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# Behavior Therapy for Stereotypic Movement Disorder in Typically Developing Children: A Clinical Case Series

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*Stereotypic movement disorder (SMD) is characterized by repetitive, rhythmic, episodic movement and is associated with distress and functional impairment. A range of behavioral strategies have been implemented for the treatment of stereotypies, but research on the effectiveness of behavior therapy in typically developing children is limited. The following case series describes the implementation of behavior therapy for 3 typically developing children (ages 12 to 14) with SMD. Results showed significant reductions in the frequency and intensity of the stereotypies. Future refinement and testing of a behavior therapy protocol is recommended.*

Motor stereotypies are repetitive, rhythmic, patterned, and coordinated movements that occur in paroxysmal episodes (American Psychiatric Association [APA], 2000). These stereotyped movements (SMs) can take many forms, including hand flapping, head nodding and body rocking; and are often accompanied by facial grimacing and/or pacing (Singer, 2011). Motor stereotypies are frequently diagnosed in individuals with intellectual disabilities and neurodevelopmental syndromes, but can also occur in typically developing children (Castellanos, Ritchie, Marsh, & Rapoport, 1996; Freeman, Soltanifar, & Baer, 2010; MacDonald et al., 2007; Mahone, Bridges, Prahme, & Singer, 2004; Tan, Salgado, & Fahn, 1997). SMs usually appear before the age of 3 and have a relatively chronic course (Harris, Mahone, & Singer, 2008). Formal diagnosis of stereotypic movement disorder (SMD) can be made if the movement is present for more than 4 weeks, causes functional impairment and/or produces an injury that requires medical attention (APA, 2000). Little is known about the etiology of SMD, but some data suggest a biological predisposition toward the condition; SMs tend to run in families and are associated with reductions in white matter volume in certain brain regions (Harris et al., 2008; Kates, Lanham, & Singer, 2005; Muthugovindan & Singer, 2009).

Although SMs are described as "nonfunctional" (p. 134; APA, 2000), empirical investigations support the notion that they may serve one or more behavioral functions. Research on SMs in individuals with intellectual disabilities suggests the movements are generally maintained by "automatic" reinforcement (i.e., the internal stimuli produced by engaging in the behavior is reinforcing; Lovaas, Newsom, & Hickman, 1987) and may be inadvertently strengthened by social reinforcement (e.g., provision of caregiver attention or escape from demands; Cunningham & Schreibman, 2008). In one study, researchers identified common "triggers"/antecedents for SMs among 100 typically developing children who presented consecutively to a pediatric neurologist (Harris et al., 2008). The most common triggers included excitement (80%), boredom (23%), fatigue (21%), anxiety/stress (26%), and being focused/engrossed [on/in] a task (33%). Based on similar observations in the earlier experimental literature (Altman, 1971; Berkson & Mason, 1963; Bexton, Heron, & Scott, 1954), some (e.g., Zentall & Zentall, 1983) have argued that engaging in SMs may both enhance one's ability to focus on a cognitively demanding task and serve a self-stimulatory function.

Prevalence data for SMs are limited, but data that do exist suggest SMs occur in 5% to 19% of typically developing children (Leekam et al., 2007; Sallustro & Atwell, 1978; Werry, Carlielle, & Fitzpatrick, 1983). Comorbid conditions (from most to least common) are attention/deficit-hyperactivity disorder, tics/Tourette's syndrome, and obsessive-compulsive disorder/obsessive-compulsive behaviors (Harris et al., 2008; Mahone et al., 2004). Differential diagnosis is important, as SMs may be mistaken for habits, and a number of movement disorders, including compulsions, dyskinesias, and often tics. Key differences between complex motor tics and SMs are that the age of onset in tics is later, typically between 5 and 7; tics appear more purposeless and less rhythmic than SMs; and patients with tics typically report a premonitory urge prior

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to tic occurrence, whereas those with SMs do not. Also, tics occur more randomly and are experienced as more bothersome than are SMs (Mahone et al.; Muthugovindan & Singer, 2009; Singer, 2011). Nevertheless, few seek treatment for SMs, and reasons for this are unclear. One possible explanation is that many children with non-self-injurious SMs do not experience significant impairment or distress as a result of the behavior, although evidence does suggest that SMs can lead to bullying by peers and significant concern by parents (Barry, Baird, Lascelles, Bunton, & Hedderly, 2011). In situations where treatment is warranted, options are limited. Pharmacotherapy is not often considered for pediatric patients with non-self-injurious SMs, as the costs (e.g., side effects) are generally perceived to outweigh the benefits (Barry et al., 2011), and literature on the efficacy of nonpharmacological (primarily behavioral) treatments is scarce.

### Behavioral Interventions for Stereotyped Movements

Some single-subject experimental designs and case reports have suggested that behavioral techniques, including differential reinforcement of other behavior (DRO; Ringdahl et al., 2002; Taylor, Hoch, & Weissman, 2005), response interruption, and redirection may reduce the frequency of SMs (Miguel, Clark, Tereshko, & Ahearn, 2009). However, these studies were conducted on children with developmental disabilities in special settings, thus limiting the generalizability to typically developing children.

Although the functional differences between SMs in children with developmental disabilities and those who are typically functioning are unclear, research suggests SMs in typically developing children occur with less frequency, shorter duration, and less intensity (Schwartz, Gallagher, & Berkson, 1986). In addition, the structure and intensity of SM treatments as utilized in children with developmental disabilities may not be necessary in a typically developing population. Instead, such children may benefit from modified versions of existing treatment protocols for repetitive behavior, such as habit reversal training (HRT). In the only published study of a behavioral treatment for SMs ($n = 12$) in typically developing children, Miller, Singer, Bridges, and Waranch (2006) conducted an open trial of a modified HRT + DRO treatment package delivered in an outpatient pediatric neurology clinic. Modified HRT was conducted in Session 1, and was described as simulation of SMs by the patient for 30 seconds with a 1-minute break. This process was repeated five times while the parent prompted the child to best match the movement to its typically occurring form. For homework, the parent was asked to monitor their child practice the modified HRT procedure in front of a mirror twice a day, and complete a daily monitoring sheet tracking stereotypy frequency each hour, and ranking the severity. In Session 2, occurring 1 to 2 weeks following the first two sessions, monitoring homework was reviewed, and DRO procedures were implemented. During two 10-minute periods per day, the patient was instructed to practice not engaging in the stereotypy, and the parent was asked to verbally praise their child every few minutes for doing so. Session 2 concluded with additional practice of modified HRT. Remaining sessions occurred every 2 to 4 weeks, and were increasingly spaced over time. In these sessions, modified HRT was reviewed, and DRO sessions were steadily increased in frequency and length, and supplemented with tangible rewards. The intervention yielded significant pre- to posttreatment decreases (a 26% mean reduction) on the Stereotypy Severity Scale total score; however, when motor and global impairment subscales were analyzed independently, only significant pre-post changes on the global impairment subscale were found. Additionally, there were significant pre to post changes (a 38% mean reduction) for the Stereotypy Linear Analog Scale, but only trends toward significant decreases (a 10% mean improvement) on the Child Global Assessment Scale.

Outcomes were better for those who had more treatment sessions and who had been rated by parents as highly motivated to stop SMs at treatment onset. Reasons for the mixed results were unclear, but one possibility is that the HRT component had been modified from original HRT procedures. In traditional HRT (Azrin & Nunn, 1973), the two active components are awareness training, in which the patient is trained to acknowledge when the target behavior or any antecedent behaviors or sensations are occurring; and competing response (CR) training, in which the patient is taught to perform a CR contingent on the occurrence of the target behavior (Azrin & Nunn; Miltenberger & Fuqua, 1985; Woods et al., 2008). In the Miller et al. (2006) study, no formal CR was trained. Instead, modified awareness training and a DRO procedure were used, in which children were praised by parents for not engaging in the stereotypy.

Furthermore, Miller et al. (2006) did not report the inclusion of function-based assessment and intervention procedures in their protocol. Such techniques have been integrated with HRT to reduce the occurrence of tics (Piacentini et al., 2010; Watson & Sterling, 1998) and a host of other body-focused repetitive behaviors (Dufrene, Watson, & Kazmerski, 2008; Lane, Thompson, Reske, Gable, & Barton-Arwood, 2006; Rapp, Miltenberger, Galensky, Ellingson, & Long, 1999). Likewise, interventions relying on function-based strategies have been successful in treating SMs in individuals with intellectual disabilities (Matson, Bamburg, Cherry, & Paclawskyj, 1999; Repp, Felce, & Barton, 1988), and as stated earlier, functional variables appear to substantially influence SMs in typically developing children (Harris et al., 2008). Combined, these findings suggest that inclusion of function-based interventions and a more traditional form of HRT may be useful in managing SMs in typically developing children.