

There is Limited Evidence that the Wilbarger Protocol was Ineffective and Increased Stereotypical Behaviors in Children Ages Four to Fifteen with Autism Spectrum Disorder.

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CLINICAL SCENARIO:

Condition/Problem

The problem addressed in this CAT is stereotypical motor or vocal behaviors in people with autism spectrum disorder (ASD). Motor stereotypical behaviors are any nonfunctional hand, arm, body, or finger movements including, hand flapping, body rocking, finger posturing, finger tapping, etc. Vocal stereotypical behaviors are non contextual vocal sounds such as screaming, singing, clicking, etc. It is believed that children with autism spectrum disorder engage in stereotypical behaviors, in part, because they are seeking the sensory input that the behavior provides (Moore, Cividini-Motta, Clark, & Ahearn, 2015). Stereotypical behaviors can interfere with educational participation and violate social norms.

Incidence/Prevalence

In 2014, the CDC concluded that 1 in every 68 children in the United States will be born with ASD (CDC, 2015). Although, resources such as the CDC indicate that children with ASD often display stereotypical behaviors, no reports were found on how prevalent stereotypical behaviors are in children with ASD.

Impact of the Problem on Occupational Performance

Stereotypical behaviors can have an effect on various areas of occupational performance. One area in particular is formal educational participation. Motor stereotype or abnormal vocal behaviors like hand flapping and screaming, may interfere with the child's and other classmates' ability to concentrate on school work, as well as it may impact their ability to participate in extracurricular activities such as sports or band. Another area of occupational performance that could be effected is social participation with peers, family, and teachers. Actions such as finger tapping, hand flapping, and making clicking noises could be viewed by society as "abnormal;" children who display these types of actions could have a hard time making and/or keeping friends as well as effectively communicating with others.

Intervention

The client is brushed with a surgical brush, designed for the brushing protocol, on the arms, hands, legs, feet, and back. The entire surface of the body part is brushed once, using lengthwise strokes. The brushing procedure is followed by joint compression at the wrist, elbow, shoulder, chest/back, hip, knee, and ankle joints, five times each. This treatment takes place five to seven times per day and five to seven days per week, at home or at school.

OT Theoretical Basis

The sensory integration (sensory motor) frame of reference (FOR) supports the Wilbarger Protocol. The basis of this theory proposes that people who present with sensory processing disorders are lacking specific forms of sensory stimuli (tactile, visual, auditory, etc.) that are needed in order to modulate behavior. Therefore, providing those with sensory processing disorders the input that he/she needs will allow the individual to have a more

adaptive response, in order to better adapt to the environment and learn. The tenets of this theory relate to the Wilbarger Protocol as this intervention provides individuals with sensory processing disorders the tactile input that they may need to modulate their behavior through brushing.

Science Behind the Intervention

The Wilbarger Protocol uses tactile input to decrease motor stereotype and vocal behaviors that are often displayed in children with autism spectrum disorder. Nerve endings located beneath the skin carry tactile information regarding deep touch, light touch, and pressure to the central nervous system (CNS). This tactile input serves as incoming sensory stimuli that is said to cause neurological changes at synapses located within the brain. These neurological changes then result in new formations of dendrites. The brain has the ability to form these new formations due to neuroplasticity. An addition of new dendrites in the brain will increase the neuronal connections in the brain and will allow for more neural messages to be transmitted. These new neural connections are said to then enable the CNS to be changed or modified. When these changes in the nervous system occur it is projected to decrease motor and vocal stereotypical behaviors. (Shriber, 2010)

Why is the intervention appropriate for OT?

The Wilbarger Protocol is considered a preparatory method. The Wilbarger Protocol was designed for children with sensory defensiveness and can be used to reduce stereotypical behaviors. The idea behind the use of the Wilbarger Protocol with a person with autism spectrum disorder, who often engages in stereotypical behaviors, is that they may be engaging in these behaviors because they are seeking sensory input. Therefore, if that input is provided, via the brushing protocol, they will not need to engage in those behaviors to receive the input and can better participate in their occupations. The goal of the intervention is to then improve occupational performance in school, home, and community settings.

FOCUSED CLINICAL QUESTION: Does the Wilbarger Protocol reduce stereotypical behaviors or improve school performance more than no treatment, in children ages four to fifteen with autism spectrum disorder?

SUMMARY:

- This CAT investigates the effectiveness of the Wilbarger Protocol on reducing stereotypical behaviors in children with autism spectrum disorder.
- **SEARCH**
 - We searched seven databases and located five relevant articles. Of the five relevant articles, three level five case studies were critiqued. Two of the articles had a high level of rigor, while the third article had a medium level of rigor. The three articles critiqued were selected based on similarities in dependent variables and population studied.
- The literature reviewed did not support the Wilbarger Protocol when used with a strict schedule of treatment.

CLINICAL BOTTOM LINE: There is limited evidence that the Wilbarger Protocol was ineffective and increased stereotypical behaviors in children ages four to fifteen with autism spectrum disorder.

Limitation of this CAT: This critically appraised paper (or topic) has been reviewed by occupational therapy graduate students and the course instructor.

Table 1: Search Strategy

Databases Searched	Search Terms	Limits used	Inclusion and Exclusion Criteria
Cochrane Reviews OT Search AJOT OT Seeker Murphy Library EBSCO Host PubMed	Wilbarger Protocol Brushing Sensory Defensiveness Sensory Modulation Sensory Processing	and or	Inclusion: Children, Full Text, Peer Reviewed Journals, English Exclusion: Adults, Elderly, News articles, articles older than 1997

RESULTS OF SEARCH

Table 2: Summary of Study Designs of Articles Retrieved

Level	Study Design/ Methodology of Articles Retrieved	Total Number Located	Database Source	Citation (Name, Year)
Level 1a	Systematic Reviews or Metanalysis of Randomized Control Trials	1	Murphy Library	(Weeks, Boshoff, & Stewart, 2012)
Level 1b	Individualized Randomized Control Trials			
Level 2a	Systematic reviews of cohort studies			
Level 2b	Individualized cohort studies and low quality RCT's (PEDro < 6)			
Level 3a	Systematic review of case-control studies			
Level 3b	Case-control studies and non-randomized controlled trials			
Level 4	Case-series and poor quality cohort and case- control studies			
Level 5	Expert Opinion, qualitative research, program descriptions	4 case studies	Murphy Library	(Davis, Durand, & Chan, 2010; Benson, Beeman, Smitsky, & Provident, 2011; Moore, Cividini-Motta,

				Clark, & Aheam, 2015; Kimball et al., 2007)
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STUDIES INCLUDED:

Table 3: Summary of Included Studies

	Study 1	Study 2	Study 3
Design	Single Case Study	Single Case study	Single Case Study
Level of Evidence	5	5	5
Rigor Score	7/10 SCED	9/10 SCED	5/10 SCED
Population	1 child with autism who displayed motor stereotypy Age: 4	3 children with autism who display motor and verbal stereotypy Ages: 15, 8 ,11	2 children with sensory defensiveness disorders (autism and pervasive developmental delay) Age: 5
Intervention Investigated	Wilbarger Protocol	Wilbarger Protocol, Sensory Diet, DPT	Wilbarger Protocol (DPPT) and Non-specific Child Guided Brushing (NST)
Comparison Intervention	None	None	None
Dependent Variables	<ol style="list-style-type: none"> 1. Attention 2. Demand 3. Tangible 4. Play 5. Alone 	% observed motor and vocal stereotypy behavior	Behavioral Regulation as measured by the SFA.
Outcome Measures	Functional Analysis (FA)	Observation was time sampling	School Function Assessment (SFA - pre and post)
Results	Percent stereotype fluctuated between	Not effective in reducing stereotypy	The child who received NST improved on

	reduced to increased stereotype. There were no patterns indicated.	and sometimes increased symptomatology	behavioral regulation slightly, while the other child who received DPPT maintained the same from pre to posttest.
Effect Size	N/A	N/A	N/A
Conclusion	The Wilbarger Protocol did not have an effect on changing stereotype.	The Wilbarger Protocol was not an effective treatment for stereotypy in children with autism spectrum disorder	The Wilbarger Protocol may be an effective treatment protocol for children with sensory defensiveness to improve performance in school when used as needed.

IMPLICATIONS FOR PRACTICE, EDUCATION and FUTURE RESEARCH

PICO: Does the Wilbarger Protocol reduce stereotypical behaviors or improve school performance more than no treatment in children ages four to fifteen with autism spectrum disorder?

Operational Definition of Terms:

These terms were defined by the study reviewed as:

- Stereotypical Behaviors described in this CAT include motor stereotypy, any nonfunctional body movement including finger flicking and body rocking and vocal stereotypy, any non contextual vocalization such as screaming, crying, and clicking.
- School Performance in this CAT was measured by the School Function Assessment (SFA), however this CAT presentation will focus on the behavior regulation subsection (e.g. ability to accept changes and maintain self-control during a conflict).
- Wilbarger Protocol, according to Wilbarger & Wilbarger, uses a Clippers Mills brush, that is not intended to scratch or tickle, to brush the hands, arms, back and feet one time lengthwise. The entire surface area of these body parts are brushed once over. Following the brushing procedure, ten joint compressions are applied to the shoulder, elbow, wrist, sternum, hip, knee, and ankle joints. This procedure is performed every 90-120 minutes of the child's waking hours.

Overall Conclusions

Results: Similar Findings

- Five out of the six participants in the studies had a set schedule of when they were receiving the intervention, following the prescribed protocol more closely.

- Those same five participants, who followed the prescribed protocol most closely, showed no improvement or demonstrated increased stereotypical behaviors with the intervention.

Results: Differences

- Each study measured behaviors using a different outcome measure such as the School Function Assessment, Functional Analysis (FA), and observation of stereotypical behaviors done as time sampling.
- School performance was only assessed in two out of the six participants in these studies. One out of the two participants in that study did not have a set protocol schedule indicating when he would receive the intervention. This participant received the intervention when he or the therapist/teacher deemed necessary. All other participants, in the studies, had a set schedule of how many times they would receive the intervention, however, the set schedule varied among studies. This participant was the only one who showed a slight improvement in school performance.
- Protocol in each of the studies differed from that of the Wilbarger Protocol. One study completed five joint compressions following the brushing protocol, one study did not state whether or not joint compressions were given, and the third article did not specify how many compressions were given but stated that they were given to both upper and lower extremities. The number of minutes between each brushing session per day varied between the studies, only one participant received the brushing intervention every 90-120 minutes as described by Wilbarger & Wilbarger. Length of treatment varied between studies ranging from three weeks to six weeks including baseline periods.
- The results varied between participants. Three out of the six (50%) participants, that received the Wilbarger Protocol, demonstrated an increase in stereotypical behaviors than before the treatment, while two out of the six (33%) participants showed no improvement in behaviors, and one out of the six (17%) participants showed a slight improvement in behaviors.
- Location of where each participant received the intervention differed between studies. Two out of the six participants received treatment at school and home, one out of the six participants received treatment only at home, and three out of the six participants received treatment only at school.
- One of the six studies had a follow up portion of the methodology. The follow up was taken six months after the last brushing administration.

Boundaries:

These three case studies included eight children, seven males and one female, ages four to nineteen. Of the eight participants, only six received the Wilbarger Protocol. The mean age of the six participants that received the protocol was eight. The diagnosis included mainly autism spectrum disorder, but also lead poisoning and pervasive developmental delay not otherwise specified. Inclusion and exclusion criteria was not noted in any of the three case studies.

Implications for Practice:

All three programs used the Wilbarger Protocol to either decrease stereotypical behaviors or improve school performance. Five out of the six participants received the Wilbarger Protocol closely to the program standards described by Wilbarger & Wilbarger, having a more scheduled prescription of the brushing. However, between these participants, the frequency and location of the treatment varied. One of the six participants received the treatment upon request or when the occupational therapist or teacher determined it was needed, when the child felt or seemed agitated. The participants who received a scheduled treatment protocol either got worse or showed no improvement in stereotypical behaviors or school performance, while the participant who received the treatment upon request or therapist/teacher determination was the only participant who showed mild improvements in school performance.

In summary, the key ingredients in these studies were: allowing the child to self-determine the need for the treatment or therapist/teacher-determination of the need and a trained adult/professional in the Wilbarger Protocol available to perform the treatment any time it is needed.

Children in these studies were preschool to high school age. The effects of the Wilbarger Protocol for children younger than four and older than fifteen, were not tested. Children with multiple diagnoses (medical or psychological) and who received other therapy were not tested; therefore, the effectiveness of this treatment for these populations is not known.

All three of the studies lacked the children's perception of the treatment. Two of the studies lack a long term follow up of the results of the protocol. School performance was not assessed, in two of the studies, so they are missing the occupational component.

All three studies are level five case studies. This is the lowest level evidence and therefore there is limited evidence that the Wilbarger Protocol was ineffective in reducing stereotypical behaviors or improving school performance in children with ASD.

Based upon the results from all three studies, the findings may suggest that the Wilbarger Protocol used at the child's and therapist's/teacher's discretion may be a better approach to produce the best outcomes for the client. This method of applying the Wilbarger Protocol requires further research to be done in order to explore the effectiveness of this treatment as a sensory regulation technique.

Clinical Bottom Line:

There is limited evidence that the Wilbarger Protocol was ineffective and increased stereotypical behaviors in children ages four to fifteen with autism spectrum disorder.

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