used Abbreviations**

ADHD	Attention Deficit Hyperactivity Disorder	RCT	Randomized Control Trial
ASD	Autism Spectrum Disorder	SBI	Sensory Based Intervention
GAS	Goal Attainment Scale	SD	Standard Deviation
OM	Outcome Measure	SI	Sensory Integration
PDD-NOS	Pervasive Developmental Disorder- Not Otherwise Specified	SIT	Sensory Integration Therapy
ADHDT	Attention Deficit Hyperactivity Disorder Test	SPD	Sensory Processing Disorder
SSP	Short Sensory Profile	wk	Week
SMD	Sensory Modulation Disorder	EDR	Electrodermal Reactivity
SPM	Sensory Processing Measure	TTM	Thai Traditional Massage
		SRS	Social Responsiveness Scale

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Sensory Kits Involvement Plan

OT636

March 8<sup>th</sup>, 2016

Cordelia Nwogu and Kelly Peterson

George Tomlin and Sheryl Zylstra

## **Introduction**

Jennifer Burke is an occupational therapist for the Franklin Pierce School district. Given the research presented to her in the form of a CAT table, her clinical experience, and information from a colleague who attended a conference by Lucy Miller on sensory issues in children, Burke is interested in making sensory strategies more accessible for children who may not qualify for occupational therapy services in the schools. Burke understands that much of the research she was presented with provides only weak evidence for sensory based interventions. However, the research generally did not reveal negative effects of sensory based interventions and Burke believes these interventions are helpful for some children.

Burke believes that there is a population of kids that do not qualify for occupational therapy services in the school district but would benefit from the use of sensory strategies in the classroom. While the evidence is not strong for interventions like dynamic seating, weighted vests, or sound dampening walls, the research does appear to suggest that these methods may have benefits for some children. This leads Burke to believe other sensory methods could be brought into the classroom and benefit certain students. However, she is concerned that sensory tools may be given to students with no instruction on how and when to use each item and/or no follow-up on whether the item is achieving its purpose for a particular student. That is why Burke is interested in finding a way to make sensory strategies accessible as well as their being data driven.

Our project will help Burke identify current sensory kits that are available for use in school classrooms. Besides identifying favorable sensory kits based on pragmatic factors we will create simple data sheets so that when a teacher or school counselor uses an item from the kit they are able to keep track of whether the intervention is effective or not. We will create an

informational product for our collaborating therapist to share with teachers or school counselors that will also include an outcome monitoring component.

### **Contextual Factors**

In order for Burke's idea to be successful she needs buy in from teachers and/or school counselors. Without their support it is very unlikely that a sensory kit would be utilized appropriately in a classroom. Each teacher has a varying amount of contact with occupational therapists or Burke specifically, and so it may take some time for them to spread beyond a couple classrooms or school counselors. If teachers do not feel competent in using the kit appropriately in their classroom they may choose not to use it. The demand on the teacher needs to be relatively low so that they can use it without greatly affecting their ability to successfully run a classroom. This means the data sheet needs to be easy to use. There is also the financial factor of how much each kit costs, which may impact whether they are purchased or not. Since there is no target classroom for the kits, the kits need to fit a variety of teaching styles and be age appropriate for a variety of children. In general Burke, teachers, and school counselors are all busy people, and so it may take some time for them to explore the kits and decide if one would be beneficial for their setting.

**Task Schedule**

<b>Date to be completed by</b>	<b>Task to be completed</b>
3/25	<ul style="list-style-type: none"> <li>• Sensory kits identified for evaluation (goal: find 5-6 kits)</li> <li>• Evaluation criteria identified (sheet made), confirmed with Burke and Tomlin</li> </ul>
4/1	<ul style="list-style-type: none"> <li>• Half of sensory kits evaluated</li> <li>• Rough draft form of data collection sheets, e-mailed to Burke for opinion</li> </ul>
4/8	<ul style="list-style-type: none"> <li>• Other half of sensory kits evaluated</li> </ul>
4/15	<ul style="list-style-type: none"> <li>• Data forms finalized</li> <li>• Packet containing sensory kit evaluations and data forms given to Burke</li> </ul>
4/22	<ul style="list-style-type: none"> <li>• Meet with Burke in person to discuss how she views the information being used or if it has been used</li> </ul>

**Outcome of Activities to be Monitored**

We will monitor how Burke uses the information we provide her, if any of the kits we evaluated are purchased and for whom they are purchased for (teacher or school counselor). If a kit is purchased before the final project is due, we will hope to have e-mail contact with whomever is using the kit and record how often they use it and if they use the data sheets. If we had more time we would like to look to see if the data sheets impacted the use of the sensory strategy.

**Knowledge Translation: Meeting with Occupational Therapy Team to Present Results**

In November the occupational therapists from the Franklin Pierce School District were invited to attend an informal presentation about the results from the literature review. Six therapists attended. It was learned at that time that one of the therapy team members had recently attended a conference by Lucy Miller on sensory issues and had already shared his knowledge with the team of therapists. The results he shared were very similar to the findings of the literature review and so the therapists were already familiar with the results.

Based on the information from the Lucy Miller conference and presented to them through the literature review, many of the occupational therapists said they would likely use weighted vests less in practice. However, one of the clinicians stated that one of her clients very clearly benefited from a weighted vest and so was likely to continue to use them. The clinicians believed they already did a good job taking data about interventions and so the recommendation to be prudent in data taking did not seem to make any impact at that moment. However, on the survey one therapist identified that she would now collect more outcome based data in settings outside the occupational therapy treatment (i.e. classroom). There was discussion about how teachers, and especially parents, can impact if good data can be collected or not, for example if a parent insists on using two sensory strategies at once it cannot be determined if one had a positive effect or not.

The information the therapists received from the Lucy Miller conference included that massage was a promising area for improving behaviors in children. One study about massage was included in the literature review and so much of the discussion was around the feasibility of massage in a school setting.

### **Knowledge Translation Project: Expanding to School Counselors and Teachers**

Burke initially desired to have a sensory kit created with instructions for use for each object in the kit so a non-occupational therapy professional could easily use it. However, it was concluded that to create a new sensory kit would take more time than this project had available and would be repetitive of others who already have put together sensory kits.

A table of commercially available sensory kits for school teachers was created, detailing the pros and cons of each kit. The first step in this process was identifying the sensory kits that were meant to be used in a school setting. Many websites advertised sensory kits for classrooms but either the kits were meant for a single child or only targeted one sensory area (i.e. tactile). Through continued searching, five kits were identified as suitable for general use. One kit identified came from a search of Sound Ideas on sensory and classrooms.

The second step was to make sure that the kits were being evaluated for the targeted reasons. A list of ideal types of items to be included was made and e-mailed to Burke. Burke responded adding one item to the list. Then the process of analyzing each kit began. Each kit was evaluated for each sensory area it addressed and then for ease of use factors such as having multiples of items, how appropriate items were for a school setting, or instructions on how to use the items. Because the literature review indicated that the evidence for sensory based interventions is mixed, a simple data sheet was created to be used in a classroom setting. The data sheet included space for information on what sensory intervention was being tried and observation of behavior. Both the table and data sheet were well received by Burke. Burke used the table in a conversation with a school counselor who would like to purchase a sensory kit. Burke also shared the table and data sheet with her team so that they can share it with other school counselors and teachers.

Name of kit, cost, link to website	Content of kit		Pros	Cons
<p>Self Calming Tools Kit, \$159.23,  <a href="https://funandfunction.com/self-calming-tools-kit.html">https://funandfunction.com/self-calming-tools-kit.html</a></p>	<p>Homework tent                      Noise reduction ear muff                      Find me lap pad                      Sit-a-Round cushion                      Spaghetti fidget                      2 squeeze lizards                      3 grabbers</p>	<p>Proprioceptive                      Tactile                      Oral motor                      Auditory                      Fidgets</p>	<p>Different items for a variety of sensory areas</p> <p>Chewy items are reusable and washable</p> <p>Sit-A-Round Focus Cushion adjustable from less firm to more firm</p> <p>Chewy fidget can be clipped onto different items to stay with a student</p>	<p>Cost</p> <p>Sharing chewy item might not be hygienic.</p> <p>Home tent may be a duplication of Quiet Area most classes already have, or may be difficult to use in a classroom setting</p>
<p>Sensory Survival Kit, \$89.99,  <a href="https://funandfunction.com/sensory-survival-kit.html">https://funandfunction.com/sensory-survival-kit.html</a></p>	<p>Textured pencil toppers                      Hand-eye Coordination scarves Set                      2oz putty                      Busy fingers tangram gel puzzle                      Lycra stretch band                      Sensory fidget brushes</p>	<p>Proprioceptive                      Tactile                      Oral motor                      Fidgets</p>	<p>Different items for a variety of sensory areas</p> <p>Textured pencil toppers can be used as a fidget or for oral motor stimulation during class</p>	<p>Moderately expensive</p> <p>Only 1 of most items</p> <p>Only 3 pencil toppers</p> <p>Only one putty type included (soft)</p> <p>No item to address auditory needs</p>

<p>Classroom break box starter kit, \$154.99,  <a href="https://funandfunction.com/classroom-break-boxes-sensory-tool-kit.html">https://funandfunction.com/classroom-break-boxes-sensory-tool-kit.html</a></p>	<p>Discovery putty                  Pressure foam roller                  Discovery disc                  Busy finger lap pad                  Pet Massager                  Crawl and Calm                  Resistance Tunnel</p>	<p>Proprioceptive                  Tactile                  Oral motor                  Fidgets</p>	<p>Different items for a variety of sensory areas                   Variety of proprioceptive options                   Include vibration sensory input from pet massager</p>	<p>Expensive                   Only firm resistance putty available                   Pressure foam roller may not be appropriate in classroom setting                   No item to address auditory needs</p>
<p>Classroom break box standard kit, \$299.99,  <a href="https://funandfunction.com/classroom-break-boxes-sensory-tool-kit.html">https://funandfunction.com/classroom-break-boxes-sensory-tool-kit.html</a></p>	<p>Discovery putty                  Pet massager                  Busy fingers gel fidget                  Fidget Key Chain                  Balls-3 pack                  Bumpy gel cushion                  Emotion putty                  Pressure foam roller                  Hand eye coordination scarves set                  Spaghetti chewy fidget                  Noise reduction earmuffs                  Find me lap pad                  Transformer sensory sack                  Reggie regulation ruler                  Mega weighted lap pad</p>	<p>Proprioceptive                  Tactile                  Oral motor                  Auditory                  Fidgets</p>	<p>Many different items for a variety of sensory areas                   Variety of proprioceptive options                   Include vibration sensory input from pet massager</p>	<p>Very expensive                   Pressure foam roller may not be appropriate in classroom setting</p>
<p>Wiggle Whomper Kit,</p>	<p>2 putties</p>	<p>Proprioceptive</p>	<p>Different items for a</p>	<p>Expensive</p>

<p>\$184.95,  <a href="http://shoponline.pfot.com/product1882.html">http://shoponline.pfot.com/product1882.html</a></p>	<p>4 stretch bands                  3 puff air seat cushions                  Pipe cleaners                  Various types of gum                  Straws                  Squeeze balls                  2 Cd's                  Stretch and basic yoga instruction sheet</p>	<p>Tactile                  Oral motor                  Auditory                  Fidgets</p>	<p>variety of sensory areas</p> <p>Contains directions for all activities and references for evidence for their use</p> <p>Multiples of items included</p> <p>Different putties included</p> <p>Clear container makes it easy to locate items</p>	
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Sensory Data Sheet

Student Name \_\_\_\_\_

Targeted behavior \_\_\_\_\_

Sensory strategy \_\_\_\_\_

Instructions: Record the above information. Record how often the targeted behavior happens over your choice of time (15 minutes, 1 hour, 1 day, etc). Select a sensory strategy and teach it to the child. At three points when the child is using or has used the strategy record again how often the target behavior happens.

Time frame:

Occurrence of behavior before sensory strategy	Using sensory strategy first time	Using sensory strategy second time	Using sensory strategy third time
Date:	Date:	Date:	Date:

Sensory Data Sheet

Student Name \_\_\_\_\_

Targeted behavior \_\_\_\_\_

Sensory strategy \_\_\_\_\_

Instructions: Record the above information. Record how often the targeted behavior happens over your choice of time (15 minutes, 1 hour, 1 day, etc). Select a sensory strategy and teach it to the child. At three points when the child is using or has used the strategy record again how often the target behavior happens.

Time frame:

Occurrence of behavior before sensory strategy	Using sensory strategy first time	Using sensory strategy second time	Using sensory strategy third time
Date:	Date:	Date:	Date:

**Table of Completion of Steps of Involvement Plan**

Date of completion	Task completed
3/29	<ul style="list-style-type: none"> <li>• Emailed clinician about plan to evaluate existing sensory kits</li> <li>• Identified evaluation criteria</li> <li>• Created table/started identifying sensory kit</li> </ul>
4/8	<ul style="list-style-type: none"> <li>• Started evaluating sensory kits</li> <li>• Created data sheet</li> </ul>
4/11	<ul style="list-style-type: none"> <li>• Finished evaluating sensory kits</li> <li>• Emailed table of evaluated kits and data sheet to clinician</li> </ul>
4/21	<ul style="list-style-type: none"> <li>• Data sheet finalized with clinician feedback</li> <li>• Created survey for clinician and clinician</li> <li>• Emailed survey to clinician</li> </ul>
4/28	<ul style="list-style-type: none"> <li>• Received survey from clinician</li> </ul>

### **Monitoring Outcomes**

Time to complete the project and have follow up was limited and so not all outcomes were monitored how desired. Ideally, one measure of the sensory kit table project would be if any teachers or school counselors purchased any of the kits listed. If a kit was purchased monitoring the use of data sheets would provide information on both if the data sheets were used by non-occupational therapy personnel and if the data sheets impacted the use of sensory materials in classrooms. However, due to the timing of this project a sensory kit was not purchased in time to monitor its use via data sheets.

A survey was sent to Burke regarding how the literature review has and will impact practice and how she plans to utilize the sensory kit tables. Burke filled out the survey with input from others on the occupational therapy team. The survey portion related to the literature review asked about the likelihood of using different sensory methods in practice (weighted vest, dynamic seating, massage, and sensory integration), if they would continue to seek out information on sensory treatments, and how the literature review would/has impacted how they take data. The sensory kit portion asked about how they plan to use the table, how they would educate others about sensory kits, and how data would be taken and stored related to use of the sensory kits in classrooms.

### **Evaluation of the Effectiveness of the Tasks and Products**

Overall the presentation of the literature review appears to have been effective in providing the information needed to make slight changes in practice. Based on the survey results Burke is now less likely to use weighted vests in practice, equally as likely to use dynamic seating, and equally as likely to use massage in practice compared to before the presentation of the literature review. These results correspond with the information presented about sensory based treatments in that weighted vests had the least support. Burke reported that she is now more likely to investigate using sensory integration techniques because she feels with the limited evidence more investigation is needed before advocating for their use. She says that she plans to continue to seek out additional education on using sensory interventions in her practice.

While Burke always took data on interventions before, based on the information presented she now plans on changing her data collection methods slightly. Her team will now focus on collecting data about the impact of the intervention on the target behavior. This aligns with the information presented because of the success of sensory integration based on individualized goals.

The effectiveness of creating the table of sensory kits at this point cannot be measured in detail. So far Burke has used the table in one conversation with a school counselor who is interested in purchasing a sensory kit. The school counselor plans to share it with the principal of the school. The table has also been shared with the entire therapy team of the district so that they all may use it in conversation and collaboration with teachers or school counselors or other personnel interested in having sensory tools available not through occupational therapy. Burke believes they will be able to educate others about using a sensory kit through sharing protocols, handouts, summarizing research, and in conversation/consultation.

One way that the table product was not as effective as hoped was that all of the kits cost more than would be preferred to be spent on a sensory kit. This has led Burke to, while using it in discussion with others, not be confident that one of the five kits analyzed will be purchased. Instead Burke believes it is more likely that she and other therapists will use the table as a guide for purchasing some new materials to go with material they already have access to when speaking to others about getting a sensory kit.

Because no sensory kit at this point in time has been purchased or assembled there is no evidence for the effectiveness of the data sheets created. Burke did have a positive response towards the data sheets, noting the simplicity. While Burke may be on board to use the data sheets there are still significant barriers to be crossed for their use. Because the point of the data sheet is to allow data to be simply taken by non-occupational therapy personnel there is still the need of buy in from others. There is a good chance of the data sheets being effective if Burke or another therapist knowledgeable about the literature review completed is consulting on the implementation of a sensory kit in a classroom because they will be able to communicate the importance of the sheets.

Overall, the completion and presentation of the literature review was effective in educating the occupational therapists of Franklin Pierce School District on the current state of research on the effectiveness of sensory methods possible in a school setting demonstrated by the slight changes made after the presentation in line with the information presented. So far the creation of a table of sensory kits has been an effective tool for discussion with non-occupational therapy personnel however its general effectiveness is limited by the cost of the kits. The effectiveness of the data sheets is not known at this point because no sensory kit has been implemented in a classroom.

### **Analysis of the Overall Process of the Project**

The most difficult aspect of this project was coordinating timing. While technology has greatly increased abilities to communicate when face to face is not possible, sometimes face to face is needed to make sure everyone is on the same page. Having a full time 2<sup>nd</sup> year MSOT student and a part-time MSOT student taking predominately 1<sup>st</sup> year classes greatly limited times that both could meet. Throwing into it a project chair who taught doctorate classes as well as MSOT level classes, a work schedule, and parenting, made it very difficult to get together in a timely manner. Typically Fridays were reserved to work on this project by the MSOT students, but increased informal daily communication could have had a positive impact on the completion of this project. In the future it may also be beneficial if there is less time devoted to revising the literature review and more time devoted to the involvement plan knowledge translation project.

While working with a clinician in the community helped the MSOT students gain valuable insight into a potential future work setting and how research works in the real world, it presented its own challenges. Again adding a 3<sup>rd</sup> schedule to the mix of two schedules that already were limited in overlaps of available time proved challenging for scheduling meetings. When originally meeting to select a topic, while many options were presented, the topic of sensory in schools was selected because of Burke's administrator's interest in having research on hand related to sensory in schools. This made the topic possibly not the collaborating clinician's highest priority and may have limited buy in.

The strengths of the process included lectures in class that corresponded to what aspect of the project was being worked on. Feedback on assignments throughout the semester was extremely helpful. Time to discuss the project in lecture was helpful, except that one of the two group members had to leave early every week during this time to attend another class.

### **Recommendations for Follow-on Projects**

These recommendations are based off of recommendations from the collaborating clinician and student reflection on the project:

- Follow-up on use or nonuse of data sheets with sensory kits in the Franklin Pierce School District
- Literature review on massage techniques possible in occupational therapy treatment
- Creation of instructions on how to use a sensory kit aimed at a school counselor or teacher
- Paper on the current definitions used and differences and similarities of the following terms: sensory based intervention, sensory integration therapy, Ayre's sensory integration

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Name: \_\_\_\_\_ Date: \_\_\_\_\_

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Signature of MSOT Student

Name: \_\_\_\_\_ Date: \_\_\_\_\_

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