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COMPRESSION VEST USE: A SURVEY OF OCCUPATIONAL THERAPISTS

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CHAPTER I

INTRODUCTION

When a child's nervous system detects and transmits sensory information in an atypical manner, the child may demonstrate behavioral responses that interfere with what he or she wants or needs to do in daily activities (Dunn, 1997). When this occurs, sensory processing dysfunction (SPD) may be present. Signs of SPD include distractibility and inattention (Ayres, 1979), exaggerated or diminished responses to sensory stimulation, sensation seeking or avoiding behaviors (Hanft, Miller, & Lane, 2000), behavioral rigidity, fixation on objects or actions, difficulty developing relationships with others, and deficits in perceived competence (Cohn, Miller, & Tickle-Degnen, 2000). Ahn, Miller, Milberger, and McIntosh (2004) surveyed parents of kindergarten students from one public school district in the United States and estimated the prevalence of SPD to be 5.3% to 13.7%. Based on results from several studies, Dunn (2007) concluded that individuals of diverse age groups with a variety of disabilities demonstrate intense patterns of sensory processing (sensation seeking, sensation avoiding, sensory sensitivity, and low registration, a pattern marked by a high neurological threshold and passive behavioral responses). Therefore, the rate of SPD among children with disabilities may be even higher than the rate estimated among kindergarten-aged students in a regular education system.

Researchers have studied behavioral responses to sensory information among children with a number of diagnoses. Children with ADHD, a condition characterized by inattention, hyperactivity, and impulsivity (American Psychiatric Association, as cited in Centers for Disease Control and Prevention, 2008), demonstrated significantly different patterns of sensory processing compared with typically developing children (Ermer & Dunn, 1998; Mangeot et al., 2001) and those diagnosed with autism (Ermer & Dunn, 1998). The diagnostic criteria for pervasive developmental disorder (PDD), including autism and Asperger disorder, contains some traits consistent with the signs of SPD that Cohn et al. described (2000), such as impairments in social interaction and the presence of restricted, repetitive, and stereotyped patterns of behavior and interests (American Psychiatric Association, 2000). Researchers have been able to discriminate children with autism from other groups (Ermer & Dunn, 1998) and have identified atypical responses in most areas of sensory processing, especially with sensory seeking behaviors, auditory filtering (the child's ability to attend and respond to sound; Dunn, 1997), tactile sensitivity (Tomchek & Dunn, 2007), and taste/smell sensitivity (Rogers, Hepburn, & Wehner, 2003). In children diagnosed with Asperger disorder, Pfeiffer, Kinnealy, Reed, and Herzberg (2005) found correlations between sensory hyper- and hyposensitivity and signs of affective disorders, such as anxiety and depression, and inverse correlations between sensory hyper- and hyposensitivity and community use and social skills. Children diagnosed with other neurogenetic disorders, including Fragile X syndrome

(Baranek et al., 2002; Rogers et al., 2003) and Angelman syndrome (Walz & Baranek, 2006) also display atypical patterns of sensory processing.

SPD theoretically occurs as a result of inefficient neurological activity during the transmission of input from peripheral receptors to various centers in the brain (Royeen & Lane, 1991). Therapists who use interventions that offer enhanced sensory experiences, which are focused on the tactile, vestibular, and proprioceptive systems, expect to improve underlying neurological functions among children with SPD, and believe the improvements will be reflected in the quality of the child's responses to environmental demands (Ayres, 1979; Mulligan, 2003a). Dunn (1997) hypothesized that a relationship exists between ones neurological threshold, the level of stimulation required to transmit information from one place to another within the nervous system (Purves et al., 2004), and ones behavioral response to sensory information. Deep pressure, a form of tactile stimulation provided through firm touch, is thought to modulate responses and arousal via the central nervous system's dorsal medial leminiscal and anterolateral pathway projections to various structures within the limbic system, hypothalamus, reticular formation and cortex, and the pathways' convergence in a number of these locations (Lane, 2002). Interventions that provide deep pressure stimulation aim to positively affect these neurological pathways so that the child is able to appropriately respond to a situational demand. Interventions are usually implemented as one portion of a sensory diet, a term Wilbarger (1995) coined to describe the intentional application of sensory input throughout a person's day.

A number of studies have explored the use of weighted vests, which are intended to provide deep pressure, for children with sensory processing dysfunction. Vandenberg (2001) and Fertel-Daly, Bedell, and Hinojosa (2001), using single subject designs, reported significant increases in attention to fine motor tasks while the children in their studies wore weighted vests. Fertel-Daly et al. (2001) also found that during a withdrawal phase, the children's attention to task decreased but did not fall to the baseline level. These authors also reported a decline in the number of distractions and sensory seeking behaviors in which the children engaged while they wore the vests during fine motor activities. These studies appear to support the use of weighted vests; however, they had inconsistencies, such as the diagnoses of the children, the amount of weight worn in the vests, the duration of wear, and the ages of the participants.

To determine the extent to which weighted vests are used in practice and the parameters occupational therapists follow when using weighted vests, Olson and Moulton (2004) conducted a nationwide survey of occupational therapists who work with children. Therapists with advanced master degrees and those with more years experience working with children were significantly more likely to recommend the use of weighted vests than those without advanced degrees and less experience with children. Vests were worn most frequently by children with diagnoses of autism/PDD, ADHD, and developmental delay, though some children had other diagnoses, including cerebral palsy and Down syndrome. The therapists reported that the children had a number of dysfunctions, but hyperactivity

and sensory defensiveness, or strong, negative responses to sensation that others would consider harmless (Bundy, Lane, & Murray, 2002) were the most common.

Although evidence is building that supports the use of weighted vests for some children, personal observations and reports from colleagues indicate other children do not like weighted vests, resist wearing them, or do not show positive changes during or following use of the vests. Anecdotal reports indicate children may experience rebound effects (Joe, 1998), which occur when a child displays negative behaviors associated with vest wear, and may habituate to the weight of the vest so the intervention is no longer beneficial. Habituation is a process that causes one to become less responsive to a recurrent stimulus (Purves et al., 2004). Fellow occupational therapists have reported concerns that children who wear the vests, and those who monitor the children, must strictly adhere to a prescribed wear schedule in an attempt to avoid rebound and habituation effects, as well as extraneous force on joints. In cases where these therapists believed the schedule would not be followed, they did not recommend vests.

An alternative treatment option to weighted vests is the application of compression vests, which is another strategy to achieve the potentially desirable effects of deep pressure. Compression vests are thought to provide deep pressure via tight fitting but light-weight neoprene material. Personal experience and colleague reports indicate some children who do not tolerate or benefit from weighted vests do demonstrate increased attention to tasks and decreased sensory seeking and injurious behaviors when

they wear compression vests. One of the potential benefits of compression vests is the possibility for increased flexibility in schedules of wear. Colleagues report they prescribe wear schedules for these vests but are less concerned if the child wears the vest for somewhat longer or shorter periods than recommended. They reportedly believe compression vests place less force on joints because weight is not externally applied and rebound effects and habituation are less likely because the neoprene material used to fabricate the vests is flexible and conforms to the movement of the body.

Although parents, teachers, and other professionals ask occupational therapists for their opinions and guidance on using compression vests with children with characteristics of SPD, literature searches in a variety of databases, including MEDLINE, AMED, PsychINFO, CINAHL, and ERIC, and consultation with staff at the American Occupational Therapy Association's (AOTA) Wilma West library resulted in no literature on the use of compression vests as a form of treatment for children with diagnoses or dysfunction associated with SPD. The purpose of this study was to begin providing information about the use of compression vests by describing the extent to which the vests are used in practice with children, the population of children for whom they are prescribed, the factors that relate to occupational therapists' use of these vests, and the parameters occupational therapists follow when using compression vests.

CHAPTER II

LITERATURE REVIEW

To understand the potential usefulness of an intervention that applies deep pressure, one must first understand the meaning of the term sensory processing dysfunction (SPD). Because there has been confusion regarding terminology related to sensory processing within and outside the field of occupational therapy, terms will be described and the current recommendations for language in this area of occupational therapy practice will be presented. Further, behavioral and physiological evidence that supports the diagnosis of SPD will be reviewed. Next, the interventions that are used to treat SPD and the research that has been generated to support or refute their efficacy will be discussed. Finally the implications for practice and the importance of this study will be described.

Sensory Processing Dysfunction

Ayres (1979), the founder of sensory integration theory, described sensory integration dysfunction as an abnormality in brain function that makes integration of sensory information difficult. Since then, authors have attempted to clarify terminology to distinguish between neurophysiological processes and observable behaviors. Dunn (1997) hypothesized a model comprised of four sensory processing patterns based on neurological threshold and behavioral response continua. Individuals who demonstrate behavior consistent with poor registration have high neurological thresholds and have

limited strategies to support their threshold needs (Dunn). Those who seek sensation also have high neurological thresholds but they use strategies and make attempts to support their threshold needs (Dunn). Individuals who are sensitive to sensory stimulation and those who avoid sensation both have low neurological thresholds; however, the former behave in a way that reflects their threshold while the latter use strategies that limit their exposure to environmental stimuli (Dunn).

Lane, Miller, and Hanft (2000) encouraged therapists to use the term *response* when referring to observable behaviors and to reserve the term *reaction* for neurophysiological processes. They also suggested the term dysfunction in sensory integration (DSI) to describe a general condition in which individuals have a limited ability to respond effectively to the demands of their environment. One subtype of DSI they described was sensory modulation dysfunction (SMD), the inability to "regulate and organize the degree, intensity, and nature of response to sensory input in a graded and adaptive manner" (Lane et al., 2000, p. 2). SMD could further be categorized into patterns of hyperresponsivity, hyporesponsivity, or fluctuating responsivity to sensory stimulation. Hanft, Miller, and Lane (2000) noted that these patterns of SMD could vary between sensory modality (tactile, vestibular, proprioceptive, visual, auditory, olfactory and gustatory). Other suggested subtypes of DSI included dysfunction in praxis, or difficulty with planning and executing new movements, and dysfunction in sensory discrimination, or diminished ability with identification of the spatial and temporal characteristics of stimulation.

More recently, Miller, Anzalone, Lane, Cermak and Osten (2007) recommended the term sensory processing dysfunction (SPD) to describe the condition previously known as dysfunction in sensory integration. They believed this terminology would distinguish the disorder from both sensory integration theory and intervention, which they referred to as OT-SI. These authors also proposed changes in terminology for the patterns of SPD and the pattern subtypes. They suggested that the first pattern, sensory modulation dysfunction, be categorized into the subtypes of sensory underresponsivity, sensory overresponsivity, and sensory seeking/craving. They also described another pattern of SPD, sensory-based motor disorders, with the subtypes of dyspraxia, previously referred to as dysfunction in praxis, and postural disorders, whereby individuals have difficulty stabilizing their bodies to meet environmental demands. Miller et al. (2007) believed that this evolution in terminology and the use of this taxonomy would improve researchers' ability to identify homogenous populations for future research in the field.

Although occupational therapists have referred to sensory processing dysfunction for decades, it is not included in the current Diagnostic and Statistical Manual Mental Disorders (Fourth edition---text revision (DSM-IV-TR) (American Psychiatric Association, 2000) and controversy remains as to whether it is a legitimate diagnosis. However, research supporting the existence of SPD has been building and SPD has gained recognition and legitimacy outside the field of occupational therapy. In recent years, the Diagnostic Classification of Mental Health and Developmental

Disorders of Infancy and Early Childhood, Revised (Zero to Three, 2008), the Interdisciplinary Council on Developmental and Learning Disorders Diagnostic Manual for Infancy and Early Childhood (Greenspan & Wieder, 2008), and the Psychodynamic Diagnostic Manual (2008) have included the diagnosis in their classification systems.

Evidence to Support the Diagnosis of SPD

Behavioral evidence

The Sensory Profile (SP) (Dunn, 1999), a caregiver report measure that describes children's responses to sensory experiences in daily life, was developed to serve as an assessment for SPD; and the Short Sensory Profile (SSP) (McIntosh, Miller, Shyu, & Dunn, 1999), a shorter version of the SP, was developed as a research tool for studies of sensory processing. A number of researchers have used these tools to examine behavioral responses to sensory information among children with various diagnoses. McIntosh, Miller, Shyu, and Hagerman (1999) studied children who were clinically identified as having SMD and found that those with SMD who had atypical electrodermal responses (EDR) to sensory stimulation had significantly lower scores on the SSP, indicating less typical behavioral performance. Using the SSP as one measure of behavioral responses among children with ADHD, Mangeot et al. (2001) found that children with ADHD scored significantly lower on six of the seven SSP subscales when compared to typically developing children. Ermer and Dunn (1998) examined the SP scores of 769 children using discriminant analysis and were able to correctly identify 89% of the children into one of three groups, those without disabilities, those with autism

and those with ADHD. Baranek et al. (2002) found that 73% of their sample of boys with fragile X syndrome demonstrated significant sensory processing differences when compared to the SP test norms. Rogers, Hepburn, and Wehner (2003) also found that children with fragile X syndrome and autism both had elevated sensory symptoms on the SSP when compared to those with developmental delays and those who were typically developing. In their study, children with fragile X syndrome had significantly higher scores on the low energy/weak muscle subscale of the SSP when compared with the other groups. Using the SSP as the measure of sensory processing abilities, Pfeiffer, Kinnealy, Reed, and Herzberg (2005) found significant relationships between sensory sensitivity and anxiety and between sensory hyposensitivity and depression among children and adolescents with Asperger's disorder. Finally, Tomchek and Dunn (2007), in a retrospective study using chart reviews of children diagnosed with autism spectrum disorders, discovered that 83.6% of their sample demonstrated definite differences in sensory processing as measured by their total SSP scores. When those with scores in the probable difference range were included, the percentage rose to 95%.

The SSP and SP appear to be the most widely used measures of behavioral responses to sensory stimulation in research studies. However, other behavioral measures have been reported and have revealed sensory processing differences among the populations studied. Baranek et al. (2002) found differences between children with fragile X syndrome and children who were typically developing using two unpublished observational measures. Based on parental responses using an unpublished standardized

questionnaire, Walz and Baranek (2006) reported that 75% of children with Angelman syndrome in their sample demonstrated sensory processing abnormalities.

Physiological evidence

Sensory integration theory is based on the belief that immaturity or dysfunction in the neural processes in the brain lead to behaviors that are ineffective in meeting environmental demands (Ayres, 1979). Sensory integration intervention is designed to positively affect the neural processes in the brain so that adaptive responses to situational demands will be produced. The research described thus far describes behavioral, observable responses, which are thought to reflect atypical processes in the central nervous system. In recent years, researchers have begun to test these basic assumptions of sensory integration theory by using physiological measures such as electrodermal response, vagal tone index, and electroencephalography (EEG).

The sympathetic nervous system allows the body to make maximum use of its resources to increase its chances for survival in challenging or dangerous situations (Purves et al., 2004). Electrodermal responses (EDR) may be used as an indirect measure of sympathetic nervous system's response to discrete stimuli (Miller et al., 1999). Miller and her colleagues designed the Sensory Challenge Protocol to gauge participants' EDR to sensory stimulation. The Sensory Challenge Protocol was administered in a laboratory, designed to simulate a space ship, wherein electrodes are placed on individuals to measure EDR in response to stimulation of five senses. When the Sensory Challenge Protocol was administered to children with fragile X syndrome and to children

who were typically developing, children with fragile X syndrome demonstrated significantly stronger initial responses to sensory stimulation and habituated to stimulation more slowly than children in the control group. McIntosh et al. (1999) conducted the Sensory Challenge Protocol with a group of children clinically identified as having sensory modulation dysfunction (SMD) and a group of age and gender matched typically developing children. The group of children with SMD had significantly more non-responders to sensory stimulation than the control group. Also, among those who did respond to stimulation, children with SMD demonstrated a greater initial response and more responses to stimulation than the group of typically developing children. Mangeot et al. (2001) studied a group of children with ADHD and compared them with a group of children without disabilities using EDR and behavioral response measures. Based on EDR results, the researchers found significant differences between groups and trials. Because the groups demonstrated similar patterns of habituation to stimulation, the researchers concluded the difference was likely present because the group of children with ADHD showed stronger initial reactions to sensory stimulation.

The parasympathetic branch of the central nervous system helps the body increase metabolic and other activities when it is at rest (Purves et al., 2004). Schaaf, Miller, Seawell, and O'Keefe (2003) used vagal tone index and other cardiac measures, as a measure of the parasympathetic nervous system's functioning and ability to regulate stress and maintain homeostasis. Cardiac activity was monitored as children participated in the Sensory Challenge Protocol. When the researchers compared the results of the

children identified as having SPD to the children without disabilities, the authors found that children with SPD had significantly lower vagal tone and lower heart period, which the authors interpreted as decreased parasympathetic functioning.

EEG records the electrical activity in the cortex of the brain, while event-related potentials (ERP) measure the cortex's electrical activity in response to a precise experience, such as sensory stimulation (Davies & Gavin, 2007). Davies and Gavin compared the ERP of children who were clinically identified as having SPD (sensory modulation dysfunction pattern) and children who were typically developing. They found that children with SPD demonstrated less sensory gating, the brain's ability to filter information (Davies & Gavin), than those who were typically developing, but the difference did not reach statistical significance based on the alpha level set a priori. Also, the groups did not differ on measures of sensory registration, the brain's ability to organize information (Davies & Gavin). When regression analysis was completed, the researchers found that age accounted for a statistically significant smaller percentage of the variance in the ratio used to measure auditory sensory gating in children with SPD when compared to typically developing children. When a prediction equation was employed, the authors were able to correctly identify group membership for 86% of the children.

Treatment for SPD

Sensory integration intervention

Occupational therapists often design interventions for children with SPD and other deficits based on sensory integration (SI) theory (National Board for Certification in Occupational Therapy, 2004). Therapists who use this theory as a framework for planning and implementing interventions aim to improve underlying neurological functions, which are reflected in the quality of the child's adaptive responses (Ayres, 1979; Mulligan 2003a). Parham et al. (2007) identified key structural and procedural elements in SI intervention, several of which highlight the importance of child involvement and active engagement in activities throughout the intervention process. Because SI intervention is child-directed, the intervention is not easily controlled, making research that studies its effectiveness difficult (Mulligan, 2003a; Parham et al., 2007). Earlier studies comparing SI treatment to no treatment resulted in favorable effects for SI; however, in later studies, results in favor of SI were not evident (Mulligan, 2003b; Vargas & Camilli, 1999).

Several recent studies with better quality than earlier research have studied the effect of SI intervention among children with autism. Case-Smith and Bryan (1999) studied five preschool aged children during a three week baseline phase and ten week intervention phase. The authors found significant improvements among 3 of 5 children when measuring mastery play, among 4 of 5 children when measuring non-engaged behaviors, and 1 of 5 children when measuring interaction with adults. Linderman and

Stewart (1999) also studied baseline and intervention phases for 2 preschool children with PDD. One child improved significantly in all three areas measured (social interaction, approach to new activities, and response to holding and hugging), but several confounding factors were present during the intervention phase. The other child improved significantly in 2 of 3 areas measured (social interaction and response to movement). Smith, Press, Koenig, and Kinnealey (2005) used an alternating treatment design and compared the effects of a control intervention (table top activities) and SI intervention among seven children with PDD and mental retardation. They found that self-stimulating and self-injurious behaviors significantly decreased one hour after SI treatment when compared with the control intervention and that the frequency of the behaviors declined over the four week study. Watling and Dietz (2007) compared SI intervention with a no treatment phase using an ABAB design over a four week period. Visual data analysis of engaged behaviors and self-stimulatory or self-injurious behaviors did not reveal significant differences. Caregiver reports and clinical observations recorded during intervention identified positive behavioral changes.

Researchers have recently studied the effects of SI intervention on children clinically diagnosed with SPD. Bundy, Shia, Qi, and Miller (2007) first compared a group of children with SPD to a group of typically developing children using the SSP and the Test of Playfulness (ToP; Bundy, 2005). They found that children with SPD scored significantly lower on the ToP than children who were typically developing and that scores on the ToP and the SSP were significantly correlated. Children with SPD then

participated in 20 sessions of SI intervention. Comparison of ToP pretest and posttest scores did not reveal significant differences. The authors report that results should be interpreted with caution because children in both groups at pretest scored higher than children whose scores were used to establish norms for the ToP. In a pilot randomized controlled trial, Miller, Coll and Schoen (2007) found that children with SPD, sensory modulation dysfunction pattern, who participated in SI intervention made significantly greater gains than children who participated in alternate treatment (an activity protocol) and children who received no treatment on goal attainment scales and the cognitive/social composite of the Leiter-R (Roid & Miller, 1997). Significant gains were also made in attention when children were with compared with the no treatment group. Trends toward improvement on other measures were noted but they did not reach statistical significance.

Intervention using controlled sensory stimulation

Sound therapies, which involve listening to modulated and filtered music, are designed to produce effects on specific listening skills (Frick & Hacker, 2001) and auditory sensitivity (Sinha, Silove, Wheeler, & Williams, 2004). Sinha et al. completed a systematic review of the use of sound therapies for people with autism spectrum disorders. Six randomized controlled trials met their inclusion criteria, and all used auditory integration training (AIT), a specific form of sound therapy. The authors concluded that future studies with rigorous designs were necessary to determine the effectiveness of sound therapies and that sound therapies should be considered experimental until that time. Since then, Hall and Case-Smith (2007) used a single

subject design to study the effects of a Therapeutic Listening (Frick & Hacker) program combined with a sensory diet among children with SPD and visual-motor deficits. They found significant changes on 9 of 14 Sensory Profile subscales and significant improvements on portions of tests used to measure visual-motor skills. Post hoc comparisons revealed that significant improvement occurred only when the Therapeutic Listening program was implemented with the sensory diet.

Koomar and Bundy (2002) described deep pressure, a form of tactile sensation, and proprioceptive input as strategies used to treat children with SPD. Although these strategies may be most beneficial when they are self-administered, these authors recognize that some children may have impairments that limit their ability to do so. In these cases, the stimulation may be administered to the children by other trained adults. Researchers have begun to investigate the effectiveness of the controlled application of deep pressure via hug machines (Grandin, 1992; Edelson, Edelson, Kerr, & Grandin, 1998), deep touch pressure (Kimball, Lynch, Stewart, Williams, Thomas, & Atwood, 2007), and weighted vests (Fertel-Daly et al, 2001; Olson & Moulton, 2004; Vandenberg, 2001).

Temple Grandin (1992), a person with autism, developed the "squeeze" or "hug" machine to provide deep touch pressure stimulation to reduce hypersensitivity to touch and nervousness. A person using this machine lies down between two padded side boards and then engages a lever which pulls the boards together. In a study of typically developing college students who used the "squeeze machine," 45% of the participants

described their reaction as “relaxing” or “sleep.” Edelson et al. (1998) studied the effects of Grandin’s “hug machine” on children with autism, using behavioral rating scales and galvanic skin response (GSR) as a measure of arousal. The authors used an experimental design, with random assignment of children to an intervention or control group. The children in the control group participated in a placebo intervention whereby they activated a disengaged lever which did not apply any pressure. Behavioral rating results indicated a significant reduction in anxiety and tension for children in the experimental group; however, GSR at pretest and posttest, were not statistically significantly different between the groups.

Wilbarger and Wilbarger (1991) developed a deep touch pressure protocol that includes brushing the skin, applying joint compression, and following a sensory diet, to decrease tactile sensitivity. Kimball et al. (2007) studied cortisol levels, a measure directly related to sympathetic nervous system arousal, in the saliva of four boys with sensory defensiveness to investigate whether tactile deep pressure, which they referred to as a Wilbarger Protocol-Based Procedure, elicited responses indicative of more optimal levels of stress. The authors did not find differences between pretest and posttest on the Short Sensory Profile (Dunn, 1999) or the Conners’ Rating Scales-Revised (Conners, 1997), nor did they expect to due to the short duration and modified approach to the intervention. However, they did conclude that each boy attained a more optimal cortisol level based on the individual child’s behavioral characteristics and the direction of change in cortisol levels following the procedure.

Weighted vests have shown promise for increasing attention among children with ADHD (Vandenberg, 2001) and children with PDD (Fertel-Daly et al., 2001), as well as decreasing sensory seeking behaviors (Fertel-Daly et al., 2001). In a single subject design with a baseline and intervention phase, Vandenberg found that children with ADHD significantly increased their attention to table top activities while they wore the vests. Fertel-Daly et al. studied preschool-aged children with autism using a single subject design with a baseline, intervention, and withdrawal phase. They found that the children demonstrated increased attention to fine motor tasks and decreased sensory seeking behaviors while they wore weighted vests. During the withdrawal phase, the children's attention to task declined but not to the level observed in the baseline period. Olson and Moulton (2004) described the prevalence of weighted vest recommendations for children who are seen by occupational therapists and the parameters the therapists follow when they establish vest wear schedules.

Implications

SPD is gaining recognition within and outside the occupational therapy community. Researchers have studied children clinically identified as having SPD or a subtype of SPD as well as children diagnosed with conditions that have characteristics of SPD. Both behavioral and physiological evidence that supports the diagnosis of SPD is accumulating. SI intervention is often used to treat children with SPD. Many difficulties exist for researchers attempting to study the effects of SI intervention. Older studies designed to test the efficacy of SI intervention yielded positive results but often lacked

methodological quality. More recent studies with improved quality have produced mixed results. Research to test the efficacy of controlled sensory stimulation, which includes interventions that are often a portion of a sensory diet, has produced some promising results; however, most of the studies have employed single subject designs with small numbers of participants.

Among the interventions that use controlled sensory stimulation, sound based treatments and Wilbarger-based deep touch protocols require substantial time commitments to implement and may cause discomfort to the child receiving the treatment. Hug machines are typically located in clinical settings and may not be available for the child's use on a regular basis. Weighted vests are more readily accessible and may be worn while the child participates in daily activities, but they are not tolerated by all children. Also, guidelines for their use are not yet available and the effects of long term use on the child's joints and sensory system are unknown.

Compression vests offer an alternate form of intervention for children hypothesized to benefit from deep touch pressure. These vests are made of strong, yet flexible, neoprene material. The Velcro fasteners on the vests may be adjusted to provide varying amounts of pressure to meet the individual's needs. Compression vests may be worn during daily activities, are pliable to the movements of the body, and might be tolerated by children who resist other forms of intervention. Tickle-Degnen (1999) and Mortera (2007) emphasized that research should address questions that are important to therapists and test treatment approaches and frames of reference that guide daily

occupational therapy practice. Research investigating other forms of controlled sensory stimulation in the form of deep pressure provided initial evidence that supported their use. Of these studies, weighted vests are the only intervention with evidence that shows the frequency with which they are used by occupational therapists. By providing information regarding the percentage of therapists who recommend compression vests and the frequency with which vests are recommended, researchers will be able to consider whether future experimental studies are in keeping with Tickle-Degnen's and Mortera's recommendations.

A nationwide survey of occupational therapists that studies their use of compression vests with children would provide information therapists could incorporate with their own clinical reasoning, and the results will help identify variables which might be studied in future research. The purposes of this study are as follows. 1. To determine the extent to which compression vests are used in occupational therapy practice with children. 2. To determine whether demographic differences exist between therapists who recommend vests and those who do not. 3. To describe the children for whom compression vests are recommended and the parameters therapists follow when they recommend vests. 4. To determine the extent to which therapists rely on various sources of evidence to guide their compression vest recommendations and whether differences exist in the use of the evidence between therapists who do and do not recommend compression vests.

CHAPTER III

METHODS

Participants

Address lists of occupational therapists who work with children in the United States were rented from AOTA. A proportional stratified national sample of 525 occupational therapists who were members of AOTA and had selected either School System or Sensory Integration as their primary special interest section were surveyed. The sample size of this survey was similar to the sample size of the weighted vest survey conducted by Olson and Moulton (2004). Because the primary purpose of this study was to yield descriptive statistics, a power study was not conducted prior to determining the sample size. The proportion of occupational therapists in the sample matched the proportion of the total number of members in each section. AOTA provided the list of names and ensured there were no duplicates. The University of Oklahoma Health Sciences (OUHSC) Institutional Review Board reviewed and approved this study to ensure the rights of participants were protected. Consent to participate in the study was implied by the completion and return of the survey. Therapists were provided instructions they could follow to have their names removed from the mailing list.

Instrument

A questionnaire was developed to answer the research questions (see Appendix). Sections of the survey were divided into therapist demographic information,

vest wear parameters, and use of evidenced-based practice. The survey contained 26 questions, and used a variety of question formats. Closed-ended questions were comprised of dichotomous, grid, multiple choice, and Likert scales. Other questions were open ended, and some questions combined the two formats by adding the option of "other" with a space for a written answer. The survey was pilot tested with occupational therapists in the OUHSC Master of Science in Rehabilitation Sciences degree program. Based on feedback from participating therapists, questions were reworded and added. Also, information was gathered to provide respondents with an estimate of the time commitment required of them and instructions to ease completion of the Internet-based survey.

The Tailored Design Method (Dillman, 2007), a comprehensive plan for self-administered surveys, guided the survey methods. A mixed-mode survey, using the Internet and the postal system, was implemented. The Internet-based survey was designed using SurveyMonkey, an on-line survey tool that provides the means to collect responses and analyze data. The paper version of the survey was designed using Dillman's recommendations for survey construction, and the questions and instructions were worded as closely as possible to the Internet-based survey.

Dillman recommended five contacts with survey participants to generate the highest response rate. The first contact, a "prenotice" letter, which offered a brief description of the survey to come, was mailed in June 2008. Several days later, a detailed letter was sent to explain the purpose of the study and to provide instructions to access

the Internet-based survey. A postcard, serving as a reminder of the survey and a "thank you" for participation, was sent one week after the letter to all those who had not yet responded. Approximately four weeks after the postcard mailing, a follow-up letter and paper copy of the survey along with a self-addressed, stamped return envelope was sent to all non-respondents. Response deadlines were not indicated in any of the mailings. Data collection from the paper copy of the survey continued for four and one half weeks and ended when three days passed without receiving any survey responses. Dillman (2007) recommended the fifth contact be sent via certified or priority mail or special delivery. This final mailing was not conducted because the cost would have been too great and because the surveys referenced in this study (National Board for Certification in Occupational Therapy, 2004; Olson & Moulton, 2004) as well as a survey conducted by Johnson, Inglebret, Jones, and Ray (2006), which had followed the Tailored Design Method (Dillman, 2007), had only conducted 3 mailings. The mixed-mode sequence was intended to reduce costs and increase response rates.

Data Analysis

SurveyMonkey (2007) uses software that automatically codes data as it is entered and the surveys are completed. After the final mailing, the data acquired from the return of paper versions of the survey were manually entered into the website. SurveyMonkey uses security measures to maintain confidentiality, and information from surveys returned via mail were stored in a locked file cabinet and in a password protected computer.

To use as much information as possible, surveys with unanswered questions were included in data collection. Analysis was conducted with varying numbers of responses rather than using the total number of respondents in the respective category. Responses to the multiple choice questions with an open-ended option were reviewed to identify any trends or commonalities. When respondents answered similarly, the answers and percentages were recorded. The data primarily yielded descriptive statistics. Frequency counts, averages, and percentages were calculated to describe the sample of therapists, vest wear parameters, and therapists' beliefs about and use of evidence based practice. To examine the degree of association between categorical variables, the group of therapists who recommended a compression vest and those who did not, chi square tests of independence were performed (Portney & Watkins, 2000). Chi square tests were conducted to examine therapist demographics and therapists' use of sources of evidence and their beliefs about evidence based practice. Tests of independent means were calculated to determine whether differences existed between groups in terms of the number of years they had worked with children as occupational therapists and the number of years that passed since they earned their most recent degrees. All statistical calculations were conducted using VassarStats: Web Site for Statistical Computation (Lowry, 2008). The alpha level was set at 0.05 for all comparisons.

CHAPTER IV

RESULTS

A total of 254 usable surveys and 23 unusable surveys were returned, for a response rate of 52.8%. Of the usable surveys, 111 were completed using the Internet version and 143 were completed using the paper version. A survey was determined unusable when respondents reported they did not work with children during the time period indicated in the survey, respondents were unclear whether or not they had recommended a compression vest, or when two or more sections of the survey contained response errors. The most common response error occurred when respondents selected more than the requested number of options.

Therapist Demographics

Table 1 describes the sample of therapists who responded to the survey. The majority of respondents (58.7%) did recommend a compression vest for at least one child between August 2007 and August 2008. Tests of independent means did not reveal significant differences between the therapists who did and did not recommend compression vests for children when comparing the number of years they worked with children as occupational therapists (M = 14.1, SD = 9.1, M = 15.4, SD = 10.7, respectively; t[251] = -1.06, p = .29) or the number of years since they earned their most recent degree (M = 15.1, SD = 9.4, M = 14.1, SD = 10.7, respectively; t[249] = .84, p = .4). Among those who held postprofessional degrees, 97% of those who recommended

vests and 86.2% of those who did not recommend compression vests held master's degrees. Chi square tests of independence did not reveal significant differences between those who did and did not recommend compression vests in entry level (p = .92) or postprofessional degree (p = .47), current enrollment in postprofessional degree programs (p = .36), advanced certification (p = .81, "BCP" and "Other" categories were collapsed to meet assumptions for chi square tests of independence), or primary work setting (p = .19).

Table 1

Demographic Comparison of Therapists

	Total respondents n = 254	Did recommend compression vests n = 149 (59%)	Did not recommend compression vests n = 105 (41%)
	n (%)	n (%)	n (%)
Education			
Entry level degree			
Bachelor's degree	155 (61)	91 (61.1)	64 (61)
Master's degree	99 (39)	58 (38.9)	41 (39)
OTD	0	0	0
Postprofessional degree	Yes: 63 (24.8)	Yes: 34 (22.8)	Yes: 29 (27.6)

Current enrollment in postprofessional degree program[a]	No: 191 (75.2) Yes: 15 (6) No: 237 (94)	No: 115 (77.2) Yes: 11 (7.4) No: 137 (92.6)	No: 76 (72.4) Yes: 4 (3.8) No: 100 (96.2)
Advanced certification[b]	98 (38.6)	63 (42.3)	35 (33.3)
SIPT	59 (23.2)	39 (26.2)	20 (19)
NDT	30 (11.8)	21 (14.1)	9 (8.6)
BCP	7 (2.8)	3 (2)	4 (3.8)
Other	32 (12.6)	20 (13.4)	12 (11.4)
Primary work setting			
Schools	157 (61.8)	96 (64.4)	61 (58.1)
Early intervention	39 (15.4)	18 (12.1)	21 (20)
Outpatient	41 (16.1)	27 (18.1)	14 (13.3)
Others	17 (6.7)	8 (5.4)	9 (8.6)

Note. OTD = Doctor of Occupational Therapy. SIPT = Sensory Integration Praxis Tests. NDT = Neurodevelopmental Treatment. BCP = Board Certified in Pediatrics.

[a] N's vary due to missing information.

[b] N's vary due to the possibility that respondents may not have held an advanced certification or may have held more than one advanced certification.

Compression Vest Parameters

Therapists who reported that they recommended at least one compression vest during the previous year were asked to identify which, if any, interventions were tried prior to a compression vest. The deep touch pressure protocol developed by Wilbarger and Wilbarger (1991) and weighted vests were implemented by the majority of therapists (63.7% and 58.9%, respectively). The hug machine was applied before a compression vest by 7.5% of therapists. The most common intervention, a sensory diet that did not include strategies already mentioned, was employed by 80.8% of therapists. Among those who recommended a vest for a child, the mean number of children for whom they recommended a vest during the previous year was 5.17 (*SD* = 9.6), with a minimum of one child and a maximum of 100 children listed. Five therapists reported they recommended a vest for 20, 30, 50 or 100 children. Because this group of therapists represented only 3.4% of the population who recommended compression vests and the number of children they reported appeared extreme when compared to others' reports, the responses were considered outliers. When the data were filtered to exclude those who recommended compression vests for more than 15 children (*n*=5), the mean decreased to 3.81. Three was the median number of children for whom therapists recommended a vest during the previous year.

The information in Table 2 describes the children for whom therapists most often recommended compression vests. When asked to select the two most common diagnoses, the majority identified autism, Asperger syndrome, or PDD and ADD/ADHD.

Of those who selected a diagnosis other than those listed, 69% identified sensory processing disorder. The most common age range selected was 6-8 years, followed by 4-5 years.

Table 2

Characteristics of Children for Whom Compression Vests Were Recommended

Characteristic	*n* (%)
Diagnoses[a]	(*n* = 143)
Autism, Asperger, PDD	127 (88.8)
ADD/ADHD	81 (56.6)
Developmental delay	20 (14)
Cerebral palsy	8 (5.6)
Down syndrome	4 (2.8)
Other	13 (9.1)
Age	(*n* = 146)
1-3 years	15 (10.3)
4-5 years	55 (37.7)
6-8 years	65 (44.5)
9-11 years	6 (4.1)
12+ years	5 (3.4)

[a] Therapists were asked to mark the two most common diagnoses.

Respondents who had recommended a compression vest were asked to identify where the vest should be worn and by whom it was fabricated. Most therapists recommended that children wear vests over clothing (79.1%), and they reported that vests were fabricated by a vendor (90.6%). Table 3 describes compression vest wear schedules the therapists recommended. Therapists were asked to list their recommendations for the average number of minutes per wear session and the average number of wear sessions per day. The mean length of a wear session was 38.5 minutes (*SD* = 65.8). After the mean was calculated, data were further analyzed to determine which range of 15 minute time increments was most frequently recommended. Most recommendations (65.5%) were in the 16-30 minute range. Three respondents provided numeric answers but also noted that they increased the wear session to nearly the whole day; thus the mean number of sessions these therapists recommended per day may have decreased. Only the numeric responses were included when the mean was calculated. When respondents were asked to select the two most common activities during which they recommended the children wear compression vests, the majority of respondents selected fine motor or table top activities (79.9%) and circle time (41.7%). Additionally, 83.1% of therapists expected that the effects from the vest would remain for a period of time following removal of the vest. These therapists listed the length of time they expected the effects to carryover, which equated to a mean of 50.2 minutes (*SD* = 29.7).

Table 3

Compression Vest Wear Parameters

Parameter	*n* (%)	*M*
Length of wear sessions	(*n* = 148)	38.5 minutes[a]
16-30 minutes	97 (65.5)	
< 15 minutes	19 (12.8)	
46-60 minutes	11 (7.4)	
>60 minutes	11 (7.4)	
31-45 minutes	10 (6.7)	
Frequency of wear sessions	(*n* = 147)	3.1 sessions/day[a]
Activities during which the vest was to be worn[b]	(*n* = 144)	
Fine motor/Table top	115 (79.9)	
Circle time	60 (41.7)	
Transitions	38 (26.4)	
Movement activities	21 (14.6)	
Family outings	21 (14.6)	
Free choice	7 (4.9)	
Special classes	5 (3.5)	
Other	9 (6.3)	

Expectations for carryover of effects	(*n* = 148)	
Yes	123 (83.1)	
	(*n* = 121)	50.2 minutes expected
No	25 (16.9)	

[a] Averages are based only on numeric responses.

[b] Therapists marked the two most common activities.

Therapists who recommended compression vests were asked to select the two most common sensory processing patterns and the two most common behaviors that were targeted for improvement when they recommended compression vests. Table 4 contains this information. Of the four patterns of sensory processing described by Dunn (1997), 89.9% of therapists aimed to support children's pattern of sensory seeking behaviors. Children with sensory sensitivity (33.1%) and low registration (29.1%) were the next most frequent characteristics targeted. The most common behaviors respondents sought to improve were attention span (68.3%) and extraneous movement (61.4%). Among those who listed other areas for improvement, several responses related to calming and self-regulation.

Table 4

Targeted Areas for Improvement

Targeted Area	*n* (%)
Sensory processing patterns	

Sensory seeking	133 (89.9)
Sensory sensitivity	49 (33.1)
Low registration	43 (29.1)
Sensory avoidance	11 (7.4)
Behaviors	
Attention span	99 (68.3)
Extraneous movement	89 (61.4)
Remaining in seat	36 (24.8)
Work completion	20 (13.8)
Self-injurious behaviors	18 (12.4)
Injurious behaviors to others	5 (3.4)
Other	11 (7.6)

Note. Therapists were asked to mark the two most common choices.

Evidence Based Practice

Therapists were asked to identify to what extent they relied on various sources of evidence to guide their decisions regarding whether or not to recommend compression vests for the children they treated. To determine if there was an association between the two groups of therapists and the extent to which they relied on each source of information, chi square tests of independence were conducted. The frequency counts in the cells representing therapists who relied on colleague report "a small extent" and "not

at all" were too small to meet the assumptions for a chi square test of independence. When these categories were collapsed, the difference between groups approached, but did not reach, statistical significance [$\chi^2(2, N = 242) = 5.91, p = .052$]. Also, no significant differences were found between groups and their reliance on text books, journal articles or other sources of evidence. Table 5 provides information about the individual sources of evidence for which statistically significant differences between groups were found. Continuing education [$\chi^2(3, N = 241) = 8.1, p = .044$] and personal experience and clinical observations [$\chi^2(3, N = 490) = 37.16, p = <.0001$] were more likely to direct decisions about vests by those who recommended them than by those who did not. The categories of personal experience and clinical observations were collapsed for statistical analysis for two reasons. First, the frequency counts in the cells for "small extent" and "not at all" for the individual categories of personal experience and clinical observations were too small to meet the assumptions for a chi square test; and secondly, the two categories had been combined on the paper-based version of the survey.

Therapists were asked to identify the two most common methods they use to determine whether compression vests were effective for the children with whom they work. This question was posed in the parameters section of the survey and was answered only by those who did recommend a compression vest in the previous year. The data are presented in Table 5. Clinical observation was the leading method for determining effectiveness (78.6%), followed by teacher report (57.9%) and parent report (28.3%). Data and progress toward goals was the 4th most common method (24.8%).

Table 5

Information Sources that Guide Vest Recommendations and Methods for Determining Vest Effectiveness

	Total respondents	Did recommend vests	Did not recommend vests
	n (%)	*n* (%)	n (%)
Continuing education*	n = 241	*n* = 144	*n* = 97
Great extent	100 (41.5)	63 (43.8)	37 (37.4)
Some extent	103 (42.7)	64 (44.4)	39 (40.2)
Small extent	25 (10.4)	14 (9.7)	11 (11.3)
Not at all	13 (5.4)	3 (2.1)	10 (10.3)
Personal experience & Clinical observations[b]**	*n* =490	*n* = 292	*n* = 198
Great extent	326 (66.5)	219 (75)	107 (54)
Some extent	127 (25.9)	66 (22.6)	61 (30.1)
Small extent	19 (3.9)	5 (1.7)	14 (7.1)
Not at all	18 (3.7)	2 (.7)	16 (8.1)
Methods for determining vest effectiveness among those who		*n* (%)	

recommended compression vests[c]	
Clinical observations	114 (78.6)
Teacher report	84 (57.9)
Parent report	41 (28.3)
Data/progress toward goals	36 (24.8)
Child report	4 (2.8)
Other	3 (2.1)

Note. Only data from those sources of evidence that had statistically significant differences between groups are reported above.

[a] N's vary due to missing information.

[b] The sources of information were combined due to small numbers in the "small extent" and "not at all" categories and because sources were combined on the paper-based version of the survey.

[c] Therapists were asked to mark the two most common methods.

*$p < .05$. **$p < .01$.

CHAPTER V

DISCUSSION

This national survey of occupational therapists was conducted to determine the extent to which therapists use compression vests in practice, the parameters they use when making their recommendations, and the extent to which they rely on various sources of evidence to guide their recommendations. The study revealed that 58.7% of respondents have recommended at least one compression vest for a child with whom they worked during the past year, suggesting that compression vests may be a common form of intervention. Unlike therapists who responded to a survey about weighted vests (Olson & Moulton, 2004), there were no statistically significant demographic differences among respondents who did and did not recommend compression vests. Therefore, occupational therapists with similar amounts of experience, degree, and advanced certifications were equally likely to recommend or not recommend compression vests. Although significant differences were not detected, the power of the study may have been too low to reveal differences that might have existed. The approximate power of this study (N=254, *df* 1, $p < .05$) to detect differences with a small effect size ranged between 35 and 75 percent (Portney & Watkins, 2000).

The majority of therapists who recommended compression vests recommended them for children diagnosed with autism, Asperger syndrome, or PDD or those with ADD/ADHD. The children were most likely to be in the age range of 4-5

years or 6-8 years. These child characteristics were consistent with those reported by therapists who used weighted vests (Olson & Moulton, 2004). The children studied in other weighted vest research were diagnosed with PDD (Fertel-Daly et al., 2001) or ADHD (VandenBerg, 2001) and ranged in age from 2-3 years (Fertel-Daly et al., 2001) or 5-6 years (VandenBerg, 2001). Most therapists recommended compression vests be worn for one hour or less (85.7%) and during table top or fine motor activities (79.9%). Similarly, Olson and Moulton (2004) found the majority of therapists who recommended weighted vests suggested they should be worn for less than one hour (73%) and the most frequently cited activities during which the vests should be worn were desktop activities (42%). Based on these results, it appears that compression vests and weighted vests are used with similar populations of children during similar activities. The results did not reveal why one intervention is selected over another or whether one intervention produces more favorable effects among children with the characteristics described.

Therapists reported characteristics of the children for whom they believe compression vests are most effective. They also described the length of time they think children should wear the vests to achieve desirable effects and the activities during which vest wear is most likely to improve performance. Seven respondents provided comments which conveyed that their recommendations were made based on the individual needs of the child or that their expectations for carryover of effects from the vest varied between children. For this reason, it may be beneficial for researchers to design studies in which the children serve as their own controls.

Most respondents who recommended compression vests reported that they provided a sensory diet, implemented the deep touch pressure protocol, or attempted to use a weighted vest prior to a compression vest trial. A smaller percentage reported the use of a hug machine or alternate seating. Limited research has been conducted to support the use of any of these interventions; however, several of them, which are typically implemented as a portion of a sensory diet, have been explored in experimental studies. Kimball et al. (2007) explored the effect of a Wilbarger protocol-based procedure, sometimes referred to as the deep touch pressure protocol, and concluded that the cortisol levels, which the researchers used as a measure of stress and arousal, of children with sensory modulation dysfunction in their study moved toward a more optimal level following the procedure. Research indicates that weighted vests may reduce sensory seeking behaviors among children with PDD (Fertel-Daly et al., 2001) and increase attention to task among those with PDD and ADHD (Fertel-Daly et al., 2001; VandenBerg, 2001). The "hug machine" was found to produce a relaxing effect on typically-developing college-aged students (Grandin, 1992) and to reduce anxiety and tension among children with autism (Edelson et al., 1998). The clinical reasoning behind therapists' recommendations was unclear, but these interventions may have been tried prior to compression vests because no evidence yet is available to support compression vest recommendations, because they have been used in occupational therapy practice for a longer period of time, or for some other unknown reason. Respondents may have

recommended or tried a compression vest for a child but later abandoned use of the vest, but this survey did not request that information.

Currently, no scientific evidence is available to guide recommendations for compression vests. Therapists who recommended compression vests were likely to rely heavily on personal experience and clinical observations as well as continuing education. These therapists also used clinical observations and reports from those familiar with the children more than data and progress toward goals when they determined whether the compression vests were effective. In the absence of research regarding the use of compression vests, therapists relied on multiple sources of information. However, when using evidence primarily derived from clinical experience and expertise, Holm (2000) cautioned therapists to be aware of how their personal beliefs and biases may influence their treatment decisions. If therapists' decisions were based on objective information such as data, treatment recommendations would be less likely to be biased.

Limitations

The response rate to this survey was lower than desired. A response rate of 74.9% (N = 393) would have yielded 80% power between groups for the two-tailed tests of independent means at the .05 significance level (Aron, Aron, & Coups, 2005). This response rate would have also produced enough power to detect the majority of differences with small effect sizes (.20) between groups when chi square tests of independence were conducted. No data is available from the nonresponders to identify

whether any differences existed between those who responded to the survey and those who did not.

A mixed-mode format using the Internet and postal system was implemented with the desired goals of reducing mailing costs and nonresponse error. However, costs were minimally reduced because three mailings, which encouraged therapists to respond to the Internet-based survey, produced a return of only 111 usable surveys (44%). The final mailing, which included a paper version of the survey, produced a return of 143 usable surveys (56%). The overall time period allowed for the Internet-based version was comparable to that of the paper-based version. Dillman's Tailored Design Method (2007) recommends implementing elements of social exchange theory to increase response rate. One way to do so is to establish sponsorship by a "legitimate authority" through use of official stationery. Two of the first three mailings were sent using the University of Oklahoma Health Sciences Center (OUHSC) letterhead and return address, while the fourth used a personal return address and a regular envelope. A number of therapists responded to the paper-based version with comments that they had not received previous mailings. It is possible that therapists did not thoroughly review the information sent from a less personal source, or that the majority of therapists prefer paper-based versions of surveys to Internet-based versions. Additionally, the majority of respondents reported schools as their primary work setting; so the topic may have been less salient to them during the summer months when they were not working with children.

The data from the survey were reviewed and there were no apparent differences among respondents of the survey based on missing information or on response mode. Although care was taken to reduce measurement error (Dillman, 2007) by pre-testing the survey among therapists and to reduce recall bias (Portney & Watkins, 2000) by limiting the time period therapists were requested to remember, therapists may have responded erroneously because their memory of the past year was inaccurate or because they misunderstood questions. For example, it is likely the therapists who recommended vests for more than 15 children misunderstood the question and responded based on the total number of children for whom they recommended vests rather than only those in the past calendar year. Upon review of the results, the wording of two other questions might have been more specific. When therapists were asked to identify the sensory processing pattern they expected to support through use of the compression vest, the question did not clarify whether differences in the sensory processing patterns had been confirmed through use of the Sensory Profile (Dunn, 1999). Similarly, therapists were asked to identify the most common diagnoses of the children for whom they recommended the vests, but the question did not specify whether the diagnoses were confirmed or whether characteristics of the diagnoses were present.

Sampling and coverage errors (Dillman, 2007) may have occurred because only a random sample of members of AOTA was surveyed. Therapists who are members of AOTA have more access to evidence in the field of occupational therapy than those who are not. Therefore, those who are not members of AOTA and those in the random

sample who did not respond to the survey may have different demographic characteristics, follow different parameters regarding compression vests, and may implement and hold different beliefs about evidence based practice than those who responded.

Conclusion

This study describes therapists' use of compression vests with children and the information they use to determine whether or not compression vests are effective, as well as the information sources that guide their compression vest recommendations. Currently therapists rely most heavily on their own clinical experience and observations and those of their colleagues. Although this study is a level V study, the lowest level of evidence and that based on the experience and opinions of others, it allows therapists to incorporate some external evidence with their own clinical reasoning.

Future research, possibly level III studies using single subject designs, should be conducted to test whether compression vests produce favorable results on the behaviors most often targeted, among children with the characteristics identified by the respondents, and during the activities most frequently recommended. Also, if compression vests are found to produce favorable results during times the children wear them, researchers might also test the thought that children demonstrate a carryover of effects following removal of compression vests. Similarities exist between the children for whom therapists recommended compression vests and those for whom therapists recommended weighted vests. If initial studies using compression vests yield positive

results, other level III studies using multiple treatment designs or level II studies using randomized trials might be conducted to explore whether one type of vest is more effective than the other among a homogenous population of children and whether specific child characteristics exist that predict which type of vest will be most effective.

Holm (2000) reported it is common for entry-level therapists and those who are new to a practice setting to rely on expert opinions. However, those in this study have been practicing with children for an average of 14-15 years. Sackett et al. (1996) recommend that practitioners should seek information generated from experimental studies because that type of evidence is more likely to inform rather than to mislead decisions. This study provides background information upon which more detailed clinical questions regarding therapists' compression vest practices may be generated and tested.

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APPENDIX

Compression Vest Use: A Survey of Occupational Therapists

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1. How many years have you worked with children as an occupational therapist?

_____ Number of years

2. What is your entry-level occupational therapy degree?

() Bachelor's degree

() Master's degree

() OTD

3. Do you hold a post professional degree?

() No→ Skip to 5

() Yes

4. What level is your post-professional degree?

() Post-professional or advanced master's degree

() Post-professional OTD or advanced practice doctorate

() PhD or other research doctorate

5. Are you currently enrolled in a postprofessional degree program?

() No

() Yes

6. How many years have passed since you earned your most recent degree?

_____ Number of years

7. Do you hold any of the following advanced certifications? *Place an "X" by all that apply.*

() SIPT

() NDT

() BCP

() Other, please list _____

8. In which setting do you work most often? *Select only one response.*

() Outpatient

() Early intervention

() Schools

() Other, please list _____

9. Since August 2007, have you recommended the use of a compression vest for at least one child?

() No→ Skip to 24

() Yes

When answering questions #10-23, respond to the questions based only on recommendations between August 2007 and the present.

10. For how many children have you recommended use of a compression vest?

_____ Number of children

11. Which are the most common diagnoses of the children for whom you recommended a vest? *Place an "X" by the two most common diagnoses.*

() Attention deficit disorder/attention deficit hyperactivity disorder (ADD/ADHD)

() Autism, Asperger syndrome, or other pervasive developmental disorder

() Developmental delay

() Down syndrome

() Cerebral palsy

() Other, please list _____

12. What is the most common age range of the child or children for whom you recommended the vest? *Place an "X" by only one answer.*

() 1-3 years

() 4-5 years

() 6-8 years

() 9-11 years

() 12 years or older

13. Where did you recommend wearing the vest?

() Under clothing

() Over clothing

14. How was the compression vest most frequently fabricated?

() Fabricated and purchased from vendor

() Fabricated by therapist

() Fabricated by parent

() Other, please list _____

15. Which sensory processing pattern was most frequently targeted for improvement? *Place an "X" by the two most common.*

() Sensory seeking

() Low registration

() Sensory sensitivity

() Sensory avoidance

16. Which behaviors were most frequently targeted for improvement? *Place an "X" by the two most common.*

() Attention span

() Remaining in seat

() Reduction of extraneous movement

() Reduction of self injurious behaviors

() Reducition of injurious behaviors to others

() Work completion

() Other, please list _____

17. Which, if any, other interventions were tried prior to the compression vest? *Place an "X" by all those that apply.*

() Weighted vest

() Hug machine

() Deep touch pressure protocol

() Sensory diet that did not include equipment or techniques already listed

() Other, please list _____

18. How long did you recommend wearing the vest during one wearing event?

_____ Average minutes/session

19. How frequently did you recommend that the child or children wear the vest?

_____ Average number of wear sessions/day

20. During which types of activities do you most often recommend that a child wear a vest? *Place an "X" by the two most common activities.*

() Fine motor or table top activities, including written work

() Circle time

() Free choice time

() Movement activities

() Special classes, such as music, art, etc.

() Transitions

() Family outings, such as shopping, eating at restaurants, etc.

() Other, please list _____

21. How did you determine whether the vest was effective in achieving the targeted goal? *Place an "X" by the two most common.*

() Data/progress toward goal(s)

() Clinical observation

() Teacher report

() Parent report

() Child report

() Other, please list _____

22. Did you expect the effects achieved by wearing the vest to carry over for a period of time following the removal of the vest?

() No→ Skip to 24

() Yes

23. For how long did you expect the effects achieved by wearing the vest to carry over?

_____ Number of minutes

24. To what extent do the following sources of information guide your decisions about whether or not to recommend the use of a compression vest for a child?

Circle one answer for each source of information.

	A great	To some	A small	Not at
Colleague reports……	extent	extent	extent	all
	A great	To some	A small	Not at
Continuing education...	extent	extent	extent	all
	A great	To some	A small	Not at

Text books……extent	extent	extent	all	
	A great	To some	A small	Not at
Journal articles…….extent	extent	extent	all	
Personal experience/	A great	To some	A small	Not at
clinical observations...extent	extent	extent	all	
Other, please list	A great	To some	A small	Not at
_____.....extent	extent	extent	all	

25. How much knowledge do you have about evidence-based practice in occupational therapy?

() A lot

() Some

() Little

() None

26. To what extent do you agree with this statement: "I use evidence-based practice to guide my decisions during daily occupational therapy treatments."

() Strongly agree

() Somewhat agree

() Neither agree nor disagree

() Somewhat disagree

() Strongly disagree

Thank you for volunteering your thoughts and time for this survey. Please add any additional comments in the space below.