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Research in Autism Spectrum Disorders

Journal homepage: <http://ees.elsevier.com/RASD/default.asp>

Effects of weighted vests on classroom behavior for children with autism and cognitive impairments

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ARTICLE INFO

Article history:

Received 14 June 2010

Accepted 18 June 2010

Keywords:

Autism

Weighted vests

Sensory modulation

Participation

Classroom behavior

ABSTRACT

This randomized controlled single-case study investigated the effects of weighted vests for 10 children with autism in a classroom setting. Blinded observers rated targeted behaviors through video taken during structured table-top activities typically part of the classroom routine. Blinded teachers rated each child's behavior with the Conners' Global Index following each phase of the study. Unblinded educational aides provided subjective feedback about the effects of weighted vest.

Objective data provided evidence to support the use of weighted vests to decrease off-task behavior for some participants. Weighted vests did not improve sitting in any participant. Subjectively, all aides reported that weighted vests were effective in improving classroom behaviors in all participants at least some of the time. All teachers and aides reported that weighted vests were appropriate modalities to use in the classroom and wanted to continue using weighted vests following the study.

Some children benefited from the weighted vests; however, effects were not strong or consistent across participants. Weighted vests may be a component of intervention for some children with autism, but the results do not support the use of weighted vests in isolation to improve attention to task or sitting in children with autism in the classroom setting.

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Considerable evidence exists that indicates many individuals with autism experience differences in sensory processing, especially in persons with increased severity of autism (Ben-Sasson et al., 2009; Huebner & Dunn, 2001; Rogers & Ozonoff, 2005). These differences in sensory processing are not typically due to structural deficits in the sensory organs, but rather to difficulties deriving meaning from sensory information (Dunn, 2000). Difficulties responding to sensory input with behavior that is appropriate to the type and intensity of the sensory input is described as sensory modulation dysfunction (Miller, Anzalone, Lane, Cermak, & Osten, 2007) and is assumed to reflect poor modulation of inhibitory and excitatory functions of the central nervous systems (Baranek, 2002). Different types of sensory modulation dysfunction have been identified to help interpret behavior and guide intervention planning (Huebner & Dunn, 2001). Sensory over-responsivity represents an increased response to sensory input compared to individuals with typical sensory modulation and under-responsivity represents a decreased response. Although a child's behavior may appear willful, responses due to sensory modulation dysfunction are thought to be automatic, unconscious, physiologic responses (Miller, Coll, & Schoen, 2007; Miller, Anzalone, et al., 2007).

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Sensory modulation dysfunction can result in attention problems and abnormal activity levels, thus impacting classroom behavior and participation (Bar-Shalita, Vatine, & Parush, 2008; Huebner & Dunn, 2001; Liss, Saulnier, Fein, & Kinsbourne, 2006). Therefore, interventions that improve sensory modulation, thereby decreasing attention problems and abnormal activity levels, can have important implications for children with autism.

Interventions to address sensory processing are used frequently and are well received by parents of children with autism (Baranek, 2002; Goin-Kochel, Mackintosh, & Myers, 2009). In two independent surveys examining pediatric occupational therapy practice, interventions that target sensory processing differences were the most common recommendation for children with autism across settings (Case-Smith & Miller, 1999; Watling, Deitz, Kanny, & McLaughlin, 1999). Most of these interventions were based on sensory integration theory, in which graded sensory inputs, especially tactile and proprioceptive inputs, are purported to enhance neurological function and decrease problem behaviors caused by difficulties modulating sensory input (Baranek, Wakeford, & David, 2008; Huebner & Dunn, 2001). Although traditional sensory integration treatment is a remedial approach and often discussed in relationship to sensory modulation dysfunction and autism, recent conceptualizations of sensory processing intervention recommend strategies beyond remediation, including adapting activities and environments to fit the sensory processing preferences of the individual (Baranek et al., 2008; Dunn 1997). Baranek et al. (2008) acknowledge that, beyond sensory processing preferences, one's motivation and cognitive ability must be considered related to participation and function. However, even though a holistic approach is recommended, remedial approaches are still widely used by occupational therapists and other professionals (Miller & Summers, 2001).

One specific remedial technique to decrease sensory modulation dysfunction within the context of daily activities is the passive application of sensory stimulation through weighted vests. They are reportedly used by 92% of occupational therapists working with children with autism, most often with preschool and elementary-school aged children in classroom settings to improve staying on task, attention, and staying in seat (Olson & Moulton, 2004a, 2004b). However, there is very little conclusive evidence supporting the efficacy of interventions to address sensory modulation dysfunction, including weighted vests. Stephenson and Carter's (2009) review of the literature related to weighted vests and children with autism spectrum disorders found five peer-reviewed articles, one non-peer reviewed article, and one poster presentation. They concluded:

There may be an arguable case for continued research on this intervention but future investigators need to ensure that: criteria for participant selection are replicable and justifiable; participants are adequately described; inter-observer reliability is satisfactorily established; observers are blinded to the presence of weight in the vests; results are appropriately interpreted with consideration of the functional magnitude of changes; and more stringent research designs are employed (p. 112–113).

This study addressed all of the methodological concerns identified by Stephenson and Carter (2009) and investigated the effects of weighted vests on classroom behavior for children with autism. We hypothesized that: (1) touch-pressure sensory input through a weighted vest would decrease off-task behavior and increase sitting time and (2) teachers and educational assistants would view weighted vests as a tool to enable children with autism to function more productively.

1. Methods

1.1. Participants

Each participant is described in Table 1. Participants were 8 boys and 2 girls between the ages of 3–10 years. Inclusion criteria were a confirmed diagnosis of autism, difficulty with attention to task based on teacher report, and sensory modulation dysfunction as identified by a total score more than 2 standard deviations below the mean on the Short Sensory Profile (McIntosh, Miller, Shyu, & Dunn, 1999a), completed by a parent. Seven children had a confirmed severe language delay. Most of the children were non-verbal ($n = 7$) and three children had echolalia, but limited or no functional language. Four children had verified severe cognitive delays, and three children had possible severe cognitive delays although modified standardized testing could not be completed. Based on the adaptation required for educational activities and the support required in daily life, the other three children likely had significant cognitive delays. All of the children were diagnosed through a multidisciplinary assessment, most of which included the ADOS – Module 1 ($n = 8$). Assessment information other than the Short Sensory Profile was from the child's school file. Assessments were completed within 2 years of data collection. There were no changes in school or home-based services or medications during the study.

1.2. Setting

The experimental setting was each child's self-contained classroom. Six participants attended a preschool for children with various developmental disabilities (Evan, Fabian, Grace, Hailey, Ian, and Jack), three attended an elementary grade school program specific to children with autism (Adam, Bobby, and Connor), and David was in a mainstream kindergarten class with aide support. A total of five teachers and nine aides participated in this study. Fabian and Grace had the same aide, as Grace attended the program in the morning and Fabian in the afternoon. Each participant was observed at the same time of day during a fine-motor table-top activity typical of his or her classroom routine. Activities included matching, sorting,

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