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Sensory/Manipulation Interventions for Children with Autism and Developmental Disabilities: An Evidence-Based Practice Project

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Sensory/Manipulation Interventions
For Children with Autism and Developmental Disabilities:
An Evidence-Based Practice Project

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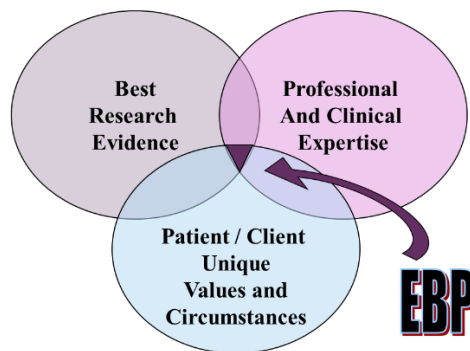
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Introduction

Evidence Based Practice

Evidence based practice is defined as the integration of knowledge from professional and clinical expertise, patient/client unique values and circumstances, and best research evidence (Straus, Richardson, Glasziou, & Haynes, 2005). The EBP courses in the St. Catherine University occupational therapy programs emphasizes skill building in finding, analyzing, and synthesizing research.

A definition of Evidence-Based Practice (EBP)



(Straus, Richardson, Glasziou & Haynes, 2005)



The EBP Project

Occupational therapy graduate students at St. Catherine University complete an EBP project in partial fulfillment of the requirements for a course on Evidence-Based Practice.

The EBP Process

- Begins with a practice dilemma
- Dilemma is framed as an EBP question and PICO
P (population/problem) I (intervention) C (comparison group) O (outcome(s) of interest)
- Background learning
- Search for the best evidence
- Initial appraisal and critical appraisal of the evidence
- Summary of themes from the evidence
- Recommendations for practice
- Next steps – implementation in practice

Practice Dilemma

The practice dilemma for these projects centered on children with developmental disabilities, particularly those with autism spectrum disorder.

In the past couple of decades we have seen the enormous growth in the number of individuals with ASD and the types and costs of services provided to them and their families (Centers for Disease Control and Prevention, 2016):

- Autism spectrum disorder: 1 in 68 children
- U.S. annual costs for children with ASD in 2011
 - \$11-60 billion
- Cost of autism medical care and therapies per year
 - Medical care for children with ASD on Medicare: \$10,000
 - Intensive behavioral interventions: \$40,000-60,000

Occupational therapy is a primary provider for children with autism spectrum disorder and their families. There are expectations that the interventions occupational therapy uses are evidence-based. There are growing questions about Comprehensive Treatment Models that are being used with children with ASD.

Comprehensive Treatment Models for ASD and Developmental Disabilities

A number of governmental agencies and expert review groups have begun to examine those interventions that are most costly and time intensive. These have been described as comprehensive treatment models (rather than focused interventions) because of the unique characteristics related to some of these features (Wong et al., 2013). AOTA, the Department of Human Services, and others receive a lot of questions from practitioners and families about some of these interventions that have been used in practice and thus, it seemed appropriate to conduct a review of the research evidence.

- Comprehensive Treatment Models “consist of a set of practices designed to achieve a broad learning or developmental impact on the core deficits of ASD” and “are characterized by
 - organization (i.e., around a conceptual framework),
 - operationalization (i.e., procedures manualized),
 - intensity (i.e., substantial number of hours per week),
 - longevity (i.e., occur across one or more years), and
 - breadth of outcome focus (i.e., multiple outcomes such as communication, behavior, social competence targeted)” (p. 3)
- Focused Intervention Practice: “address a single goal or skill” (p. 3)

Table 1.

Interventions Reviewed in the Evidence Based Practice Projects

General Category	Specific Interventions
Listening Therapies	Auditory Integration Therapy The Listening Program Therapeutic Listening
Movement Therapies	Brain Gym Interactive Metronome Makoto Therapy
Reflex Integration Therapies	Masgutova Method (MNRI) Reflex Integration Rhythmic Movement Training
Sensory/Manipulative Therapies	Wilbarger Therasuit Craniosacral therapy

Appraisal of Best Research

After searching and finding evidence available from library databases and alternative sources, students conducted an initial appraisal to evaluate the quality and relevance of the evidence and select the best research for further review. Then they conducted critical appraisals of the best formal reviews of primary research (e.g., systematic reviews, meta-analyses) and/or primary/original research studies using the AOTA CAP form (American Occupational Therapy Association, 2016). One of the steps in the CAP process is to evaluate the strength or level of the research design and the types of conclusions that are possible from each design.

Initial Appraisal

- Quality of the evidence
 - type of evidence
 - research design
 - investigator qualifications
 - journal/publication/website
- Relevance of the evidence
 - PICO

Critical Appraisal

- Reviews of primary research
 - systematic reviews, meta-analysis
 - review process and approach
 - consistent and inconsistent findings
- Primary research studies AOTA CAP
 - Level 1: randomized controlled trials
 - Level 2: two groups, nonrandomized/cohort and case control
 - Level 3: nonrandomized, pretest/posttest and cross-sectional
 - Level 4: single subject
 - Level 5: case report

Expert Review Groups

Students also explored the conclusions and recommendations of expert review groups when available (see Tables 1-4). The Wisconsin Treatment Intervention Advisory Committee in particular has made determinations on a number of the interventions that students reviewed.

- Wisconsin Treatment Intervention Advisory Committee
- Evidence-Based Practices for Children, Youth, and Young Adults with Autism Spectrum (UNC)
- Association for Science in Autism Treatment (ASAT) Disorder
- Cochrane Collaboration
- U.S. Department of Health and Human Services, Centers for Medicare & Medicaid Services
- National Autism Center
- American Academy of Pediatrics
- Others

Wisconsin Determination Levels (Wisconsin Department of Health Services, 2016).

After reviewing all of the evidence, students made their own recommendations using the Wisconsin determination levels.

- Level 1- Well Established or Strong Evidence
(DHS 107 - Proven & Effective Treatment)
- Level 2 – Established or Moderate Evidence
(DHS 107 - Proven & Effective Treatment)
- Level 3 – Emerging Evidence
(DHS 107 – Promising as a Proven & Effective Treatment)
- Level 4 – Insufficient Evidence (Experimental Treatment)
- Level 5 – Untested (Experimental Treatment) and/or Potentially Harmful.

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All EBP Projects are available at <http://sophia.stkate.edu/>.

Final EBP Question and PICOs

Are selected sensory/manipulation therapies effective for improving occupational performance and participation for children with Autism Spectrum Disorder?

Key Learning From Individual Background Learning Papers

1. All of the interventions reviewed rely on physical manipulation of the body to influence behavior (Kratz, Kerr, & Porter, 2016; Therapeutic brushing techniques, 2016; Upledger, 2000).
2. There is limited objective research for sensory manipulative therapies (Lancaster et al., 2016).
3. All interventions require special training by specific intervention developers (Therasuit LLC, 2006; Wilbarger & Wilbarger, 2002).
4. Protocols are targeted to other populations in addition to ASD (CP, stroke, developmental disabilities, etc.) (Lancaster et al., 2016; Lee, 2016; Mehl-Madrona, 2001; Therapeutic brushing techniques, 2016; Turner, 2006; Upledger, 2000; Wilbarger brushing and joint compressions, n.d.).

Rationale for Selecting this EBP PICO Question

1. The prevalence of ASD diagnoses is increasing so having appropriate, research based interventions would be extremely beneficial.
2. These interventions are currently being used in therapeutic practices; understanding the research behind them allows practitioners to determine the efficacy of using these interventions specifically for pediatric populations.

3. Parents and practitioners seek to meet the diverse needs of children with ASD, but both come with their own personal biases and desired outcomes. Researching the effectiveness of these specific sensory/manipulation techniques will aid in providing more quality and bias-free care.
4. As occupational therapy students, utilizing evidence based practice is imperative for our future success when working with pediatric populations.

	Keywords	More broad and narrow keywords	Keyword synonyms, abbreviations, and spelling variants
P Patient / population Problem	-Pediatrics -Autism Spectrum Disorders -Cerebral Palsy -craniosacral system	-Sensory disorders -Sensory defensiveness -Proprioception -Health Induced Autism	Children Kids ASD Autism CP
I Intervention	-Occupational therapy -Sensory integration -Manipulation -Wilbarger Deep Pressure and Proprioceptive Technique and Oral Tactile Technique -Wilbarger Protocol -Therasuit -Craniosacral Therapy	Education	OT WPPT/OTT Therasuit Adeli Suit Therapy suit CST
C Comparison	-Control group -Pretest/Posttest		
O Outcome	-Quality of life -Cortisol levels -Gross motor function -Mechanical efficiency -Improved behavior -Improved self-regulation -Improved transition between activities	-Participation -Function -Sympathetic arousal	ADL IADL QoL

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The Wilbarger Protocol

Executive Summary

Final Question and PICO.

Are selected sensory/manipulation therapies effective for improving occupational performance and participation for children with Autism Spectrum Disorder?

EBP Themes.

Description of the Intervention.

The Wilbarger technique was created to improve occupational performance of those showing signs of sensory defensiveness (Wilbarger & Wilbarger, 2002). It was developed for children, ages 2 months and older, as well as adults (as cited in Lancaster, et al., 2016; Wilbarger & Wilbarger, 2002). The Wilbarger technique is comprised of three components: education, sensory diet, and physical intervention implemented by trained professional (Wilbarger & Wilbarger, 2002). The third step in the overall technique is typically referred to as the Wilbarger Protocol, but there are inconsistencies in its description amongst research. However, the Wilbarger's state that the Wilbarger Protocol includes Deep Pressure and Proprioceptive Technique (DPPT), joint compressions, and/or the Oral Tactile Technique (OTT) (Wilbarger & Wilbarger, 2002). Using a very specific surgical brush, deep pressure is applied to the hands, arms, back, legs, and feet, but never to the stomach, face, groin, or buttocks (Wilbarger & Wilbarger, 2002). The recipient then receives joint compressions in the shoulders, elbows, hands, hips, and legs to provide proprioceptive input (Wilbarger brushing and joint compressions, 2016). The technique is done every 90 minutes to two hours each day for two to eight weeks (Lancaster et al., 2016). Cost for training is unknown.

Developers/Proponents, Researchers, and Organization/Company.

The Wilbarger technique was created in 1991 by Patricia Wilbarger, M.Ed., OTR, FAOTA, and her daughter, Julia Wilbarger, MS, OTR (Therapeutic brushing techniques, 2016; Wilbarger & Wilbarger, 2002). Patricia Wilbarger is an occupational therapist and who specialized in sensory defensiveness (Therapeutic brushing techniques, 2016). There are no known researchers that are actively invested in the protocol. The Wilbargers co-founded the Avanti sensory integrative camps for children in the 80s and have since contributed to sensory integration treatment and research (Avanti Educational Programs Inc., n.d.). The technique is used by occupational therapists working with pediatric populations (Lancaster et al., 2016).

Description of the Quality and Quantity of Available Evidence.

After an in depth search of different databases, such as Pubmed, CINAHL, and OT Search, 19 relevant research articles were found (see References for a full list of found articles). Ten primary research studies were found; with the majority being case studies and single-subject design, none of the articles had both high relevance and high quality. Two of the ten that were believed to have the best quality and relevance were used for critical appraisal papers (Bhohti, A. & Brown, T. 2013; Kimball, J. G., Lynch, K. M., Stewart, K. C., Williams, N. E., Thomas, M. A., & Atwood, K. D., 2007). Six systematic reviews were found; the majority of articles had strong relevance and moderate overall quality. One of the six that was believed to have the best quality and relevance was further reviewed (Foss, Swinth, McGruder, & Tomlin, 2003). Three conceptual/theoretical articles were found; none of the articles had both high relevance and high quality. All of the conceptual articles and two systematic reviews (five total) were not published in peer-reviewed journals. All other research studies were peer-reviewed. None of the seven expert review groups in Table 1 reviewed the Wilbarger Protocol specifically.

Summary of the Current Evidence and Reviews of Evidence by Expert Review Groups.

A primary research study by Kimball et al. (2007) examined the effects of a Wilbarger Protocol-based procedure on children's sympathetic arousal. Sympathetic arousal was measured by analyzing salivary cortisol levels pre and post-treatment. The findings suggest that a Wilbarger Protocol-based procedure may modulate sympathetic arousal in children ages 3-5. However, more research is required before definite conclusions can be made, as this was a pilot study with only 4 participants. In addition, this study lacked any statistical analyses, did not provide any reliability or validity data on the cortisol measuring tool, and inferences about cortisol modulation were made when there is no known normative levels of cortisol. Practitioners should take precautions when using this study in practice as researchers made conclusions based on inadequate data.

Another primary research study by Bhojti et al. (2013) assessed the Wilbarger Protocol to treat negative symptoms in children with sensory defensiveness. After conducting sensory profiles, goal attainment scalings, and parent/caregiver questionnaires, researchers concluded the Wilbarger Protocol reduced sensory defensiveness behaviors for participants and that the parents and caregivers felt positively on the outcome. Practitioners should be aware of limitations in this study as they had a small sample size with only four out of the five total participants completely following the Wilbarger Protocol (one participant only followed the sensory diet and not the deep pressure proprioceptive technique).

A systematic review by Foss, Swinth, McGruder, and Tomlin (2003) was conducted regarding the Wilbarger Protocol. Although overall findings suggested a change in outcomes for those using the Wilbarger Protocol, evidence was limited. All studies reviewed were single-subject design or case studies and involved participants of varying diagnoses. None of the studies were comprehensive clinical trials with a control group. Further, many studies did not

adhere to consistent use of the intervention as recommended by the Wilbargers. The reviewers did not find sufficient research to support clinical use of the Wilbarger Protocol and recommended practitioners to apply the intervention with caution.

Expert Review Table.

Table 1
Summary of Evidence and Recommendations by Expert Review Groups for the Wilbarger Protocol.

Review Organization	Summary and Recommendations	Citation and Source
Wisconsin Treatment Intervention Advisory Committee	Wilbarger Protocol was not reviewed. There is not enough quality research to support Sensory Integration Therapy. It is placed at a Level 4 – Insufficient Evidence.	Wisconsin Department of Health Services Autism and Other Developmental Disabilities Treatment Intervention Advisory Committee (2015). https://tiac.wisconsin.gov/summary-determinations-regarding-level-evidence.htm
Evidence-Based Practices for Children, Youth, and Young Adults with Autism Spectrum Disorder	Wilbarger Protocol was not reviewed. Sensory Integration was excluded from the review of evidence-based practices due to insufficient evidence.	Wong, C., Odom, S. L., Hume, K. Cox, A. W., Fettig, A., Kucharczyk, S., ... Schultz, T. R. (2013). <i>Evidence-based practices for children, youth, and young adults with Autism Spectrum Disorder</i> . Chapel Hill: The University of North Carolina, Frank Porter Graham Child Development Institute, Autism Evidence-Based Practice Review Group. http://autismpdc.fpg.unc.edu/sites/autismpdc.fpg.unc.edu/files/2014-EBP-Report.pdf
Association for Science in Autism Treatment (ASAT)	Wilbarger Protocol was not reviewed. Sensory motor therapies should be viewed as untested interventions. Families considering them should evaluate them carefully.	Association for Science in Autism Treatment (n.d.) Treatments in alphabetical order. http://www.asatonline.org/for-parents/learn-more-about-specific-treatments/treatments-in-alphabetical-order/
Cochrane Collaboration	The Wilbarger Protocol was not reviewed.	Cochrane Collaboration (2016) http://www.cochrane.org/
U.S. Department of Health and Human Services, Centers for Medicare & Medicaid Services.	The Wilbarger Protocol was not reviewed.	U.S. Department of Health and Human Services, Centers for Medicare & Medicaid Services. (2010). Autism spectrum disorders (ASDs) services final report on environmental scan. Retrieved from http://www.impaqint.com/sites/default/files/files/Autism_Spectrum_Disorders.pdf

National Autism Center	The Wilbarger Protocol was not reviewed. “Sensory Integration Package” was listed as un-established. The National Autism Center reported there was not enough evidence to conclude the effectiveness of the intervention.	National Autism Center (2015). National Standards Project, Phase 2. Retrieved from http://www.nationalautismcenter.org/national-standards-project/phase-2/
American Academy of Pediatrics	Studies of Complementary and Alternative Medicines (CAM) interventions are limited or flawed. Not recommended as an evidence-based intervention.	Myers, S. M., & Johnson, C. P. (2007). Management of children with autism spectrum disorders. <i>Pediatrics</i> , 120(5), 1162-1182. http://pediatrics.aappublications.org/content/pediatrics/120/5/1162.full.pdf http://pediatrics.aappublications.org/content/pediatrics/120/5/1162.full.pdf

There are currently many gaps in the research regarding the Wilbarger Protocol. There are not many studies of the intervention, and the ones that do exist are case studies with small sample sizes. Many of the study designs are also flawed, with multiple limitations or interpretations biases. Additionally, the implementation and adherence to the Wilbarger Protocol throughout the different studies was not consistent, as many of the studies did not follow the protocol recommended by the original authors.

Recommendations for future research should include larger sample sizes and control groups. Education about the Wilbarger Protocol should be made more accessible in order to ensure that inconsistencies do not occur when the protocol is being used in research. Finally, more research on the Wilbarger Protocol is needed to determine its effectiveness and efficacy.

EBP Summary.

Throughout the research process, very few articles had strong relevance to the PICO question, and those that were strongly related to the PICO did not have strong quality. In addition, articles typically did not focus on occupational performance as the main outcome of the

therapy and worked with populations that were not specifically ASD. Although some findings have suggested that the Wilbarger Protocol can be used as an intervention for people with sensory defensiveness, more research is needed before conclusions can be made. Few studies were found on the Wilbarger Protocol and studies that were found provided limited evidence to support the Wilbarger Protocol. The Wisconsin Determination Levels placed sensory integration therapy at a Level Four (insufficient evidence [experimental treatment]); although the Wilbarger Protocol was not rated, we would assign a Level Four rating to the Wilbarger Protocol. Practitioners should take precautions when using this intervention in therapy as there is not yet enough evidence to support its use in clinical practice.

Our Conclusion About the Implications for Occupational Therapy Practice.

We did not find sufficient evidence to conclude that any of our three interventions impacted occupational performance, which is the basis of occupational therapy. Multiple were designed for diagnoses other than Autism Spectrum Disorder and were not designed with occupational engagement as a goal. In addition, two of the interventions, The Wilbarger Protocol and Therasuit, were not reviewed by any of the expert review groups. In order for conclusions to be made about the effectiveness and efficacy of these interventions, thorough, high-quality research is needed. We do not recommend the use of the Wilbarger Protocol, Therasuit, or CranioSacral Therapy as comprehensive treatments in clinical occupational therapy practice at this time.

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Wilbarger, J., & Wilbarger, P. (2002). The Wilbarger approach to treating sensory defensiveness. In A. C. Bundy, S. J. Lane, & E. A. Murray (Eds.), *Sensory integration: Theory and practice* (2nd ed., pp. 335-338). Philadelphia, PA: F. A. Davis Company.

Wisconsin Department of Health Services Autism and other Developmental Disabilities

Treatment Intervention Advisory Committee. (2015). *Determination of Sensory Integration Therapy as a proven and effective treatment*. Retrieved from

<https://tiac.wisconsin.gov/summary-determinations-regarding-level-evidence.htm>

Background Learning and Evidence Searches

Table of Resources.

Table 1.

Background Information Pertinent to the Wilbarger Protocol

Title/Name	Description	Source
Sensory Processing Disorder	Website Definition, symptoms, and potential causes of Sensory Processing Disorder. Explanation of sensory integration treatment. Does not explain Wilbarger Approach.	http://www.webmd.com/children/sensory-processing-disorder#1
Delivery of the Wilbarger Protocol: A survey of pediatric occupational therapist practitioners (2016)	Article from peer-reviewed journal. Provided a background of the Wilbarger Therapressure method. Occupational therapists were surveyed about the method regarding frequency of use, diagnoses implemented, and further demographics about the occupational therapists.	Journal of Occupational Therapy, Schools, & Early Intervention SCU Library: CINAHL Database
Addressing Sensory Integration and Sensory Processing Disorders Across the Lifespan: The Role of Occupational Therapy	Fact sheet provided by AOTA. Succinct and easy to read. Overview of occupational therapy interventions. Describes the sensory integration and processing issues experienced by different populations. Lists possible locations of occupational therapy services for sensory integration and processing problems.	American Occupational Therapy Association https://www.aota.org/-/media/Corporate/Files/AboutOT/Professionals/WhatIsSOT/CY/FactSheets/FactSheet_SensoryIntegration.pdf
Sensory Processing Disorder Parent Support: Wilbarger Brushing and Joint Suppressions	Website intended to support parents/caregivers of people with Sensory Processing Disorder. Wilbarger Protocol. Procedure explained. Potential results and behaviors. Joint suppression procedure.	http://www.sensoryprocessingdisorderparentsupport.com/wilbarger-brushing-compressions.php

Title/Name	Description	Source
Occupational Therapy Using a Sensory Integration–Based Approach With Adult Populations	Definitions of sensory processing disorders. List of conditions that sensory processing disorders can be comorbid with.	American Occupational Therapy Association https://www.aota.org/Search.aspx?q=adult%20populations%20sensory&sort=relevancy/~media/Corporate/Files/AboutOT/Professionals/WhatIsOT/HW/Facts/SI-Adults.pdf
Wilbarger Deep Pressure and Proprioceptive Technique (DPPT) & Oral Tactile Technique (OTT)	General information website. Provides information on the creators of the protocol, the proposed benefits, and the steps of the protocol.	http://www.ot-innovations.com/clinical-practice/sensory-modulation/therapeutic-brushing-techniques/

Background learning paper one.

This EBP project will focus on a sensory integration therapy technique called The Wilbarger Deep Pressure and Proprioceptive Technique and the Oral Tactile Technique. This is an occupational therapy intervention technique that can be used on children with sensory defensiveness. This background learning project explored the basis for the creation of the intervention, the history of the intervention, and the protocol of the technique.

Sensory processing disorders were the basis for the creation of this sensory integration therapy technique. The term “sensory processing disorder” is a broad term used to define any condition in which the brain has problems receiving and interpreting sensory information (Sensory processing disorders, 2016). A sensory processing disorder is believed to impact an individual’s self-regulation, self-concept, behavior control, and social interactions (May-Benson & Champagne, 2011). Symptoms of a sensory processing disorder have been reported as under- or over-responsiveness to stimuli (Lancaster, et al., 2016; Sensory processing disorders, 2016). According to Wilbarger and Wilbarger, the term sensory defensiveness is used when the symptom of over-responsiveness results in an aversive behavioral response (as cited in Lancaster, et al., 2016). The Wilbarger Deep Pressure and Proprioceptive Technique and the Oral Tactile Technique is based on the idea that these behaviors may stand-alone or may be comorbid with other conditions like autism spectrum disorders (May-Benson & Champagne, 2011). However, it is important to note that while the American Occupational Therapy Association does identify sensory processing problems for some populations with special needs (May-Benson & Champagne, 2011), the medical community does not recognize sensory processing disorder as a distinct medical diagnosis (Sensory processing disorders, 2016).

The Wilbarger Deep Pressure and Proprioceptive Technique and the Oral Tactile Technique was created in 1991 by Patricia Wilbarger, M.Ed., OTR, FAOTA, and her daughter, Julia Wilbarger, MS, OTR (Therapeutic brushing techniques, 2016; Wilbarger & Wilbarger, 2002a). It was developed for children, ages 2 months and older, as well as adults (as cited in Lancaster, et al., 2016; Wilbarger & Wilbarger, 2002a). The technique is often referred to as the Wilbarger Therapressure Program, the Wilbarger protocol, the Deep Pressure and Proprioceptive Technique (DPPT), or the brushing and compression protocol (Lancaster, et al., 2016). However, the term “brushing” is reported to be misleading and thus, should not be used to describe the protocol. (Wilbarger & Wilbarger, 2002a).

The Wilbargers proposed a specific protocol for their technique. The technique is part of a larger three-step process that includes education of the client and caregivers about sensory defensiveness, a sensory diet, and the implementation of a pressure and proprioceptive technique (Wilbarger & Wilbarger, 2002a). The third step in the overall technique is termed the Wilbarger protocol, and there are inconsistencies in its description. It has been proposed to consist of deep pressure brushing, joint compressions, and a sensory diet (Lancaster, et al., 2016) or it may be deep pressure brushing, joint compressions, and an oral swipe (Therapeutic brushing techniques, 2016). When the protocol includes the oral swipe for oral defensiveness, the full name for the technique is used. The discrepancies in the description of the protocol are confusing, as a sensory diet is proposed as a part of the larger three-step process. Sensory diet is a term coined by Patricia Wilbarger to describe personalized in-home interventions that incorporate various sensory input into daily routines in order to positively impact functional abilities (Lancaster, et al., 2016; Wilbarger & Wilbarger, 2002b). A special Therapressure brush is required for the deep pressure brushing step of the protocol (Wilbarger brushing and joint compressions, 2016). In

addition, the Wilbargers state that formal training is required to perform the therapy accurately (Wilbarger brushing and joint compressions, 2016; Wilbarger & Wilbarger, 2002a). The Wilbargers recommend that the protocol be done every 90 to 120 minutes for a period of 2 to 8 weeks, depending on the individual (as cited in Lancaster, et al., 2016; Wilbarger & Wilbarger, 2002a).

In summary, The Wilbarger Deep Pressure and Proprioceptive Technique and the Oral Tactile Technique is a specific sensory integration therapy technique. It has its basis in sensory processing disorders, was recently developed by Patricia and Julia Wilbarger, and has a specific protocol that must be followed when implementing it into practice. However, there are discrepancies in the three steps of the protocol.

References

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- Wilbarger, J., & Wilbarger, P. (2002b). The Wilbarger approach to treating sensory defensiveness. In A. C. Bundy, S. J. Lane, & E. A. Murray (Eds.), *Sensory integration: Theory and practice* (2nd ed., pp. 335-338). Philadelphia, PA: F. A. Davis Company

Background learning paper two.

This EBP project will explore the Wilbarger Deep Pressure and Proprioceptive Technique and Oral Tactile Technique, also known as the Wilbarger Protocol. Background learning will explore how this intervention was developed, recommended diagnoses for this intervention, how to implement the technique, and reported effects.

The Wilbarger Deep Pressure and Proprioceptive Technique (DPPT) and Oral Tactile Technique (OTT) were developed by Patricia Wilbarger (Therapeutic brushing techniques, 2016). Wilbarger is an occupational therapist with reported expertise in sensory defensiveness (Therapeutic brushing techniques, 2016). The DPPT/OTT is one component of Wilbarger's approach to treating sensory defensiveness (Wilbarger & Wilbarger, 2002). Wilbarger and her daughter, Julia Wilbarger, co-founded the Avanti sensory integrative camps for children in the 1980s and have advocated for sensory integration treatment and research (Avanti Educational Programs Inc., n.d.a). They continue to provide training to therapists in the Wilbarger approach (Wilbarger & Wilbarger, 2002).

The Wilbarger Protocol was developed specifically for individuals with sensory defensiveness (Therapeutic brushing techniques, 2016; Wilbarger & Wilbarger, 2002). People with sensory defensiveness are believed to react to non-noxious sensory stimuli in a negative way (Baranek, Foster, & Berkson, 1997). Tactile defensiveness is proposed as a category of sensory defensiveness specifically involving a person's sense of touch (Baranek et al., 1997). LeDoux suggested that sensory defensiveness may be caused by a central nervous system error in interpreting whether sensory stimuli is noxious (as cited in Wilbarger & Wilbarger, 2002, p. 335). It is claimed that individuals with sensory defensiveness may respond to sensory stimuli with anxiety, aggression, fright, sensory-seeking behavior, or evasion (Avanti Educational

Programs Inc., n.d.b). Wilbarger estimated 15% of the population may have sensory defensiveness (Avanti Educational Programs Inc., n.d.b). Although the Wilbargers maintain that the approach is only appropriate for those with sensory defensiveness, there is evidence that occupational therapists use it for individuals with other diagnoses as well (Lancaster, Zachry, Duck, Harris, Page, & Sanders, 2016).

Wilbarger's technique is comprised of three steps: education, sensory diet, and DPPT/OTT (Wilbarger & Wilbarger, 2002). In the first step, the therapist assesses the client and provides an explanation for defensive behaviors to the client and caregivers; education can give the client and caregivers awareness of how sensory defensiveness impacts their lives while providing a set of behaviors to focus on when creating interventions. For the second step, a sensory diet is recommended to incorporate sensory activities into a person's routines and daily activities. It also includes adapting the person's environment to create smooth transitions and reduce stressors. The final step provides the client with deep pressure and proprioception (Wilbarger & Wilbarger, 2002). Therapists use a specific Therapressure brush designed by the Wilbargers to brush the arms, legs, hands, and feet of the client, stimulating nerve endings in the skin (Therapeutic brushing techniques, 2016; Wilbarger & Wilbarger, 2002). Next, deep pressure is applied to the arms, legs, hands, feet, and back and the joints of the trunk, legs, and arms are compressed (Avanti Educational Programs Inc., n.d.b; Wilbarger & Wilbarger, 2002). The technique is done every 90 – 120 minutes each day for two to eight weeks (Lancaster et al., 2016; Wilbarger & Wilbarger, 2002). The Wilbargers stress that therapists need to receive direct training in order to safely and effectively use their approach (Lancaster et al., 2016; Wilbarger & Wilbarger, 2002). Evidence suggests there are therapists using this approach who have not have received formal training (Lancaster et al., 2016).

There are several proposed benefits from using the Wilbarger Protocol. The main aim of the approach is to use repeated sensory stimulation to improve behavioral regulation (Wilbarger & Wilbarger, 2002). The approach claims to improve the ability of the central nervous system to accurately interpret stimulation of the peripheral nervous system, improving an individual's ability to self-regulate (Therapeutic brushing techniques, 2016). Additionally, the Wilbarger Protocol is believed to help clients to learn to transition between activities more easily (Therapeutic brushing techniques, 2016). Symptoms of sensory defensiveness, such as avoiding touch and becoming agitated over the tag in a shirt also are claimed to be reduced (Therapeutic brushing techniques, 2016).

The background summary of the Wilbarger Protocol shows it is a widely used technique that claims to be effective in helping individuals with sensory defensiveness. Understanding the background of the technique, symptoms of sensory defensiveness, how the Wilbarger Protocol is implemented, and its claimed effects will be important information moving forward with the project.

References

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Background learning paper three.

The understanding of Autism Spectrum Disorder (ASD) is a growing body of research. One specific area of research focuses on sensory and manipulative needs of people with ASD. This Evidence-Based Practice project will focus on the effectiveness of the Wilbarger Protocol (Deep Pressure and Proprioceptive Technique and Oral Tactile Technique) as an intervention for people with ASD. Background learning on this topic included understanding ASD and Sensory Processing Disorder (SPD), protocol for the Wilbarger, and the role of an Occupational Therapist (OT) in this intervention.

The Wilbarger Protocol was developed to treat symptoms of sensory defensiveness. Sensory defensiveness has been defined as an avoidance response to sensations of any modality (Wilbarger & Wilbarger, 2002). These abnormal responses to sensation are claimed to be disrupt an individual's daily life but can be addressed through repetitive sensory experiences or sensory integration (Wilbarger & Wilbarger, 2002). Sensory integration proposed that teaching individuals to interpret sensations differently will optimize occupational performance (Mori, 2015). Individuals who are believed to benefit from sensory integration therapy are those that experience sensory integration disorders (Mori, 2015) and sensory processing disorders (Bhandari, 2016), although it is unclear how these conditions vary, if at all. Sensory processing disorder (SPD) was formerly known as sensory integration dysfunction (Bhandari, 2016). SPD is not currently recognized as a distinct disorder by some professionals (Bhandari, 2016; What is sensory processing disorder?, 2016). It is believed that many children with SPD do not exhibit symptoms of ASD but some children with ASD do exhibit symptoms of SPD (What is sensory processing disorder?, 2016). SPD has three proposed subtypes: sensory modulation disorder, sensory based motor disorder, and sensory discrimination disorder (What is sensory processing

disorder?, 2016). Although these three subtypes differ in symptoms, all of them can allegedly benefit from the Wilbarger Approach.

The Wilbarger Protocol was developed by Patricia and Julia Wilbarger (Wilbarger & Wilbarger, 2002) to decrease sensory defensive symptoms in individuals with sensory defensiveness. There are three steps in the Wilbarger Approach: education for the client and caregiver, implementation of a sensory diet into daily routines, and a professionally guided program that may include deep pressure “brushing” (Wilbarger & Wilbarger, 2002). Education begins with an assessment to increase self-awareness of specific sensory needs (Wilbarger & Wilbarger, 2002). A sensory diet is proposed to promote integration of sensations into daily life, reduce defensive behaviors, and adapt the environment to support occupational performance (Wilbarger & Wilbarger, 2002). The sensory diet is summarized in a home program designed around the recipient to meet their individual goals, preferences, and limitations (Wilbarger & Wilbarger, 2002). Deep Pressure and Proprioceptive Technique (DPPT), joint compressions and the Oral Tactile Technique (OTT) is provided using a specific surgical brush; deep pressure is applied to the hands, arms, back, legs, and feet, but never to the stomach, face, groin, or buttocks (Wilbarger & Wilbarger, 2002). The recipient then receives joint compressions in the shoulders, elbows, hands, hips, and legs to provide proprioceptive input (Wilbarger brushing and joint compressions, 2016). OTT is described as an additional technique that can be administered to reduce oral defensiveness or disruptions in the suck-swallow-breathe synchrony (Wilbarger & Wilbarger, 2002). Claimed changes include changes in behavior, physical nature, and social and emotional changes.

The Wilbarger Protocol is a sensory manipulative approach focused on treating sensory defensiveness commonly seen in people who have ASD. Components of the Wilbarger Protocol

(Deep Pressure and Proprioceptive Technique and Oral Tactile Technique) are commonly used without other components, which may or may not be effective in treating sensory defensiveness.

References

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Evidence Searches.

Individual Assignment: Library Database

Library Database: PubMed

Preparing for Search Process:

- Occupational therapy is a MeSH heading. There were two terms for occupational therapy, but the general term seemed the best for this search process.
- Autism Spectrum Disorder(s) is a MeSH heading. Searching ASD was not a clear search term, as it did not lead to Autism Spectrum Disorder definitions in this database.
- Pediatrics is a MeSH headings.
- The Wilbarger Deep Pressure and Proprioceptive Technique and Oral Tactile Technique is not a MeSH term, and is not found on the database at all, however Wilbarger Protocol and Wilbarger yielded results during the search process.
- Sensory integration/Sensory therapy are not MeSH terms, but therapy is a MeSH subheading.
- Subject Headings or Indexing Terms of the Database:
 - Therapeutics>Rehabilitation>Occupational therapy
 - Mental disorders>Neurodevelopmental disorders>Child Developmental Disorders, Pervasive>Autism Spectrum Disorders
 - Health occupations>Medicine>Pediatrics
 - Subheadings category>therapy
- Final Concept or Term List for the Database:
 - "therapy" [Subheading], "Occupational Therapy"[Mesh], "Autism Spectrum Disorder"[Mesh], "Pediatrics"[Mesh], Wilbarger protocol, Wilbarger, brushing, sensory integration therapy, sensory defensiveness
- Database filters to be tried: none
- Boolean Logic Terms to be tried: ‘AND’

Summarizing a Strategic Search Process

Filters/Years	Keywords	Total Yield/Relevant Hits	Date
None Years: unlimited	Wilbarger	16/4 (Kimball et al., 2007) (Kinnealey, Oliver, Wilbarger, 1995) (Segal, & Beyer, 2006) (Withersty, Stout, Mogge, Nesland, & David Allen, 2005)	November 13, 2016
None Years: unlimited	Wilbarger AND therapy	7/4 (Kimball et al., 2007) (Kinnealey, Oliver, & Wilbarger, 1995) (Segal, & Beyer, 2006)	November 13, 2016

		(Withersty, Stout, Mogge, Nesland, & David Allen, 2005)	
None Years: unlimited	"occupational therapy"[MeSH Terms] AND Wilbarger[All Fields]	3/2 (Kimball et al., 2007) (Segal, & Beyer, 2006)	November 13, 2016
None Years: unlimited	"Autism Spectrum Disorder"[Mesh] AND Wilbarger[All Fields]	0	November 13, 2016
None Years: unlimited	("Autism Spectrum Disorder"[Mesh]) AND sensory integration therapy	8/4 (Baum, Stevenson, & Wallace, 2015a) (Baum, Stevenson, & Wallace, 2015b) (Leong, Carter, & Stephenson, 2015) (Watling & Hauer, 2015)	November 13, 2016
None Years: unlimited	"autism spectrum disorder"[MeSH Terms] AND "brushing"[All Fields])	1/0	November 13, 2016
None Years: unlimited	(occupational therapy[MeSH Terms]) AND autism spectrum disorder[MeSH Terms]	15/2 (Leong, Carter, & Stephenson, 2015) (Watling & Hauer, 2015)	November 13, 2016
None Years: unlimited	Sensory defensiveness	42/2 (Kimball et al., 2007) (Pfeiffer, Kinnealey, Reed, & Herzberg, 2005)	November 13, 2016

Summary of 5 best Research Articles:

Kinnealey, M., Oliver, B., & Wilbarger P. (1995). A phenomenological study of sensory

defensiveness in adults. *The American Journal of Occupational Therapy*, 49, 444-451.

This article describes the experiences of five adults who are defensive toward sensations of touch, movement, vision, smell, sound, and taste that most people consider harmless. It also describes the strategies that they use when they perceive environmental stimuli to be aversive. These coping strategies are avoidance, predictability, mental preparation, talking through, counteraction, and confrontation. A conceptual framework is presented to enhance understanding and guide further study of sensory defensiveness in adults.

Leong, H. M., Carter, M., & Stephenson, J. (2015). Systematic review of sensory integration therapy for individuals with disabilities: Single case design studies. *Research in Developmental Disabilities, 47*, 334-351. doi: 0.1016/j.ridd.2015.09.022

Sensory integration therapy (SIT) is a controversial intervention that is widely used for people with disabilities. Systematic analysis was conducted on the outcomes of 17 single case design studies on sensory integration therapy for people with, or at-risk of, a developmental or learning disability, disorder or delay. An assessment of the quality of methodology of the studies found most used weak designs and poor methodology, with a tendency for higher quality studies to produce negative results. Based on limited comparative evidence, functional analysis-based interventions for challenging behavior were more effective than SIT. Overall the studies do not provide convincing evidence for the efficacy of sensory integration therapy. Given the findings of the present review and other recent analyses it is advised that the use of SIT be limited to experimental contexts. Issues with the studies and possible improvements for future research are discussed including the need to employ designs that allow for adequate demonstration of experimental control.

Pfeiffer, B., Kinnealey, M., Reed, C., & Herzberg, B. (2005). Sensory modulation and affective disorders in children and adolescents with Asperger's disorder. *The American Journal of Occupational Therapy, 59*, 335-345.

Objective: The purpose of the study was to determine if there were significant relationships between dysfunction in sensory modulation, symptoms of affective disorders, and adaptive behaviors in children and adolescents with Asperger's disorder between 6 and 17 years of age. **Method:** Parents of 50 children and adolescents between 6 and 17 years of age diagnosed with Asperger's disorder based on the Diagnostic and Statistical Manual of Mental Disorders-IV criteria completed the (a) Sensory Profile for children 6 to 10 years of age or the Adolescent/Adult Sensory Profile for adolescents 11 to 17 years of age; (b) the Adaptive Behavior Assessment System: Parent Version; (c) Revised Children's Manifest Anxiety Scale Adapted Parent's Version; and (d) the Children's Depression Inventory Adapted Parent's Version. Descriptive statistics and the Pearson product-moment coefficient of correlation calculations were used for data analysis.

Results: The results indicated that there were significantly strong positive correlations between sensory defensiveness and anxiety ($r = .476, p = .000$) in children and adolescents with Asperger's disorder. There were also significant relationships between symptoms of depression and hyposensitivity in the total group ($r = .214, p = .05$) and the older group ($r = .492, p = .027$). There were no significant relationships between depression and overall adaptive behavior ($r = -.243, p = .089$) or anxiety and overall adaptive behavior ($r = -.108, p = .455$). Significantly strong inverse relationships were found between the specific adaptive behaviors of functional academics, leisure, social skills, and symptoms of depression. Functional academics were also

significantly inversely related to anxiety. Specifically, sensory hyper- and hypersensitivity were significantly inversely related to community use and social skills.

Conclusion: The data supports positive relationships between anxiety and sensory defensiveness in all age ranges and a relationship between depression and hyposensitivity in older children. Stronger inverse relationships were apparent between specific adaptive behaviors including: (a) symptoms of depression and functional academics, leisure, social skills; (b) anxiety and functional academics; and (c) both sensory hyper- and hyposensitivity and community use and social skills. In this study, as the symptoms of affective disorders increased in children and adolescents with Asperger's disorder, the functional performance in the adaptive behaviors of functional academics and social skills appeared to decrease. Performance in the adaptive behaviors of community use and social skills appeared to decrease as symptoms of dysfunction in sensory modulation increase. Further research is necessary to determine the impact of treatment for dysfunction on sensory modulation on affective disorders and performance in specific adaptive behaviors

Segal, R., & Beyer, C. (2005). Integration and application of a home treatment program: A study of parents and occupational therapists. *The American Journal of Occupational Therapy*, 60, 500-510.

The purpose of this article is to describe parental adherence to home treatment programs. A qualitative exploratory study with six parents and eight occupational therapists who used the brushing and compression technique (Wilbarger Protocol) was conducted. Participants were interviewed one or two times, exploring their experiences in adhering to the protocol. Data analysis focused on facilitators and hindrances to parental adherence and on occupational therapists' strategies used to encourage it. Parents identified their children's responses to brushing, its perceived efficacy, and interaction of the protocol with family daily schedules, as factors influencing their adherence. Occupational therapists identified only family daily schedules as influencing parental adherence. The findings are discussed in the context of the ecocultural theory of family accommodations.

Watling, R., & Hauer, S. (2015). Effectiveness of Ayres Sensory Integration® and sensory-based interventions for people with autism spectrum disorder: A systematic review. *The American Journal of Occupation*, 69, 1-8A. doi: 10.5014/ajot.2015.018051.

This systematic review examines the literature published from January 2006 through April 2013 related to the effectiveness of Ayres Sensory Integration® (ASI) and sensory-based interventions (SBIs) within the scope of occupational therapy for people with autism spectrum disorder to improve performance in daily life activities and occupations. Of the 368 abstracts screened, 23 met the inclusion criteria and were reviewed. Moderate evidence was found to support the use of ASI. The results for sensory-based methods were mixed. Recommendations include performing higher level studies with larger samples, using the Fidelity Measure in studies of ASI, and using carefully operationalized definitions and systematic methods in examination of SBIs.

Individual Assignment: Other Evidence Resources

Evidence Resources: AOTA Website (<https://www.aota.org/>)

Preparing for Search Process

- When researching general websites and sources for our background paper, I found multiple fact sheets on the AOTA website that I thought were helpful for learning about the Wilbarger protocol. Thus, I thought it would be a good idea to do a more extensive search of the website to make sure that I was not missing any other helpful sources.
- The main way to navigate through the website is by using the search box in the upper right hand corner.
- I used key words, like I did in the database search, to find articles and other sources on the website. However, I tried to be more broad in my search by using only one or two key words at a time, and AOTA does not use MeSH terms.
- Keywords to be used:
 - Wilbarger, Wilbarger brushing protocol, deep pressure technique, Autism Spectrum Disorder, sensory
- No filters were used

Documenting the Search Process

Keywords	Total Yield/Relevant Hits	Date
Wilbarger	3/0	November 16, 2016
Wilbarger brushing protocol	2/1 (Case-Smith & Schaaf, 2013)	November 16, 2016
Deep pressure techniques	47/2 (Case-Smith & Schaaf, 2013) (Conway, Kanics, Mohler, Giudici, & Wagenfeld, 2015)	November 16, 2016
Autism Spectrum Disorder	277/- Try to narrow focus	November 16, 2016
Autism Spectrum Disorder AND sensory	192/- Led me to important pages on the website that can be accessed through the home page menu: <ul style="list-style-type: none"> - Practice>Children & Youth>Autism resources - Practice>Children & Youth>Sensory Integration>SI Resources> 	November 16, 2016

	<p>- Practice>Children & Youth>Children & Youth EBP>Autism Spectrum Disorder> Sensory-based and Ayres Sensory Integration® (ASI®) Intervention</p>	
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Summary of best articles/sources:

Case-Smith & Schaaf. (2013). *Response to systematic review of sensory integration therapy for autism spectrum disorders*. Retrieved from <https://www.aota.org>

- Provides synthesized information on eight different journal articles relating to sensory integration therapy and multi-sensory interventions.
- The authors of this article review another article, a systematic review published by Lang et al., 2012, and analyze the process and findings.
- The Lang et al., 2012 article reviewed eight research articles. All of the eight journal articles that were reviewed provide research on the ASD pediatric population, which is our target population.
- Researching these eight journal articles further could be very beneficial for our research.
- Below are the eight articles and each article’s main research question.
 - Ayres & Tickle (1980)
 - What are the effects of SI-OT on response to sensory input in children with ASD and sensory processing problems?
 - Case-Smith & Bryan (1999)
 - What are the effects of SI-OT on play behaviors, non- engaged behaviors, and social interaction in children with ASD?
 - Linderman & Stewart (1999)
 - What are the effects of SI-OT on functional behavior in children with ASD and hypersensitivity?
 - Pfeiffer et al. (2011)
 - What are the effects of Ayres sensory integration® on individualized goals, sensory processing, and social responsiveness in children with ASD?
 - Smith et al. (2005)
 - What is the effect of SI-OT on self- stimulating behaviors in children with pervasive developmental disorder (PDD) and mental retardation (MR)?
 - Watling & Deitz (2007)
 - What is the effect of SIT on task engagement in children with ASD?
 - Fazlioglu & Baran (2008)
 - What is the effect of sensory-based treatment on sensory and motor behavior in children with ASD?
 - Thompson (2011)
 - What is the effect of child interaction in a multi-sensory environment?

2) The tab “practice”, which is found on the AOTA website homepage, provides links to many helpful fact sheets, informative handouts, evidence-based research findings, occupational therapy guides, and other things. While there is not one specific link to be noted here, this is a resource that should be used when looking for general information on occupational therapists roles when working with children with ASD, general information on Autism, and definitions and descriptions of sensory integration therapy. Many of the sources on this website reference sensory integration therapy, and while that is not the specific protocol we are researching, it may relate. Unfortunately, there were not any specific handouts/links/articles for the Wilbarger Protocol.

Individual Assignment: Library Database

Library Database: CINAHL

Preparing for Search Process:

- Since I discovered in background learning that there is limited research on Wilbarger’s Deep Pressure and Proprioceptive Technique, I will start searching broadly and then begin to narrow my focus as needed.
- There have been two names used for this intervention: Wilbarger’s Deep Pressure and Proprioceptive Technique and The Wilbarger Brushing Protocol. I will use both in my search.
- As suggested in a CINAHL tutorial video, I will use both the general search term box and subject headings to achieve the best results in my search.
- Term list to be used:
 - “deep pressure and proprioceptive technique”, “Wilbarger brushing protocol” , (MH “Sensory Defensiveness/TH/RH/ED”),
- Database Filters: I will add the filter “all children” when needing to narrow my search.
- Boolean Logic terms to be tried: I will use “OR” to combine the two names of the intervention and “AND” when combining the intervention with diagnosis.

Summarizing the Strategic Searching Process:

Filters/Years	Keywords	Total Yield/ Relevant Hits	Date
None Years: Unlimited	“deep pressure and proprioceptive technique”	3/2 Bhopti, A. & Brown, T., 2013 Benson, J., Beeman, E., & Smitsky, D., 2011	November 12, 2016
None Years: Unlimited	“Wilbarger protocol” OR wilbarger brushing protocol OR “wilbarger brushing protocol” OR “deep pressure and proprioceptive technique”	6/3: “ Lancaster, S., Zachry, A., Duck, A., Harris, A., Page, E., Sanders, J., 2016 Kimball et al., 2007 Segal, R. & Beyer, C., 2006	November 12, 2016
None Years: Unlimited	(MH “Sensory Defensiveness/ED/RH/TH”)	24/0 Need more specifics	November 12, 2016
None Years: Unlimited	“sensory defensive*” AND “deep pressure”	2/2	November 13, 2016

		Bhopti, A. & Brown, T., 2013 Bhopti, A., 2011	
Age: All children Subject Major Heading: sensory defensiveness Years: Unlimited	(MM “Sensory Defensiveness”) AND “sensory brushing”	53/5 Foss, A., Swinth, Y., McGruder, J., Tomlin, G., 2003 Baranek, G. T., Foster, L. G., Berkson, G., 1997 Bhopti, A., Brown, T., 2013 Nimbalkar, E. 2015	November 13, 2016
Age: All children Years: Unlimited	“sensory diet” OR “sensory integration” AND “sensory defensiveness”	18/1 Nimbalkar, E., 2015	November 13, 2016

Summary of 5 Best Research Articles:

Benson, J. D., Beeman, E., Smitsky, D., & Provident, E., (2011). The deep pressure and proprioceptive technique (dppt) versus nonspecific child-guided brushing: a case study. *Journal of Occupational Therapy, Schools, & Early Intervention, 4*(3-4), 204-214. doi: 10.1080/19411243.2011.629536

Therapeutic interventions with a somatosensory component, such as deep pressure brushing or joint compressions, have been suggested for use with children with sensory modulation disorders (Royeen & Lane, 1991; Royeen, C. and Lane, S. 1991. “Tactile processing and sensory defensiveness”. In *Sensory integration: Theory and practice*, Edited by: Fisher, A., Murray, E. and Bundy, A. 108–133. Philadelphia, PA: F. A. Davis Company. A. (Eds; Wilbarger & Wilbarger, 2001; Wilbarger, P. and Wilbarger, J. 2001. *Sensory defensiveness: A comprehensive treatment approach*, Van Nuys, CA: Aventa Educational Programs.). This case study describes the use of brushing as an intervention technique with two children with autism. One participant was administered the deep pressure proprioceptive technique, and the other participant utilized a nonspecific brushing program.

Bhopti, A., & Brown, T. (2013). Examining the Wilbargers’ deep pressure and proprioceptive technique for treating children with sensory defensiveness using a multiple-single-case study approach. *Journal of Occupational Therapys, Schools, & Early Intervention, 6*(2), 108-130, doi: 10.1080/19411243.2013.810944

The purpose of this study was to examine the Wilbargers' deep pressure and proprioceptive technique in children presenting with sensory defensiveness and investigate parent/carer perspectives. A prospective multiple-single-case design was used with convenient sampling. Five children eligible for early childhood intervention services were recruited. Three tools were used to collect data: the Sensory Profile, sensory interviews, and parent/carer questionnaires. Goal Attainment Scaling (GAS) was used as an outcome measure. The results indicated a significant statistical difference in Sensory Profile and GAS scores. The parent/carer questionnaires indicated that it was very important for them to reduce their child's sensory defensive behaviours, and four out of five parents reported that the intervention was effective for their child.

Foss, A., Swinth, Y., McGruder, J., Tomlin, G., (2003). Sensory modulation dysfunction and the Wilbarger protocol: An evidence review. *OT Practice*, 8(12), CE-1.

Occupational therapists have used brushing as an intervention technique for many years. More recently, the Wilbarger Protocol has been used by pediatric occupational therapists who use a sensory integrative framework within occupational therapy. Specifically, this protocol has been recommended for use with children who have sensory modulation dysfunction (SMD) with manifestations of overresponsiveness to sensory stimuli, also called sensory defensiveness. This article reviews relevant literature, provides an overview of some of the issues surrounding the application of this intervention technique, and provides strategies for applying this material to clinical practice. Implications for future research are discussed.

Kimball, J. G., Lynch, K. M., Stewart, K. C., Williams, N. E., Thomas, M. A., & Atwood, K. D. (2007). Using salivary cortisol to measure the effects of a Wilbarger protocol-based procedure on sympathetic arousal: A pilot study. *The American Journal of Occupational Therapy*, 61(4), 406-413. doi: 10.5014/ajot.61.4.406

OBJECTIVE. This study investigated changes in salivary cortisol, the stress hormone, after administration of a procedure based on the Wilbarger protocol to children diagnosed with sensory defensiveness (SD), a type of sensory modulation dysfunction.

METHOD. Using a single-subject design across participants, we studied 4 boys with SD ages 3 to 5 years. Each participant completed four sessions consisting of the collection of a saliva sample, administration of a procedure based on the Wilbarger protocol, 15 min of quiet neutral activities to allow time for any changes in cortisol level to manifest in the saliva, and the second collection of saliva. Saliva samples were analyzed using enzyme-linked immunosorbent assay (ELISA).

RESULTS. Salivary cortisol levels in all participants changed after each of four applications of a procedure based on the Wilbarger protocol. The cortisol levels of 2 children whose levels were relatively higher on pretest decreased at each posttest. The levels of 1 child whose cortisol was higher on pretest three times decreased those three times and increased the one time the pretest cortisol was lower. The levels of 1 child who had the lowest cortisol levels of any of the children increased each time. Therefore, in all participants, cortisol moved in the direction of modulation.

CONCLUSION. In these 4 boys, a procedure based on the Wilbarger protocol modulated cortisol levels toward a middle range. This pilot study indicates that there is an association between sympathetic nervous system response and the Wilbarger protocol-based procedure, as indicated by salivary cortisol levels.

Lancaster, S., Zachry, A., Duck, A., Harris, A. Page, E., Sanders, J. (2016). Delivery of the

Wilbarger protocol: A survey of pediatric occupational therapy practitioners. *Journal of Occupational Therapy, Schools, & Early Intervention*, 9(3), 281-289. doi:

<http://dx.doi.org/10.1080/19411243.2016.1169243>

The Wilbarger Therapressure Program is a commonly used treatment approach utilized by occupational therapy professionals for the treatment of sensory defensiveness. The purpose of the current study was to investigate occupational therapy practitioners' sources of training in the administration of Wilbarger Therapressure Program, the uniformity of administration in practice, and the diagnoses for which therapists recommend this treatment approach. Occupational therapists from across the United States participated in an online survey investigating specifics related to training and implementation of the brushing protocol. A total of 153 respondents reported using the Wilbarger Therapressure Program in practice. Almost half of the respondents received their education on the Therapressure program by attending the workshop offered by the Wilbargers. Forty eight percent of survey participants reported learning how to administer the Therapressure program by participating in hands-on training provided by another occupational therapy practitioner, 39% by attending the course taught by the Wilbargers, 7% by information obtained through word of mouth from another occupational therapy practitioner, 3% by information obtained through online research, and 3% by other means. The results of this study reveal that a variety of approaches exist related to the training and implementation of the protocol. It is the responsibility of all occupational therapy practitioners to obtain the proper training prior to recommending and implementing the Therapressure program. Because a standardized protocol for implementation of the protocol has not been published, the optimal means of training is for practitioners to attend the Wilbarger workshop.

Individual Assignment: Other Evidence Resources

Evidence Resource: Google Scholar

Preparing for Search Process:

- I have used Google Scholar in the past and have found it to be a useful resource for finding information.
- My search on CINAHL yielded limited results and I thought I may have more success using Google Scholar.
- Many relevant sources found were already found through CINAHL.

Filters/Years	Keywords	Total Yield/Relevant Hits	Date
None Years: Unlimited	Wilbarger deep pressure and proprioceptive technique	242/? Bhopti, A., Brown, T., 2013 Kimball et al., 2007 Benson, J., Beeman, E., & Smitsky, D., 2011 Weeks, S., Boshoff, K., Stewart, H., 2012	November 14, 2016
None Years: Unlimited	Allintitle: wilbarger protocol	9/4 Weeks, S., Boshoff, K., Stewart, H., 2012 Kimball et al., 2007 Foss, A., Swinth, Y., McGruder, J., Tomlin, G., 2003 Lancaster, S., Zachry, A., Duck, A., Harris, A., Page, E., Sanders, J., 2016	November 14, 2016
None Years: Unlimited	“sensory defensiveness” AND “wilbarger protocol”	111/2 Foss, A., Swinth, Y., McGruder, J., Tomlin, G., 2003 Kimball et al., 2007	November 14, 2016

		Davis, T. N., Durand, S., Chan, J. M., 2010	
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Summary of Best Research Articles:

Davis, T. N., Durand, S., Chan, J. M., (2010). The effects of a brushing protocol on stereotypical

behavior. *Research in Autism Spectrum Disorders*, 5(3), 1053-1058. doi:

<http://dx.doi.org/10.1016/j.rasd.2010.11.011>

In this study we analyzed the effects of a brushing protocol on stereotyped behavior of a young boy with autism. First, a functional analysis was conducted which showed that the participant's stereotypy was maintained by automatic reinforcement. Next, the Wilbarger Protocol, a brushing intervention, was implemented. An ABA design was implemented in which the participant was observed during four phases: (a) baseline, prior to the administration of the brushing protocol; (b) week 3 of implementation of the brushing protocol; (c) week 5 of implementation; and (d) 6 months after the discontinuation of the brushing protocol. Findings suggest that the brushing protocol had no marked affect on levels of stereotypy.

Weeks, S., Boshoff, K., Stewardt, H., (2012). Systematic review of the effectiveness of the

Wilbarger protocol with children. *Pediatric Health, Medicine, and Therapeutics*, 3, 79-89.

Retrieved from:

https://www.researchgate.net/profile/Kobie_Boshoff/publication/284271802_Systematic_review_of_the_effectiveness_of_the_Wilbarger_Protocol_with_children/links/570c786808ae8883a1ffee10.pdf

Background: Sensory processing disorders have an estimated prevalence of 5%–10% in children without disability and 40%–88% in children with disability. A subtype of sensory processing disorder is sensory overresponsivity, which can result in fear, irritability, aggression, or avoidance behaviors in children. The Wilbarger protocol is the most prescriptive program used to treat sensory overresponsivity in children aged 2–12 years. Strong anecdotal evidence suggests that the Wilbarger protocol successfully reduces challenging behavior in children with sensory overresponsivity. The aim of this systematic review was to identify and appraise the existing evidence for the effectiveness of the Wilbarger protocol with children aged 0–18 years

Individual Assignment: Library Database

Library Database: OT Search

Preparing for Search Process:

- OT Search is provided by AOTA and AOTF and is used primarily as an index to the American Journal of Occupational Therapy but is used in addition to access other books and periodicals at AOTA.
- No need to link your search to OT as only articles written by OT practitioners or of decided interest to OTs are included.
- Power Search brings up various search window boxes for complicated searches.
- Because this source is a bibliographic resource, to see if SCU has access to that resource you must copy the title of the journal and search for it on the SCU library website. Through that website, you can follow through to find that issue and article.
- Some articles may have a “Find It” button that will do that work for you.
- You can keep a resource for further review by clicking “Keep.”
- By clicking on the “Kept” tab after keeping articles, you can email them to yourself or even have them formatted into APA references.
- References go back to 1910.
- “Indexed Items” allows you to see a list of most of the journals and newsletters and the dates included in OT Search. Additionally, the Wilma L. West Library’s collection of monographs, proceedings, reports, doctoral dissertations, and master’s theses are included in OT Search.
- “OT Thesaurus” is an extensive document showing the MeSH terms used in OT Search.
- Subject headings or indexing terms of OT Search database:
 - Wilbarger Protocol > Wilbarger
 - Deep Pressure Proprioceptive Technique > Brushing > Sensorimotor Therapy
 - Autism > Autism Spectrum Disorder > Autistic Disorder
 - Children > Pediatrics

Summarizing a Strategic Search Process

Filters/Years	Keywords	Total Yield/Relevant Hits	Date
Journal Article Years: Unlimited	“Wilbarger” AND “sensorimotor therapy” [MeSH]	6/4 Benson et al., 2011 Foss, 2003 Segal & Beyer, 2006 Sparkes, 2002	November 16, 2016
Journal Article Years: Unlimited	“autistic disorder” [MeSH] AND “sensorimotor therapy” [MeSH] AND “Wilbarger”	1/1 Benson et al., 2011	November 16, 2016
Journal Article Years: Unlimited	“autistic disorder” [MeSH] AND “sensorimotor	36/12 Lancaster, 2016 Bhohti & Brown, 2013	November 16, 2016

	therapy” [MeSH] OR “Wilbarger”	Benson et al., 2011 Kimball et al., 2007 Segal & Beyer, 2006 Foss, 2003 Baranek, 2002 Sparkes, 2002 Stagnitti et al., 1999 Wilbarger, 1998 Wilbarger, 1995 McClure & Holtz-Yotz, 1991	
Journal Article Years: Unlimited	“autistic disorder” [MeSH] AND “Wilbarger”	2/1 Benson et al., 2011	November 16, 2016
Journal Article Years: Unlimited	“autistic disorder” [MeSH] AND “pediatrics” [MeSH] AND “Wilbarger”	0/0	November 16, 2016
Journal Article Years: Unlimited	“autistic disorder” [MeSH] AND “pediatrics” [MeSH] AND “Wilbarger” OR “sensorimotor therapy” [MeSH]	131/- Try to narrow focus	November 16, 2016
Journal Article Years: Unlimited	“autistic disorder” [MeSH] AND “pediatrics” [MeSH] AND “sensorimotor therapy” [MeSH]	1/0	

Summary of 5 Best Research Articles

Bhopti, A. & Brown, T. (2013). Examining the Wilbargers’ deep pressure and proprioceptive technique for treating children with sensory defensiveness using a multiple-single-case study approach. *Journal of Occupational Therapy, Schools, & Early Intervention*, 6(2), 108-130. doi: 10.1080/19411243.2013.810944

The purpose of this study was to examine the Wilbargers’ deep pressure and proprioceptive technique in children presenting with sensory defensiveness and investigate parent/carer perspectives. A prospective multiple-single-case design was used with convenient sampling. Five children eligible for early childhood intervention services were recruited. Three tools were used to collect data: the Sensory Profile, sensory interviews, and parent/carer questionnaires. Goal Attainment Scaling (GAS) was used as an outcome measure. The results indicated a significant

statistical difference in Sensory Profile and GAS scores. The parent/carer questionnaires indicated that it was very important for them to reduce their child's sensory defensive behaviours, and four out of five parents reported that the intervention was effective for their child.

Kimball, J., Lynch, K., Stewart, K., Williams, N., Thomas, M., & Atwood, K. (2007). Using salivary cortisol to measure the effects of a Wilbarger protocol-based procedure on sympathetic arousal: A pilot study. *The American Journal of Occupational Therapy*, *61*(4), 4067-413.

This study investigated changes in salivary cortisol, the stress hormone, after administration of a procedure based on the Wilbarger protocol to children diagnosed with sensory defensiveness (SD), a type of sensory modulation dysfunction. Using a single-subject design across participants, we studied 4 boys with SD ages 3 to 5 years. Each participant completed four sessions consisting of the collection of a saliva sample, administration of a procedure based on the Wilbarger protocol, 15 minutes of quiet neutral activities to allow time for any changes in cortisol level to manifest in the saliva, and the second collection of saliva. Saliva samples were analyzed using enzyme-linked immunosorbent assay (ELISA). Salivary cortisol levels in all participants changed after each of four applications of a procedure based on the Wilbarger protocol. The cortisol levels of 2 children whose levels were relatively higher on pretest decreased at each posttest. The levels of 1 child whose cortisol was higher on pretest three times decreased those three times and increased the one time the pretest cortisol was lower. The levels of 1 child who had the lowest cortisol levels of any of the children increased each time. Therefore, in all participants, cortisol moved in the direction of modulation. In these 4 boys, a procedure based on the Wilbarger protocol modulated cortisol levels toward a middle range. This pilot study indicates that there is an association between sympathetic nervous system response and the Wilbarger protocol-based procedure, as indicated by salivary cortisol levels.

Segal, R., & Beyer, C. (2006). Integration and application of a home treatment program: A study of parents and occupational therapists. *American Journal of Occupational Therapy*, *60*, 500-510.

The purpose of this article is to describe parental adherence to home treatment programs. A qualitative exploratory study with six parents and eight occupational therapists who used the brushing and compression technique (Wilbarger Protocol) was conducted. Participants were interviewed one or two times, exploring their experiences in adhering to the protocol. Data analysis focused on facilitators and hindrances to parental adherence and on occupational therapists' strategies used to encourage it. Parents identified their children's responses to brushing, its perceived efficacy, and interaction of the protocol with family daily schedules, as factors influencing their adherence. Occupational therapists identified only family daily

schedules as influencing parental adherence. The findings are discussed in the context of the ecocultural theory of family accommodations.

Benson, J., Beeman, E., Smitsky, D., & Provident, I. (2011). The deep pressure and

proprioceptive technique (DPPT) versus nonspecific child-guided brushing: A case study.

Journal of Occupational Therapy, Schools & Early Intervention, 4, 204-214. doi:

10.1080/19411243.2011.629536

Therapeutic interventions with a somatosensory component, such as deep pressure brushing or joint compressions, have been suggested for use with children with sensory modulation disorders (Royeen & Lane, 1991; Wilbarger & Wilbarger, 2001). This case study describes the use of brushing as an intervention technique with two children with autism. One participant was administered the deep pressure proprioceptive technique, and the other participant utilized a nonspecific brushing program with the frequency guided by indicators from the child. Both children demonstrated improvements as indicated by school function assessment pre and post scores. The outcomes support the use of brushing in general as an intervention strategy to promote the development, participation, and occupational performance of a child with autism spectrum disorder and sensory defensiveness.

Baranek, G. (2002). Efficacy of sensory and motor interventions for children with Autism.

Journal of Autism and Development Disorders, 32(5), 397-422.

Idiosyncratic responses to sensory stimuli and unusual motor patterns have been reported clinically in young children with autism. The etiology of these behavioral features is the subject of much speculation. Myriad sensory- and motor-based interventions have evolved for use with children with autism to address such issues; however, much controversy exists about the efficacy of such therapies. This review paper summarizes the sensory and motor difficulties often manifested in autism, and evaluates the scientific basis of various sensory and motor interventions used with this population. Implications for education and further research are described.

Individual Assignment: Other Evidence Resources

Evidence Resource: Autism Society of Minnesota (www.ausm.org)

Preparing for Search Process:

- While reviewing the literature on DPPT, I was surprised that I found more information than previous searches yielded. Because it seemed more prevalent and understood in the Sensory Defensiveness community, I thought it would be important to look at the Autism Society of Minnesota to see what their level of understanding is.
- My goal for these searches is to find anything pertaining to sensory defensiveness (SD), sensory processing disorder, the Wilbarger Protocol, “brushing”, or Deep Pressure Proprioceptive Technique on the AuSM website.
- My rationale for this search relates to our PICO question; if the literature finds that sensory/manipulation, specifically DPPT, is successful for children with SD then they should be promoting it more for people with ASD.
 - Disclaimer: people with SD **do not** have to have ASD nor do people with ASD have to have SD; it is simply a correlation among the two conditions.
- Included in the table below are locations where information about SD/DPPT was found, location where information was not found that would be beneficial to add, and searches conducted to seek out more specific information.

Summarizing a Strategic Search Process

Tab/Search Phrase	Information Pertinent to Sensory/manipulation Therapies
About > What is Autism?	None; SD is common in people who have ASD. Understanding ASD in more depth would be beneficial for all.
Who Are You > Educator	None; information here would be beneficial because it would give some insight to different strategies used for calming. DPPT is supposed to be administered every two hours so educators understanding this intervention is crucial for success while student is in school.
Who Are You > Parent/Caregiver/Family	None; there is a section for links to AuSM programs and services that is not available yet. Information about SD/DPPT may fall under this category.
Services > Counseling and Consulting > Ask the Therapist	None; none of the published questions have anything related to search terms “sensory defensiveness” or “brushing.”
Resources > AuSM Bookstore > Amazon.com > Sensory Differences	There are a few children’s books in this category that talk about different sensory needs of children.
Classes > Training	None; this page pertains more to outside companies looking for training on how to interact with customers who have ASD or looking to hire someone with ASD.
Resources > Resource Directory	This page has so much information on it. It contains tabs that have different categories of resources: Guides and catalogs, recreation and leisure, community and support network, education resources, etc. Two links I found immediately when

	searching the page for the word “sensory” were a link for sensory friendly events and a link for sensory integration. Additional links will lead to businesses whose websites may provide more information on SD or DPPT.
Search: sensory	Businesses and companies centered around sensory needs.
Search: sensory defensiveness	None.
Search: deep pressure proprioceptive technique	None.
Search: deep pressure	Camp Wish List page asking for a donation of deep pressure games.
Search: brushing	None.

Summary of Five Best Research Articles

None.

Appraisal of Evidence

Initial Appraisal: Primary Research Studies.

Type of article	Overall Type: Primary Research study Specific Type: Case Study
APA Reference	Benson, J. D., Beeman, E., Smitsky, D., & Provident, E., (2011). The deep pressure and proprioceptive technique (dppt) versus nonspecific child-guided brushing: a case study. <i>Journal of Occupational Therapy, Schools, & Early Intervention</i> , 4(3-4), 204-214. doi: 10.1080/19411243.2011.629536
Abstract	Therapeutic interventions with a somatosensory component, such as deep pressure brushing or joint compressions, have been suggested for use with children with sensory modulation disorders (Royeen & Lane, 1991; Wilbarger & Wilbarger, 2001). This case study describes the use of brushing as an intervention technique with two children with autism. One participant was administered the deep pressure proprioceptive technique, and the other participant utilized a nonspecific brushing program with the frequency guided by indicators from the child. Both children demonstrated improvements as indicated by school function assessment pre and post scores. The outcomes support the use of brushing in general as an intervention strategy to promote the development, participation, and occupational performance of a child with autism spectrum disorder and sensory defensiveness.
Author (First Author)	Credentials: EdD, OTR/L Position and Institution: Occupational Therapy Faculty, Duquesne University Publication History in Peer-Reviewed Journals: some
Publication	Type of Publication: Peer-reviewed Journal Publisher: Taylor & Francis Inc. Other:
Date and Citation History	Date of publication: April 12, 2011 Cited by: 2
Stated Purpose or Research Questions	To determine the effectiveness of the deep pressure proprioceptive technique versus a nonspecific brushing program.
Author's Conclusion	“Both children demonstrated improvements as indicated by school function assessment pre and post scores. The outcomes support the use of brushing in general as an intervention strategy to promote the development, participation, and occupational performance of a child with autism spectrum disorder and sensory defensiveness.” p. 204
Overall Relevance to PICO	Overall Relevance to PICO: Strong Rationale: Study examined effectiveness of the intervention.
Overall Quality of Article	Overall Quality of Article: Moderate Rationale: Peer-reviewed journal, author has other research experience, small sample size (2), used reliable and valid testing measure (School Function Assessment)

Type of article	Overall Type: Primary Research Study Specific Type: Multiple-Single-Case Study
APA Reference	Bhopti, A., & Brown, T. (2013). Examining the Wilbargers’ deep pressure and proprioceptive technique for treating children with sensory defensiveness using a multiple-single-case study approach. <i>Journal of Occupational Therapy, Schools, & Early Intervention</i> , 6(2), 108-130, doi: 10.1080/19411243.2013.810944
Abstract	The purpose of this study was to examine the Wilbargers’ deep pressure and proprioceptive technique in children presenting with sensory defensiveness and investigate parent/carer perspectives. A prospective multiple-single-case design was used with convenient sampling. Five children eligible for early childhood intervention services were recruited. Three tools were used to collect data: the Sensory Profile, sensory interviews, and parent/carer questionnaires. Goal Attainment Scaling (GAS) was used as an outcome measure. The results indicated a significant statistical difference in Sensory Profile and GAS scores. The parent/carer questionnaires indicated that it was very important for them to reduce their child’s sensory defensive behaviours, and four out of five parents reported that the intervention was effective for their child.
Author (First Author)	Credentials: BScOT, MBMSc Position and Institution: Faculty, La Trobe University Publication History in Peer-Reviewed Journals: some
Publication	Type of Publication: Peer-reviewed Journal Publisher: Taylor & Francis Inc. Other:
Date and Citation History	Date of publication: August 16, 2013 Cited by: 5
Stated Purpose or Research Questions	“The purpose of this study was to examine the Wilbargers’ deep pressure and proprioceptive technique in children presenting with sensory defensiveness and investigate parent/carer perspectives.” (p. 108)
Author’s Conclusion	“In this study, four out of five participants reported significant changes to their everyday routines due to the marked reduction of the SD behaviors exhibited by their children. The results from this study appear to support the use of the DPPT with children presenting with SD. All the participants were part of an ECIS and received this treatment as part of their comprehensive FSSP. Parent/carer perspective was given utmost importance throughout the course of this study, and parents reported that they enjoyed receiving follow-up phone calls scoring the goals for their children. The parent/carer questionnaires indicated that it is very important for them to reduce their child’s SD behaviors. Four out of five parents reported that they felt the intervention was effective for their child. This fits with the principles of client-centered practice where therapists and clients (families) work together collaboratively. In summary, the findings of the study support the use of DPPT, but further ongoing investigations are needed.” (p. 128)
Overall Relevance to PICO	Overall Relevance to PICO: Strong Rationale: Study directly examined effectiveness of Wilbarger Protocol.
Overall Quality of Article	Overall Quality of Article: Moderate-Poor Rationale: Small sample size, parent biases could impact results, no control group, published in peer-reviewed journal, writer has other published articles.

Type of article	Overall Type: Primary Research Study Specific Type: ABA single-subject design
APA Reference	Davis, T. N., Durand, S., Chan, J. M., (2010). The effects of a brushing protocol on stereotypical behavior. <i>Research in Autism Spectrum Disorders</i> , 5(3), 1053-1058. doi: http://dx.doi.org/10.1016/j.rasd.2010.11.011
Abstract	In this study we analyzed the effects of a brushing protocol on stereotyped behavior of a young boy with autism. First, a functional analysis was conducted which showed that the participant's stereotypy was maintained by automatic reinforcement. Next, the Wilbarger Protocol, a brushing intervention, was implemented. An ABA design was implemented in which the participant was observed during four phases: (a) baseline, prior to the administration of the brushing protocol; (b) week 3 of implementation of the brushing protocol; (c) week 5 of implementation; and (d) 6 months after the discontinuation of the brushing protocol. Findings suggest that the brushing protocol had no marked affect on levels of stereotypy.
Author (First Author)	Credentials: PhD, BCBA Position and Institution: Assistant professional of educational psychology, Baylor University's School of Education Publication History in Peer-Reviewed Journals: extensive
Publication	Type of Publication: Scholarly, Peer-reviewed journal Publisher: Elsevier Ltd. Other:
Date and Citation History	Date of publication: 2011 Cited by: 26
Stated Purpose or Research Questions	"The purpose of this study was to examine the effects of a brushing protocol on the stereotyped behavior of a young boy with autism. The intervention was applied in the participant's home by his mother and one-to-one therapist, both of whom received hands-on training in the protocol. The level of the participant's stereotyped, self-stimulatory behavior was measured before, during, and after the implementation of the brushing treatment." (p. 1054)
Author's Conclusion	"Findings suggest that the brushing protocol had no marked affect on levels of stereotypy." (p. 1053)
Overall Relevance to PICO	Overall Relevance to PICO: Moderate Rationale: Study focuses on autism symptoms, but inappropriate protocol.
Overall Quality of Article	Overall Quality of Article: Moderate Rationale: Published within last 10 years, reputable journal, small sample size, inappropriate intervention as sensory defensiveness is not mentioned.

Type of article	Overall Type: Primary research study Specific Type: Semistructured, open-ended interview format.
APA Reference	Kinnealey, M., Oliver, B., & Wilbarger P. (1995). A phenomenological study of sensory defensiveness in adults. <i>The American Journal of Occupational Therapy</i> , 49, 444-451.
Abstract	This article describes the experiences of five adults who are defensive toward sensations of touch, movement, vision, smell, sound, and taste that most people consider harmless. It also describes the strategies that they use when they perceive environmental stimuli to be aversive. These coping strategies are avoidance, predictability, mental preparation, talking through, counteraction, and confrontation. A conceptual framework is presented to enhance understanding and guide further study of sensory defensiveness in adults.
Author (First Author)	Credentials: PhD, OTR/L, FAOTA Position and Institution: Assistant Professor, Occupational Therapy Department, College of Allied Health Professions, Temple University, Pennsylvania Publication History in Peer-Reviewed Journals: some
Publication	Type of Publication: scholarly, peer-reviewed journal Publisher: American Occupational Therapy Association (AOTA) Other: Official journal of the AOTA
Date and Citation History	Date of publication: 1995 Cited by: 107
Stated Purpose or Research Questions	“The purpose of this study is to describe sensory defensiveness in adults and to develop a conceptual framework for further study” (p. 444)
Author’s Conclusion	“Tactile defensiveness was identified by all five subjects and seemed to interfere with many aspects of life, including self-care, choice of activities, and patterns of intimacy. Descriptions of oral defensiveness seemed to be more related to tactile sensation than to the gustatory sense” (p. 450). “The [coping] strategies of avoidance, counteraction, and confrontation influenced their choices of activities” (p.450)
Overall Relevance to PICO	Overall Relevance to PICO: Limited Rationale: Article does not relate to children or specifically to ASD.
Overall Quality of Article	Overall Quality of Article: Moderate Rationale: Reputable journal and well-published author, however it is somewhat dated.

Type of article	Overall Type: Primary Research Study Specific Type: Single-subject design across participants
APA Reference	Kimball, J. G., Lynch, K. M., Stewart, K. C., Williams, N. E., Thomas, M. A., & Atwood, K. D. (2007). Using salivary cortisol to measure the effects of a Wilbarger protocol-based procedure on sympathetic arousal: A pilot study. <i>The American Journal of Occupational Therapy, 61</i> (4), 406-413. doi: 10.5014/ajot.61.4.406
Abstract	OBJECTIVE. This study investigated changes in salivary cortisol, the stress hormone, after administration of a procedure based on the Wilbarger protocol to children diagnosed with sensory defensiveness (SD), a type of sensory modulation dysfunction. METHOD. Using a single-subject design across participants, we studied 4 boys with SD ages 3 to 5 years. Each participant completed four sessions consisting of the collection of a saliva sample, administration of a procedure based on the Wilbarger protocol, 15 min of quiet neutral activities to allow time for any changes in cortisol level to manifest in the saliva, and the second collection of saliva. Saliva samples were analyzed using enzyme-linked immunosorbent assay (ELISA). RESULTS. Salivary cortisol levels in all participants changed after each of four applications of a procedure based on the Wilbarger protocol. The cortisol levels of 2 children whose levels were relatively higher on pretest decreased at each posttest. The levels of 1 child whose cortisol was higher on pretest three times decreased those three times and increased the one time the pretest cortisol was lower. The levels of 1 child who had the lowest cortisol levels of any of the children increased each time. Therefore, in all participants, cortisol moved in the direction of modulation.
Author (First Author)	Credentials: PhD, OTR/L, FAOTA Position and Institution: Post Professional Graduate Coordinator, University of New England Publication History in Peer-Reviewed Journals: some
Publication	Type of Publication: Peer-reviewed journal Publisher: American Occupational Therapy Association (AOTA) Other: Official journal of the AOTA
Date and Citation History	Date of publication: July/August 2007 Cited by: 25
Stated Purpose or Research Questions	“This study investigated changes in salivary cortisol, the stress hormone, after administration of a procedure based on the Wilbarger protocol to children diagnosed with sensory defensiveness (SD), a type of sensory modulation dysfunction.” (p. 406)
Author’s Conclusion	“ In these 4 boys, a procedure based on the Wilbarger protocol modulated cortisol levels toward a middle range. This pilot study indicates that there is an association between sympathetic nervous system response and the Wilbarger protocol–based procedure, as indicated by salivary cortisol levels.” (p, 406)
Overall Relevance to PICO	Overall Relevance to PICO: Moderate Rationale: The study examines the effects of the Wilbarger protocol, but a reduction in salivary cortisol level may not be a full measure of effectiveness to improve occupational performance.
Overall Quality of Article	Overall Quality of Article: Moderate Rationale: Small sample size, author good credentials, cited by others, no control group

Type of article	Overall Type: Primary research study Specific Type: Survey of occupational therapy practitioners
APA Reference	Lancaster, S., Zachry, A., Duck, A., Harris, A. Page, E., Sanders, J. (2016). Delivery of the wilbarger protocol: a survey of pediatric occupational therapy practitioners. <i>Journal of Occupational Therapy, Schools, & Early Intervention</i> , 9(3), 281-289. doi: http://dx.doi.org/10.1080/19411243.2016.1169243
Abstract	The Wilbarger Therapressure Program is a commonly used treatment approach utilized by occupational therapy professionals for the treatment of sensory defensiveness. The purpose of the current study was to investigate occupational therapy practitioners’ sources of training in the administration of Wilbarger Therapressure Program, the uniformity of administration in practice, and the diagnoses for which therapists recommend this treatment approach. Occupational therapists from across the United States participated in an online survey investigating specifics related to training and implementation of the brushing protocol. A total of 153 respondents reported using the Wilbarger Therapressure Program in practice. Almost half of the respondents received their education on the Therapressure program by attending the workshop offered by the Wilbargers. Forty eight percent of survey participants reported learning how to administer the Therapressure program by participating in hands-on training provided by another occupational therapy practitioner, 39% by attending the course taught by the Wilbargers, 7% by information obtained through word of mouth from another occupational therapy practitioner, 3% by information obtained through online research, and 3% by other means. The results of this study reveal that a variety of approaches exist related to the training and implementation of the protocol. It is the responsibility of all occupational therapy practitioners to obtain the proper training prior to recommending and implementing the Therapressure program. Because a standardized protocol for implementation of the protocol has not been published, the optimal means of training is for practitioners to attend the Wilbarger workshop.
Author (First Author)	Credentials: MS, OTR/L, ATP, CAPS Position and Institution: Associate Professor, University of Tennessee Health Science Center Publication History in Peer-Reviewed Journals: very little
Publication	Type of Publication: scholarly Peer-reviewed journal Publisher: Taylor & Francis Inc. Other:
Date and Citation History	Date of publication: 2016 Cited by: 0
Stated Purpose or Research Questions	“The purpose of the current study was to investigate occupational therapy practitioners’ sources of training in the administration of Wilbarger Therapressure Program, the uniformity of administration in practice, and the diagnoses for which therapists recommend this treatment approach.” (p. 281)
Author’s Conclusion	“The results of this study reveal that a variety of approaches exist related to the training and implementation of the protocol. It is the responsibility of all occupational therapy practitioners to obtain the proper training prior to recommending and implementing the Therapressure program. Because a standardized protocol for implementation of the protocol has not been published, the optimal means of training is for practitioners to attend the Wilbarger workshop.” (p. 281)
Overall Relevance to PICO	Overall Relevance to PICO: Limited Rationale: The study does not examine the effectiveness of the approach, only the uniformity of implementation by practitioners.
Overall Quality of Article	Overall Quality of Article: Moderate Rationale: Scholarly, Peer-reviewed journal. Not cited by others, published this year.

Type of article	Overall Type: Primary research study Specific Type: Case study
APA Reference	McClure, M. & Holtz-Yotz, M. (1991). The effects of sensory stimulatory treatment on an Autistic child. <i>The American Journal of Occupational Therapy</i> , 45(12), 1138-1142.
Abstract	Occupational therapy has greatly increased the medical profession's awareness of sensory input and its effect on motor output, based on the foundation provided by Rood (McCormack, 1990; Trombly, 1989) and Ayres (1973, 1985). From her personal experience, Grandin (1986) offered a unique perspective on the importance of deep pressure and tactile input for their calming effects on persons with autism. Her ability to communicate her needs and feelings has been remarkable and insightful. Unfortunately, many autistic persons are unable to express their functional needs and motivations clearly, thus leaving us to rely on our observational skills and the desires and needs of the family members and other caregivers. The treatment in the present case report is based on the following neurophysiological principles of Rood (as cited by Huss, 1983): 1. Motor output is dependent upon sensory input. Thus sensory stimuli are utilized to activate and/or inhibit motor responses. 2. Since there is interaction within the nervous system between somatic, psychic, and autonomic functions, stimuli can be used to influence one or more directly or indirectly. (p. 116) This case report involved the sensorimotor effect of deep pressure and tactile input on Bob, a 13-year-old non-verbal autistic boy with severe mental retardation, who was admitted to our psychiatric inpatient facility for evaluation and treatment following severe self-injurious behavior, including pinching, biting, and rubbing of his head, neck, trunk, and upper and lower extremities.
Author (First Author)	Credentials: OTR/L Position and Institution: Occupational Therapist at Allegheny Neuropsychiatric Institute and private practitioner at Becoming Independent Thru OT (at the time of publication) Publication History in Peer-Reviewed Journals: Some
Publication	Type of Publication: Peer reviewed Publisher: American Occupational Therapy Association (AOTA) Other: Official journal of AOTA
Date and Citation History	Date of publication: October 1990 Cited by: 49
Stated Purpose or Research Questions	“This case report involved the sensorimotor effect of deep pressure and tactile input on Bob, a 13-year-old non-verbal autistic boy with severe mental retardation, who was admitted to our psychiatric inpatient facility for evaluation and treatment following severe self-injurious behavior, including pinching, biting, and rubbing of his head, neck, trunk, and upper and lower extremities.” (p., 1138)
Author’s Conclusion	“Deep pressure, tactile, and vestibular stimulation appeared to have a more marked effect in calming the patient on days when his self-stimulation and self-injurious behavior were highest.” (p. 1142)
Overall Relevance to PICO	Overall Relevance to PICO: Moderate Rationale: Focused on specific sensory manipulative intervention for one individual with ASD.
Overall Quality of Article	Overall Quality of Article: Poor Rationale: Article focuses on one individual and one intervention. Published over twenty years ago. Reputable journal and publisher.

Type of article	Overall Type: Primary research study Specific Type: Statistical analysis of five different measurement tools.
APA Reference	Pfeiffer, B., Kinnealey, M., Reed, C., & Herzberg, B. (2005). Sensory modulation and affective disorders in children and adolescents with Asperger’s disorder. <i>The American Journal of Occupational Therapy</i> , 59, 335-345.
Abstract	<p>OBJECTIVE: The purpose of the study was to determine if there were significant relationships between dysfunction in sensory modulation, symptoms of affective disorders, and adaptive behaviors in children and adolescents with Asperger's disorder between 6 and 17 years of age.</p> <p>METHOD: Parents of 50 children and adolescents between 6 and 17 years of age diagnosed with Asperger's disorder based on the Diagnostic and Statistical Manual of Mental Disorders-IV criteria completed the (a) Sensory Profile for children 6 to 10 years of age or the Adolescent/Adult Sensory Profile for adolescents 11 to 17 years of age; (b) the Adaptive Behavior Assessment System: Parent Version; (c) Revised Children's Manifest Anxiety Scale Adapted Parent's Version; and (d) the Children's Depression Inventory Adapted Parent's Version. Descriptive statistics and the Pearson product-moment coefficient of correlation calculations were used for data analysis.</p> <p>RESULTS: The results indicated that there were significantly strong positive correlations between sensory defensiveness and anxiety ($r = .476, p = .000$) in children and adolescents with Asperger's disorder. There were also significant relationships between symptoms of depression and hyposensitivity in the total group ($r = .214, p = .05$) and the older group ($r = .492, p = .027$). There were no significant relationships between depression and overall adaptive behavior ($r = -.243, p = .089$) or anxiety and overall adaptive behavior ($r = -.108, p = .455$). Significantly strong inverse relationships were found between the specific adaptive behaviors of functional academics, leisure, social skills, and symptoms of depression. Functional academics were also significantly inversely related to anxiety. Specifically, sensory hyper- and hypersensitivity were significantly inversely related to community use and social skills.</p> <p>CONCLUSION: The data supports positive relationships between anxiety and sensory defensiveness in all age ranges and a relationship between depression and hyposensitivity in older children. Stronger inverse relationships were apparent between specific adaptive behaviors including: (a) symptoms of depression and functional academics, leisure, social skills; (b) anxiety and functional academics; and (c) both sensory hyper- and hyposensitivity and community use and social skills. In this study, as the symptoms of affective disorders increased in children and adolescents with Asperger's disorder, the functional performance in the adaptive behaviors of functional academics and social skills appeared to decrease. Performance in the adaptive behaviors of community use and social skills appeared to decrease as symptoms of dysfunction in sensory modulation increase. Further research is necessary to determine the impact of treatment for dysfunction on sensory modulation on affective disorders and performance in specific adaptive behaviors</p>
Author (First Author)	<p>Credentials: PhD, OTR/L, BCP</p> <p>Position and Institution: Assistant Professor, College Misericordia, Pennsylvania and is Senior Therapist, Pediatric Therapy Associates of the Lehigh Valley, P.C., Allentown, Pennsylvania.</p> <p>Publication History in Peer-Reviewed Journals: some</p>
Publication	<p>Type of Publication: scholarly, peer-reviewed journal</p> <p>Publisher: American Occupational Therapy Association (AOTA)</p> <p>Other: Official journal of the AOTA</p>
Date and Citation History	<p>Date of publication: 2005</p> <p>Cited by: 156</p>
Stated Purpose or Research Questions	<p>“The purpose of the study was to determine if there were significant relationships between dysfunction in sensory modulation, symptoms of affective disorders, and adaptive behaviors in children and adolescents with Asperger’s disorder between 6 and 17 years of age” (p. 335).</p>
Author’s Conclusion	<p>“The data supports positive relationships between anxiety and sensory defensiveness in all age ranges and</p>

	<p>a relationship between depression and hyposensitivity in older children. Stronger inverse relationships were apparent between specific adaptive behaviors including: (a) symptoms of depression and functional academics, leisure, social skills; (b) anxiety and functional academics; and (c) both sensory hyper- and hyposensitivity and community use and social skills. In this study, as the symptoms of affective disorders increased in children and adolescents with Asperger’s disorder, the functional performance in the adaptive behaviors of functional academics and social skills appeared to decrease” (p. 335)</p>
<p>Overall Relevance to PICO</p>	<p>Overall Relevance to PICO: Limited Rationale: The article does not talk about sensory/manipulation techniques for therapy purposes, and only focuses on Asperger’s disorder, not ASD as a whole.</p>
<p>Overall Quality of Article</p>	<p>Overall Quality of Article: Good Rationale: Well-published author, relatively recent publication date, scholarly journal.</p>

Type of article	Overall Type: Primary Research Study Specific Type: Qualitative exploratory study.
APA Reference	Segal, R., & Beyer, C. (2005). Integration and application of a home treatment program: A study of parents and occupational therapists. <i>The American Journal of Occupational Therapy</i> , 60, 500-510.
Abstract	The purpose of this article is to describe parental adherence to home treatment programs. A qualitative exploratory study with six parents and eight occupational therapists who used the brushing and compression technique (Wilbarger Protocol) was conducted. Participants were interviewed one or two times, exploring their experiences in adhering to the protocol. Data analysis focused on facilitators and hindrances to parental adherence and on occupational therapists' strategies used to encourage it. Parents identified their children's responses to brushing, its perceived efficacy, and interaction of the protocol with family daily schedules, as factors influencing their adherence. Occupational therapists identified only family daily schedules as influencing parental adherence. The findings are discussed in the context of the ecocultural theory of family accommodations.
Author (First Author)	Credentials: PhD, OTR Position and Institution: is Chair, Seton Hall University, School of Graduate Medical Education, Department of Occupational Therapy, New Jersey Publication History in Peer-Reviewed Journals: some
Publication	Type of Publication: scholarly, peer-reviewed journal Publisher: American Occupational Therapy Association (AOTA) Other: Official journal of the AOTA
Date and Citation History	Date of publication: 2005 Cited by: 23
Stated Purpose or Research Questions	“The purpose of this article is to describe parental adherence to home treatment programs. A qualitative exploratory study with six parents and eight occupational therapists who used the brushing and compression technique (Wilbarger Protocol) was conducted” (p. 500)
Author’s Conclusion	“The study’s findings suggest that occupational therapists who select the brushing and compression program need to inquire about children’s responses to the brushing and compression program at home, and about parental expectations for change as a result of this intervention. Although therapists should continue to educate parents about this intervention, it is important that they keep in mind that parents’ lives may not revolve around occupational therapy and the child who needs this particular intervention” (p. 508)
Overall Relevance to PICO	Overall Relevance to PICO: Moderate Rationale: Pediatric population, Sensory/manipulation Therapies therapy, and ASD studied.
Overall Quality of Article	Overall Quality of Article: Good Rationale: Recent publication, scholarly journal and well-published author.

Type of article	Overall Type: Primary Research Study Specific Type: Case Study
APA Reference	Stagnitti, K., Raison, P., & Ryan, P. (1999). Sensory defensiveness syndrome: A paediatric perspective and case study. <i>Australian Occupational Therapy Journal</i> , 46, 175-187.
Abstract	Sensory defensiveness syndrome includes sensory defensiveness and the associated behavioural difficulties that can occur when a child or adult perceives non-threatening sensory input as potentially harmful. This paper presents a paediatric case study where sensory defensiveness syndrome was diagnosed and treated. The effectiveness of the sensory summation technique was confirmed. Effective behavioural strategies are explained and differential diagnosis between sensory defensiveness syndrome and other disorders such as autism spectrum disorders is emphasized. Changes to Willbarger and Wilbarger’s three levels of severity of sensory defensiveness are suggested to aid clarity in diagnosis and as a guide for future research.
Author (First Author)	Credentials: BOccThy(Qld) [Bachelor of Occupational Therapy, Honors, University of Queensland], OT Position and Institution: Deakin University Publication History in Peer-Reviewed Journals: Extensive
Publication	Type of Publication: Peer reviewed Publisher: Wiley Blackwell Other: International scientific, medical, technical, and scholarly publishing business.
Date and Citation History	Date of publication: July 1999 Cited by: 43
Stated Purpose or Research Questions	“This paper discusses developments in the area of sensory defensiveness and describes how sensory defensiveness syndrome can present in paediatric practice in Australia, thus adding valuable knowledge to occupational therapy about this syndrome which affects many clients.” (p. 176)
Author’s Conclusion	“The sensory summation technique by Wilbarger & Wilbarger (1991) was shown to be very effective in treating John’s sensory defensiveness, thus adding support to Wilbarger and Wilbarger’s claim that sensory defensiveness can be cured. To further the assessment and treatment of sensory defensiveness syndrome, it was suggested that the severity levels of the syndrome given by Wilbarger & Wilbarger (1991) be changed to two categories.” (p. 186)
Overall Relevance to PICO	Overall Relevance to PICO: Strong Rationale: Focuses on a specific Sensory/manipulation Therapies approach.
Overall Quality of Article	Overall Quality of Article: Moderate Rationale: Established article, reputable journal, not published in last 10 years.

Initial Appraisal: Review of Research Studies.

Type of article	Overall Type: Review of research studies Specific Type: Review paper
APA Reference	Baranek, G. (2002). Efficacy of sensory and motor interventions for children with Autism. <i>Journal of Autism and Developmental Disorders</i> , 32(5), 397-422.
Abstract	Idiosyncratic responses to sensory stimuli and unusual motor patterns have been reported clinically in young children with autism. The etiology of these behavioral features is the subject of much speculation. Myriad sensory- and motor-based interventions have evolved for use with children with autism to address such issues; however, much controversy exists about the efficacy of such therapies. This review paper summarizes the sensory and motor difficulties often manifested in autism, and evaluates the scientific basis of various sensory and motor interventions used with this population. Implications for education and further research are described.
Author (First Author)	Credentials: PhD, OTR/L, FAOTA Position and Institution: Professor and Associate Chair for Research, Division of Occupational Science and Occupational Therapy, the University of North Carolina in Chapel Hill Publication History in Peer-Reviewed Journals: Extensive
Publication	Type of Publication: Peer reviewed Publisher: Springer Science and Business Media Other: Global publishing company based in Berlin
Date and Citation History	Date of publication: October 2002 Cited by: 519
Stated Purpose or Research Questions	“The purpose of this paper is threefold: (1) briefly summarize the empirical literature with respect to sensory and motor development/abnormalities in children with autism, (2) evaluate the scientific basis of sensory and motor interventions used with children with autism, and (3) describe implications of these findings for education and further research.” (p. 397)
Author’s Conclusion	“We cannot know the answers to these types of questions until more systematic research with increased specificity of subject variables is conducted to help distinguish various levels of response to treatments; however, these findings indicate that when provided, sensory and motor interventions need to be individualized for a given child with autism.” (p. 416)
Overall Relevance to PICO	Overall Relevance to PICO: Strong Rationale: Explores different sensory and motor interventions for children with ASD.
Overall Quality of Article	Overall Quality of Article: Moderate Rationale: Well-published author, reputable journal and publisher. Over 10 years old.

Type of article	Overall Type: Review of research studies
APA Reference	Foss, A., Swinth, Y., McGruder, J., Tomlin, G., (2003). Sensory modulation dysfunction and the Wilbarger protocol: an evidence review. <i>OT Practice</i> , 8(12), CE-1.
Abstract	Occupational therapists have used brushing as an intervention technique for many years. More recently, the Wilbarger Protocol has been used by pediatric occupational therapists who use a sensory integrative framework within occupational therapy. Specifically, this protocol has been recommended for use with children who have sensory modulation dysfunction (SMD) with manifestations of overresponsiveness to sensory stimuli, also called sensory defensiveness. This article reviews relevant literature, provides an overview of some of the issues surrounding the application of this intervention technique, and provides strategies for applying this material to clinical practice. Implications for future research are discussed.
Author (First Author)	Credentials: MS, OTS Position and Institution: Student, University of Puget Sound Publication History in Peer-Reviewed Journals: none
Publication	Type of Publication: AOTA Continuing Education Article Publisher: AOTA Other: Magazine produced by AOTA
Date and Citation History	Date of publication: July 2003 Cited by: 9
Stated Purpose or Research Questions	1. "Define evidence-based practice and understand its relevance to sensory integration theory and practice." 2. "Define SMD and understand how the clinical signs of SMD may affect the occupational performance of clients." 3. "Recognize the evidence and precautions for using the Wilbarger Protocol with clients, as well as unresolved research issues related to SMD and the use of the Wilbarger protocol." 4. "Recognize unresolved issues related to the clinical identification of SMD and application of the Wilbarger Protocol." (p. CE-1)
Author's Conclusion	"Occupational therapy with a sensory integration framework is slowly developing a basis of empirical support. Other "complementary and alternative treatments" have the potential to do the same. Pursuit of such empirical support of sensory integration-related intervention is vital to the continued development of occupational therapy with a sensory integration framework that promotes valued participation in daily activities and enhances the quality of life for persons with disabilities." (p. CE-6)
Overall Relevance to PICO	Overall Relevance to PICO: Strong Rationale: Discusses evidence supporting the effectiveness of the Wilbarger protocol.
Overall Quality of Article	Overall Quality of Article: Moderate Rationale: First author is student with no known research experience, supporting authors all PhDs. Published in AOTA Continuing Education.

Type of article	Overall Type: Review of research studies Specific Type: Systematic Review
APA Reference	Leong, H. M., Carter, M., & Stephenson, J. (2015). Systematic review of sensory integration therapy for individuals with disabilities: Single case design studies. <i>Research in Developmental Disabilities, 47</i> , 334-351. doi: 0.1016/j.ridd.2015.09.022
Abstract	Sensory integration therapy (SIT) is a controversial intervention that is widely used for people with disabilities. Systematic analysis was conducted on the outcomes of 17 single case design studies on sensory integration therapy for people with, or at-risk of, a developmental or learning disability, disorder or delay. An assessment of the quality of methodology of the studies found most used weak designs and poor methodology, with a tendency for higher quality studies to produce negative results. Based on limited comparative evidence, functional analysis-based interventions for challenging behavior were more effective than SIT. Overall the studies do not provide convincing evidence for the efficacy of sensory integration therapy. Given the findings of the present review and other recent analyses it is advised that the use of SIT be limited to experimental contexts. Issues with the studies and possible improvements for future research are discussed including the need to employ designs that allow for adequate demonstration of experimental control.
Author (First Author)	Credentials: N/A Position and Institution: Macquarie University Special Education Centre, Institute for Early Childhood, Macquarie University, Australia Publication History in Peer-Reviewed Journals: very little
Publication	Type of Publication: scholarly, peer-reviewed journal Publisher: Elsevier, ScienceDirect Other: only online
Date and Citation History	Date of publication: 2015 Cited by: 0
Stated Purpose or Research Questions	“The present study was a systematic review of research which examined SIT using single case research designs for people with, or at-risk of, a developmental disability, disorder, or delay. This review extends the scope of previous reviews (Lang et al., 2012; May-Benson & Koomar, 2010) by including an evaluation the integrity of intervention, and a more rigorous systematic analysis of study quality criteria relevant to single case designs” (p. 336)
Author’s Conclusion	“When the findings of this review are put together with the results from the meta-analysis of group design studies (Leong et al., 2014) and other recent reviews (Lang et al., 2012; Roberts et al., 2011), the evidence base for the efficacy of SIT is seen to be weak.” (p. 349)
Overall Relevance to PICO	Overall Relevance to PICO: Moderate Rationale: Focuses specifically on sensory based therapy, but not children or ASD.
Overall Quality of Article	Overall Quality of Article: Moderate Rationale: Scholarly journal, recent publication. Not a well-published author and this article has not been cited in any other publications.

Type of article	Overall Type: Review of research studies Specific Type: Systematic Review
APA Reference	Watling, R., & Hauer, S. (2015). Effectiveness of Ayers Sensory Integration® and sensory-based interventions for people with autism spectrum disorder: A systematic review. <i>The American Journal of Occupational Therapy</i> , 69, 1-12A. doi: 10.5014/ajot.2015.018051.
Abstract	This systematic review examines the literature published from January 2006 through April 2013 related to the effectiveness of Ayres Sensory Integration® (ASI) and sensory-based interventions (SBIs) within the scope of occupational therapy for people with autism spectrum disorder to improve performance in daily life activities and occupations. Of the 368 abstracts screened, 23 met the inclusion criteria and were reviewed. Moderate evidence was found to support the use of ASI. The results for sensory-based methods were mixed. Recommendations include performing higher level studies with larger samples, using the Fidelity Measure in studies of ASI, and using carefully operationalized definitions and systematic methods in examination of SBIs.
Author (First Author)	Credentials: PhD, OTR/L, FAOTA Position and Institution: Visiting Assistant Professor, School of Occupational Therapy, University of Puget Sound, Washington Publication History in Peer-Reviewed Journals: some
Publication	Type of Publication: scholarly, peer-reviewed journal Publisher: American Occupational Therapy Association (AOTA) Other: Official journal of the AOTA
Date and Citation History	Date of publication: 2015 Cited by: 10
Stated Purpose or Research Questions	“The question examined in this review was, “What is the evidence for sensory integration intervention and SBIs within the scope of occupational therapy practice to improve performance in daily life activities and occupations for children with autism spectrum disorders?”” (p. 3)
Author’s Conclusion	“A growing body of literature has provided moderate evidence that intensive, individualized clinic- based ASI intervention can improve individualized functional outcomes (Pfeiffer et al., 2011; Schaaf et al., 2013). Individual sensory processing patterns should guide application of sensory integration and SBIs in practice (Pfeiffer et al., 2011; Schaaf et al., 2013; Van Rie & Heflin, 2009). Assessment with well-established tools such as the Sensory Profile (Dunn, 1999) and the Sensory Processing Measure (Glennon, Kuhaneck, Henry, Parham, & Ecker, 2007) can meet this charge. On the basis of current evidence, using personalized measures such as GAS is essential when applying ASI in an evidence-based manner” (p. 10)
Overall Relevance to PICO	Overall Relevance to PICO: Strong Rationale: Relates specifically to ASD and sensory/manipulation therapy.
Overall Quality of Article	Overall Quality of Article: Good Rationale: Scholarly journal, well-published author, recent publication date.

Type of article	Overall Type: Review of Research Studies Specific Type: Systematic review
APA Reference	Weeks, S., Boshoff, K., Stewardt, H., (2012). Systematic review of the effectiveness of the Wilbarger protocol with children. <i>Pediatric Health, Medicine, and Therapeutics</i> , 3, 79-89. Retrieved from: https://www.researchgate.net/profile/Kobie_Boshoff/publication/284271802_Systematic_review_of_the_effectiveness_of_the_Wilbarger_Protocol_with_children/links/570c786808ae8883a1ffee10.pdf
Abstract	<p>Background: Sensory processing disorders have an estimated prevalence of 5%–10% in children without disability and 40%–88% in children with disability. A subtype of sensory processing disorder is sensory overresponsivity, which can result in fear, irritability, aggression, or avoidance behaviors in children. The Wilbarger protocol is the most prescriptive program used to treat sensory overresponsivity in children aged 2–12 years. Strong anecdotal evidence suggests that the Wilbarger protocol successfully reduces challenging behavior in children with sensory overresponsivity. The aim of this systematic review was to identify and appraise the existing evidence for the effectiveness of the Wilbarger protocol with children aged 0–18 years. Methods: A systematic review was conducted of the peer-reviewed literature written in English. The electronic databases searched up to April 2012 included CINAHL, Ovid Medline (R), Embase, Scopus, the Cochrane Library, AMED, and the Web of Science. OT Seeker and Google Scholar were searched for missed literature, along with hand-searching of retained articles. Adult studies were excluded. The Critical Review Form for Quantitative Studies by McMaster University and the levels of hierarchy from the Australian National Health and Medical Research Council were used to appraise the literature.</p> <p>Results: A total of 341 studies were found, and 302 were screened for eligibility after duplicates were removed. Four level IV intervention (case series with pretest/posttest) studies were included for indepth review. All four studies had very small sample sizes, exhibited low methodological quality, differed in outcome measures used, and lacked homogeneity of samples and treatment fidelity.</p> <p>Conclusion: A lack of high quality evidence currently exists to support or refute the use of the Wilbarger protocol with children. While the grade of recommendation, as proposed by the Australian National Health and Medical Research Council, suggests that the Wilbarger protocol should be applied with caution, emerging evidence from these studies warrants future robust research on this topic. Clinicians are advised to use clear outcome measures when using the Wilbarger protocol with clients</p>
Author (First Author)	Credentials: Master’s/PhD Candidate Position and Institution: Student researcher, University of South Australia Publication History in Peer-Reviewed Journals: very little
Publication	Type of Publication: International, peer-reviewed journal Publisher: Dovepress Other: Open-access
Date and Citation History	Date of publication: November 30, 2012 Cited by: 10
Stated Purpose or Research Questions	“The aim of this systematic review was to identify and appraise the existing evidence for the effectiveness of the Wilbarger protocol with children aged 0–18 years.” (p. 79)
Author’s Conclusion	“A lack of high quality evidence currently exists to support or refute the use of the Wilbarger protocol with children” (p. 79)
Overall Relevance to PICO	Overall Relevance to PICO: Strong Rationale: The purpose was to find the effectiveness of the Wilbarger Protocol, which is our aim.
Overall Quality of Article	Overall Quality of Article: Moderate Rationale: Written by student, but in a reputable journal. Written less than ten years ago.

Type of article	Overall Type: Review of research studies Specific Type: Treatment Intervention Advisory Committee Review and Determination
APA Reference	Wisconsin Department of Health Services Autism and other Developmental Disabilities Treatment Intervention Advisory Committee. (2015). <i>Determination of Sensory Integration Therapy as a proven and effective treatment</i> . Retrieved from https://tiac.wisconsin.gov/summary-determinations-regarding-level-evidence.htm
Abstract	Please find below a statement of our determination as to whether or not the committee views Sensory Integration Therapy as a proven and effective treatment for children with autism spectrum disorder and/or other developmental disabilities. In subsequent sections you will find documentation of our review process including a description of the proposed treatment, a synopsis of review findings, the treatment review evidence checklist, and a listing of the literature considered. In reviewing treatments presented to us by DHS/DLTC, we implement a review process that carefully and fully considers all available information regarding a proposed treatment. Our determination is limited to a statement regarding how established a practice is in regard to quality research. We do not make funding decisions.
Author (First Author)	Credentials: Lana Collet-Klingenberg, Ph.D. Position and Institution: chairperson. Wisconsin Department of Health Services Publication History in Peer-Reviewed Journals: some
Publication	Type of Publication: Government Publications Publisher: Wisconsin Department of Health Services. Other: Autism and other Developmental Disabilities Treatment Intervention Advisory Committee.
Date and Citation History	Date of publication: 2013. Re-review conducted 2015. Cited by: 0
Stated Purpose or Research Questions	To formulate “a statement of our determination as to whether or not the committee views Sensory Integration Therapy as a proven and effective treatment for children with autism spectrum disorder and/or other developmental disabilities” (p. 1)
Author’s Conclusion	“In sum, it is the decision of the committee that Sensory Integration Therapy, remain at Level 4- Insufficient Evidence.” (p. 2)
Overall Relevance to PICO	Overall Relevance to PICO: Strong Rationale: Relates directly to ASD and the effectiveness of sensory therapy.
Overall Quality of Article	Overall Quality of Article: Good Rationale: From a governmental advisory committee. Recent publication date.

Initial Appraisal: Conceptual or Theoretical Articles.

Type of article	Overall Type: Conceptual or Theoretical Article Specific Type: Pilot Study
APA Reference	Sparkes, E. (2002). Adventures in research: The early steps: Examining the Wilbarger protocol for children with autism. <i>Occupational Therapy Now</i> , 4(3), 7.
Abstract	Occupational therapists from the Child Development Service at the Ottawa Children's Treatment Centre were faced with providing evidence regarding the use of sensory processing and play-based intervention strategies or lose their funding. Find out how they managed to find time for research despite caseloads that had doubled in recent years.
Author (First Author)	Credentials: N/A Position and Institution: Occupational Therapist, Child Development Service, Ottawa Children's Treatment Centre Publication History in Peer-Reviewed Journals: N/A
Publication	Type of Publication: Periodical Research Journal Publisher: Canadian Association of Occupational Therapists Other: Provides information about occupational therapy issues, including clinical applications of recent research and theory, evidence-based practice and socio-cultural, political and economic influences on occupational therapy.
Date and Citation History	Date of publication: May 2002 Cited by: 0
Stated Purpose or Research Questions	N/A
Author's Conclusion	N/A
Overall Relevance to PICO	Overall Relevance to PICO: N/A Rationale: Not able to access article.
Overall Quality of Article	Overall Quality of Article: N/A Rationale: Not able to access article.

Type of article	Overall Type: Conceptual or Theoretical Article Specific Type: Special Interest Piece
APA Reference	Wilbarger, J. (1998). The emerging concept of sensory modulation disorders. <i>Sensory Integration Special Interest Section Quarterly</i> , 21(3), 3.
Abstract	Occupational therapy practitioners are often challenged by the range of difficulties presented by children with sensory integration, attention, regulatory, and pervasive developmental problems. Among this heterogeneous group, one may observe behaviors such as over- and under sensitivity to stimuli; unusually high, low, or fluctuating activity; difficulty with transitions or change; and problems modulating state and behavior. Occupational therapy practitioners, by using their current understanding of sensory processing, often make inferences about these behaviors, such as how they reflect arousal states, inhibition, excitation, or habituation. These behaviors and resulting inferences are not neatly explained by classic sensory integration theory (Ayes, 1979; Ayres & Tickle, 1980; Kimball, 1993; Kinnealey, Oliver, & Wilbarger, 1995; Lane & Royeen, 1991; Miller & McIntosh, 1998; Oetter, Richter, & Frick, 1995). Many researchers have attempted to explain these behaviors in terms of temperament (Rothbart & Bates, 1998), regulatory disorders (DeGangi, 1991a, 1991b; Greenspan & Wieder, 1993), inhibition (Kagan, Reznick, & Snidman, 1987), attention deficits (Barkley, 1997), or deficits in executive functions (Pennington, 1991). Outside occupational therapy, few researchers have explored the relationship of these behaviors to disruptions in sensory processing. Rather, most researchers look for explanations in either cognitive or emotional domains; however, these explanations sometimes fall short. For example, tactile defensiveness, an identifying feature of fragile X syndrome (Hagerman, 1996; Stackhouse, 1994), is not well explained by cognitive or emotional deficits. Thus, investigating sensory processing becomes a necessary link to fully understanding these deficits, and the work in occupational therapy is beginning to address this. Within occupational therapy, the concept of sensory modulation disorders is emerging as a way to categorize and explain these disruptions in behaviors, although this concept has yet to be clearly defined or explained and poses a challenge for our profession.
Author (First Author)	Credentials: MS, OTR (at time of publication) Position and Institution: Currently an Associate Professor at Dominican University of California Publication History in Peer-Reviewed Journals: Extensive
Publication	Type of Publication: Sensory Integration Special Interest Section Quarterly Publisher: American Occupational Therapy Association Other: Can become a member of a special interest section for networking with colleagues.
Date and Citation History	Date of publication: September 1998 Cited by: 4
Stated Purpose or Research Questions	“Within occupational therapy, the concept of sensory modulation disorders is emerging as a way to categorize and explain these disruptions in behaviors, although this concept has yet to be clearly defined or explained and poses a challenge for our profession.” (p. 3)
Author’s Conclusion	“Currently, little research supports a definition or explanation of sensory modulation disorders... The next few years bring the promise of understanding the emerging concept of sensory modulation disorders and of devising new ways to address disruptive behavior in our clients.” (p. 3-4)
Overall Relevance to PICO	Overall Relevance to PICO: Strong Rationale: Focuses on sensory modulation disorders and research surrounding the definition.
Overall Quality of Article	Overall Quality of Article: Moderate Rationale: Established author, reputable journal, out of date publication.

Type of article	Overall Type: Conceptual or Theoretical Article Specific Type: Special Interest Piece
APA Reference	Wilbarger, P. (1995). The sensory diet: Activity programs based on sensory processing theory. Sensory Integration Special Interest Section Newsletter, 18(2), 1.
Abstract	N/A
Author (First Author)	Credentials: Currently, M.Ed., FAOTA, OTR Position and Institution: Private Practice in Santa Barbra, CA. Publication History in Peer-Reviewed Journals: Extensive
Publication	Type of Publication: Sensory Integration Special Interest Section Quarterly Publisher: American Occupational Therapy Association Other: Can become a member of a special interest section for networking with colleagues.
Date and Citation History	Date of publication: 1995 Cited by: 76
Stated Purpose or Research Questions	N/A
Author's Conclusion	N/A
Overall Relevance to PICO	Overall Relevance to PICO: N/A Rationale: Not able to access article.
Overall Quality of Article	Overall Quality of Article: N/A Rationale: Not able to access article.

Critical Appraisals.

- Kimball, J. G., Lynch, K. M., Stewart, K. C., Williams, N. E., Thomas, M. A., & Atwood, K. D. (2007). Using salivary cortisol to measure the effects of a Wilbarger protocol-based procedure on sympathetic arousal: A pilot study. *The American Journal of Occupational Therapy, 61*(4), 406-413. doi: 10.5014/ajot.61.4.406
- Bhopti, A., & Brown, T. (2013). Examining the Wilbargers' deep pressure and proprioceptive technique for treating children with sensory defensiveness using a multiple-single-case study approach. *Journal of Occupational Therapy, Schools, & Early Intervention, 6*(2), 108-130, doi: 10.1080/19411243.2013.810944
- Foss, A., Swinth, Y., McGruder, J., Tomlin, G., (2003). Sensory modulation dysfunction and the Wilbarger protocol: an evidence review. *OT Practice, 8*(12), CE-1-CE-8

Therasuit

Executive summary

Final Question and PICO.

Are sensory manipulation therapies effective for improving occupational performance and participation for children with Autism Spectrum Disorder?

Themes.

Description of the Intervention.

In the Therasuit program, a therapist works one-on-one with a child 5 days per week for 3 hours per day for 2 or 3 weeks (Therasuit LLC, 2006a). The Therasuit includes shorts, a cap, kneepads, a vest, and shoe attachments (Lee, 2016). The children put on the suit and then the therapist attaches special cords onto hooks on the suit and attach adjustable cords in a way that fits each individual's body (Lee, 2016). This suit is indicated to help children diagnosed with cerebral palsy (CP), autism, Down syndrome, developmental delays, hypotonia, athetosis, post stroke, spasticity, traumatic brain injury, and ataxia (Ability Plus Therapy, 2014).

It is claimed that the Therasuit can correct problems mainly associated with cerebral palsy, such as coordinated movement and muscle function. The major goal of the Therasuit "is to improve and change proprioception (pressure from the joints, ligaments, muscles), reduce patient's pathological reflexes, restore physiological muscle synergies (proper patterns of movement) and load the entire body with weight (process similar to a reaction of our muscles to the gravitational forces acting up us for 24 hours)" (Therasuit LLC, 2006b, para. 5).

Each Therasuit set costs \$2,500 U.S. dollars and the Therasuit program costs the patients' families around \$1,500 U.S. dollars per week (Genius 4 Kids, 2011; Therasuit LLC, 2006a). If the parents want to be trained on the Therasuit for their children, they can attend a 2-day course

that costs \$850 U.S. dollars; training of occupational or physical therapists in the Therasuit method costs around \$1900 U.S. dollars (Therasuit LLC, 2006a).

Developers/Proponents, Researchers, and Organization/Company.

The Therasuit is derived from the Adeli suit, a device used by the Russian space program to counteract the effects of gravity in space (Mehl-Madrona, 2001). The Adeli suit's ability to correct proprioception and muscular function were the basis of the Therasuit (Mehl-Madrona, 2001). The Therasuit was produced from these principles by physical therapists Richard and Izabela Koscielny to help their daughter with cerebral palsy develop and regain normal motor movements (Neo-kinisis, n.d.). Izabela Koscielny conducted a research study over ten years ago that claimed multiple benefits from Therasuit intervention; however, it was not published in a scholarly peer-reviewed journal (Koscielny, 2004).

Research on the Therasuit is dominated by independent researchers affiliated with universities or healthcare facilities. The primary company that promotes the device is Therasuit LLC, which is owned by the Koscielnys. The Therasuit LLC website sells the equipment and offers training courses (Therasuit LLC, 2006a).

Description of the Quality and Quantity of Available Evidence.

When a literature review was done on the topic of Therasuit, evidence of its effectiveness varied in quality and quantity. We found 13 articles total that specifically discussed the Therasuit intervention. 11 of the 13 articles were publications in peer-reviewed journals. Of these 11 articles, six were primary research studies (Bailes et al., 2011; Bailes et al., 2010; Bar-Haim et al., 2006; Ko et al., 2015; Lee, 2016; Mahani, Karimloo, & Amirsalari, 2011), four were reviews of research studies (Damino, 2009; Liptak, 2005; Martins et al., 2016; Weisleder, 2010), and one was a conceptual or theoretical article (Turner, 2006).

The 11 articles were rated according to their relevance to our group's PICO question; one article had strong relevance to the PICO question (Lee, 2016), nine articles had moderate relevance, and one article had limited relevance (Ko et al., 2015). The 11 articles were also rated on the overall quality of the article; five articles were rated good quality (Bailes et al., 2011; Bar-Haim et al., 2006; Lee, 2016; Liptak, 2005; Weisleder, 2010), six articles were given the rating of moderate quality, and none of these 11 articles published in peer-reviewed journals were rated as poor quality.

Of the six primary research studies, two were quantitative studies (Bailes et al., 2011; Bar-Haim et al., 2006), three were case reviews (Bailes et al., 2010; Ko et al., 2015; Lee, 2016), and one was a randomized control trial (Mahani, Karimloo, & Amirsalari, 2011). Of the five reviews of research studies, two were informal reviews (Damino, 2009; Weisleder, 2010), one was a scoping review (Liptak, 2005), and one was a systematic review and meta-analysis (Martins et al., 2016). The Therasuit intervention was not reviewed by any expert review groups (see Table 1).

Two of the articles we found through our literature review were from non-peer-reviewed sources. One of these articles was a primary research study published by the creators of Therasuit in a popular magazine (Koscielny, 2004). It was a pilot study that was an ongoing study using pre-/post-test design that had moderate relevance to our PICO question and was an article of poor quality. The other article from a non-peer-reviewed source was a review of research studies that was a critically appraised topic (Watling & Hauer, 2015). It was a grey literature report published as part of AOTA's critically appraised topics and papers series. This article was about weighted vests so it had limited relevance to our PICO question and was also of poor quality.

Summary of the Current Evidence and Reviews of Evidence.

After analyzing the relevance to our PICO questions and the quality of the articles, we reviewed the three best evidence resources. The randomized control trial conducted by Bar-Haim et al. on the Adeli suit's effect on children with cerebral palsy provides evidence for the Adeli Suit treatment's potential to improve motor functions and mechanical efficiency in children with cerebral palsy as well as improve retention of the progress made throughout the months following the administration of the treatment (2006). Outcomes of the study suggest that the Adeli suit may increase mechanical efficiency after intensive use of the intervention but did not show an increase in gross motor function following its use (Bar-Haim et al., 2006). The strengths of this study were minimal biases, appropriate analytic methods, and proper reporting of statistics. The weaknesses included timing bias and the lack of an adequate sample size to power the study (Bar-Haim et al., 2006).

The randomized control trial study conducted by Bailes et al. (2011) investigated the potential benefits of intensive Therasuit programs in greater motor function and functional skills in children with cerebral palsy by measuring gross motor function and self-care abilities. The results yielded no significant differences between the control (Therasuit vest and shorts) and experimental (Therasuit with bungee cords) groups. This study demonstrates that the Therasuit shows insufficient evidence of enhanced motor function in children with CP (Bailes et al., 2011).

Martins et al. (2016) conducted a systematic review and meta-analysis on suit therapy and its efficacy on functioning on children and adolescents who have cerebral palsy. Out of the 46 identified studies, only four studies were included in the meta-analysis. The researchers found that for gross motor functions at post-treatment and follow-up there was small, pooled effect sizes. However they "suggest that to weigh and balance benefits against harms, clinicians,

patients, and families need better evidence to examine and prove the effects of short intensive treatment such as suit therapy on gross motor function in children and adolescents with CP” (Martins et al., 2016, p. 348).

There were numerous gaps in the research for Therasuit. Most of the research that was conducted was on the Adeli suit, which is a variation of the Therasuit. This difference in terminology may make it difficult for parents and healthcare individuals to find information and research on the Therasuit. A literature review yielded minimal results on research on the Therasuit. Much of the available research had small sample sizes and did not use evidence-based interventions as the control groups (Bar-Haim et al., 2006). The vast majority of research on the Therasuit and the Adeli Suit has been on people that have cerebral palsy; no research was found on how the intervention affects autism spectrum disorder. The developer of the Therasuit published a study that claimed the Therasuit had very positive results, but it was not peer-reviewed and was published in a magazine (Koscielny, 2004). Neither the Therasuit nor the Adeli Suit have been reviewed by expert review groups and there is no information available on the AOTA website (see Table 1).

The research studies stated different recommendations for future research. The research should have larger sample sizes and there should be more research studies done on the effect of the Therasuit to see how well it works as an intervention (Martins et al., 2016). Future research should be conducted on a variety of populations besides children with cerebral palsy to back up claims from various websites and sources.

EBP Summary.

Health-care professionals and family members should be aware of the relevance of the intervention prior to starting treatment. There are numerous proposed benefits that result from

Therasuit supported by minimal evidence. There is limited availability of scholarly research for the general public to view. The articles that are easiest to find tend to be non-peer-reviewed. We found that Therasuit is potentially helpful for children with cerebral palsy to improve gross motor function but did not test for improvement in occupational performance. The research was inconclusive and concluded with the need for additional research. It is essential to consider the consequences of the intervention associated with the cost, intensity of the program, and the limited positive results prior to starting treatment. According to our research, the Therasuit should be classified as Wisconsin Determination Level 4 – Insufficient Evidence (Experimental Treatment). There are minimal studies on the population of children with autism spectrum disorder.

Expert Review Table.

Table 1
Summary of Evidence and Recommendations by Expert Review Groups for Therapist

Review Organization	Summary and Recommendations	Citation and Source
Wisconsin Treatment Intervention Advisory Committee	Not reviewed	Wisconsin Department of Health Services Autism and Other Developmental Disabilities Treatment Intervention Advisory Committee (2016). https://tiac.wisconsin.gov/summary-determinations-regarding-level-evidence.htm
Evidence-Based Practices for Children, Youth, and Young Adults with Autism Spectrum Disorder	Not reviewed	Wong, C., Odom, S. L., Hume, K. Cox, A. W., Fetting, A., Kucharczyk, S., ... Schultz, T. R. (2013). <i>Evidence-based practices for children, youth, and young adults with Autism Spectrum Disorder</i> . Chapel Hill: The University of North Carolina, Frank Porter Graham Child Development Institute, Autism Evidence-Based Practice Review Group. http://autismpdc.fpg.unc.edu/sites/autismpdc.fpg.unc.edu/files/2014-EBP-Report.pdf
Association for Science in Autism Treatment (ASAT)	Not reviewed	Association for Science in Autism Treatment (n.d.) Treatments in alphabetical order. (http://www.asatonline.org/for-parents/learn-more-about-specific-treatments/treatments-in-alphabetical-order/)
Cochrane Collaboration	Not reviewed	Cochrane Collaboration (2016). http://www.cochrane.org/
U.S. Department of Health and Human Services, Centers for Medicare & Medicaid Services.	Not reviewed	U.S. Department of Health and Human Services, Centers for Medicare & Medicaid Services. (2010). Autism spectrum disorders (ASDs) services final report on environmental scan. Retrieved from http://www.impaqint.com/sites/default/files/files/Autism_Spectrum_Disorders.pdf
National Autism Center	Not reviewed	National Autism Center (2015). National Standards Project, Phase 2. Retrieved from http://www.nationalautismcenter.org/national-standards-project/phase-2/
American Academy of Pediatrics	Studies of Complementary and Alternative Medicines (CAM) interventions are	Myers, S. M., & Johnson, C. P. (2007). Management of children with autism spectrum disorders. <i>Pediatrics</i> , 120(5), 1162-1182. http://pediatrics.aappublications.org/content/pediatrics/120/5/1162.full.pdf

Review Organization	Summary and Recommendations	Citation and Source
	limited or flawed. Not recommended as an evidence-based intervention.	

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Ability Plus Therapy. (2014). Intensive suit therapy. Retrieved from

<http://abilityplustherapy.com/got-therapy/intensive-suit-therapy/>

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Bailes, A. F., Greve, K., & Schmitt, L. C. (2010). Changes in two children with cerebral palsy after intensive suit therapy: A case report. *Pediatric Physical Therapy*, 22(1), 76-85. doi:10.1097/PEP.0b013e3181cbf224

Bar-Haim, S., Harries, N., Belokopytov, M., Frank, A., Copeliovitch, L., Kaplanski, J., & Lahat, E. (2006). Comparison of efficacy of adeli suit and neurodevelopmental treatments in children with cerebral palsy. *Developmental Medicine and Child Neurology*, 48(5), 325-330. doi:S0012162206000727

Damino, D. L. (2009). Rehabilitative therapies in cerebral palsy: The good, the not as good, and the possible. *Journal of Child Neurology*, 24(9), 1200-1204. doi:10.1177/0883073809337919

Genius 4 Kids. (2011). Product/equipment. Retrieved from

<http://www.genius4kids.com/Main/10-Equipment-E1.htm>

Ko, M. S., Lee, J. A., Kang, S. Y., & Jeon, H. S. (2015). Effect of adeli suit treatment on gait in a child with cerebral palsy: A single-subject report. *Physiotherapy Theory and Practice*, 31(4), 275-282. doi:10.3109/09593985.2014.996307

Koscielny, I. (2004, June). Therasuit: Soft dynamic proprioceptive orthotic. *Cerebral Palsy Magazine*, 2(1), 8-13. Retrieved from

<http://www.suittherapy.com/images/TheraSuit%20Article.pdf>

Lee, B. H. (2016). Clinical usefulness of adeli suit therapy for improving gait function in children with spastic cerebral palsy: A case study. *Journal of Physical Therapy Science*, 28(6), 1949-1952. doi:10.1589/jpts.28.1949

Liptak, G. (2005). Complementary and alternative therapies for cerebral palsy. *Mental Retardation and Developmental Disabilities Research Reviews*, 11, 156-163. doi:10.1002/mrdd.20066

Mahani, M. K., Karimloo, M., & Amirjalali, S. (2011). Effects of modified adeli suit therapy on improvement of gross motor function in children with cerebral palsy. *Hong Kong Journal of Occupational Therapy*, 21(1), 9-14. <http://dx.doi.org/10.1016/j.hkjot.2011.05.001>

Martins, E., Cordovil, R., Oliveira, R., Letras, S., Lourenco, S., Pereira, I., . . . Marques, M. (2016). Efficacy of suit therapy on functioning in children and adolescents with cerebral palsy: A systematic review and meta-analysis. *Developmental Medicine and Child Neurology*, 58(4), 348-360. doi:10.1111/dmcn.12988

Mehl-Madrona, L. (2001). Cerebral palsy. Retrieved from <http://www.healing-arts.org/children/cp/cpadeli.htm>

Neo-kinisis. (n.d.). Neo-kinisis. Retrieved from <http://www.neo-kinisi.com/en/>Therasuit LLC.

(2006a). Pediatric fitness center page. Retrieved from

<http://www.therasuit.com/program.htm>

Therasuit LLC. (2006b). Therasuit method. Retrieved from

<http://www.suittherapy.com/therasuit%20info.htm>

Turner, A. (2006). The efficacy of Adeli suit treatment in children with cerebral palsy.

Developmental Medicine & Child Neurology, 48(5), 324.

Watling, R. & Hauer, S. (2015). Critically appraised topic: Evidence for weighted vests for children with autism spectrum disorder. Retrieved from

<http://www.aota.org/Practice/ChildrenYouth/Evidence-based/CAT-weighted-vests-ASD.aspx>

Weisleder, P. (2010). Unethical prescriptions: Alternative therapies for children with cerebral palsy. *Clinical Pediatrics*, 49(1), 7-11. doi:10.1177/0009922809340438

Background Learning and Evidence Searches

Table of Evidence Resources.

Table 1.
Websites that Address Therasuit Intervention

Title/Name	Brief Description	Source
Therasuit IIc: Intensive Therapy for Cerebral Palsy	Website presenting general information about Therasuit training and prices for participants Describes Therasuit exercise programs Website detailing general Therasuit therapy information and describing the equipment. Describes different equipment that is part of Therasuit therapy States the cost of all of the equipment	www.Therasuit.com
Ability Plus Therapy: Intensive Suit Therapy	Website for a Pediatric Therapy Center specializing in intensive therapy services Explains benefits and precautions of the Therasuit Method including the targeted population Describes a typical therapy session	Ability Plus Therapy (2014). http://abilityplustherapy.com/
Cerebral Palsy: The Adeli Suit	Website focusing on origination and purpose of the Adeli suit Discusses potential bodily outcomes of utilizing Adeli suit	Mehl-Madrona, L. (2001). http://www.healing-arts.org/index2.htm
Aetna: Suit Therapy	Website describing the history and development of the Adeli suit Describes typical disorders for which the Adeli suit is used as treatment Discusses various research studies that have been performed on the Adeli suit and their results	Aetna, Inc. (2015) http://www.aetna.com

Background learning paper one.

This EBP project will concentrate on the use and effectiveness of the Therasuit in pediatric therapy. Although this project examines the use of Therasuit for children with autism spectrum disorders, most of the websites focus on Therasuit for children who are diagnosed with cerebral palsy. The background learning on this topic explored descriptions of Therasuit, the history of the Therasuit, its stated benefits, and the costs that are associated with it.

The Therasuit is a suit specifically designed to help people with disabilities. The suit includes shorts, a cap, kneepads, a vest, and shoe attachments (Lee, 2016). The children put on the suit, and then the therapist attaches special cords onto hooks on the suit. They attach adjustable cords in a way that fits each individual's body (Lee, 2016). The cords are intended to be imitators of major muscle group's extensors and flexors (Ko, Lee, Kang, & Jeon, 2015). This suit is indicated to help children diagnosed with cerebral palsy, autism, down syndrome, developmental delays, hypotonia, athetosis, post stroke, spasticity, traumatic brain injury, and ataxia (Ability Plus Therapy, 2014). The Therasuit program is an intense exercise program for children as it provides pressure of 30 to 80 pounds of vertical load (Turner, 2006). In the program, a therapist works one-on-one with the child 5 days per week for 3 hours per day. The program usually lasts 2 or 3 weeks (Therasuit LLC, 2006).

The Therasuit has many stated benefits. The Therasuit company (Therasuit LLC, 2006) claims it improves balance, coordination, body and spatial awareness, bone density, and speech production. It is described as able to normalize gait patterns and muscle tone, and provide external stabilization, dynamic correction, and tactile stimulation. It is also stated to help to decrease contractures, support weak muscles, and also claims to help retrain an individual's central nervous system, restore ontogenic development. Finally it is supposedly able to influence

the vestibule system, provide resistance to strong muscles to help make them even stronger, improve hip alignment, align the body, promote the development of fine and gross motor skills and reduce uncontrolled movements related to ataxia and athetosis.. There are also several precautions with the Therasuit, for individuals who have heart conditions, hip subluxation, hydrocephalus, kidney problems, uncontrolled seizures, diabetes, and high blood pressure. The contraindications are severe scoliosis and hip subluxation that is greater than fifty percent (Therasuit LLC, 2006).

There have been various versions of suits prior to the Therasuit. Suit therapy was developed for Russia's space program. The first suit was invented in 1971 and was called the Penguin suit (Ability Plus Therapy, 2014). It was originally worn by astronauts in space to help offset the damaging effects that weightlessness had on the body (Ability Plus Therapy, 2014). The technology was then adapted for children with disabilities. The Russian Academy of Science developed the Adeli suit (Ability Plus Therapy, 2014). Polish physical therapists Richard and Izabela Koscielny then created the Therasuit, which is a modified version of the Adeli suit (Ability Plus Therapy, 2014).

There are many costs associated with the Therasuit. The Therasuit program usually lasts 2 or 3 weeks and costs the patients families around \$1500 U.S. dollars per week. If the parents want to be trained on the Therasuit for their children, they can attend a 2-day course that costs \$850 U.S. dollars. Training of occupational or physical therapists in the Therasuit method costs around \$1900 U.S. dollars (Therasuit LLC, 2006). One piece of Therasuit equipment it costs \$2500 U.S. dollars (Genius 4 Kids, 2011). Some health insurances do not cover the Therasuit program; Aetna considers the suit experimental and investigational "because there is inadequate

evidence of the effectiveness of this therapy in the management of these conditions” (Aetna Inc, 2015, para.1).

This background information on the Therasuit helps provide insight on what the Therasuit supposedly is, and what the stated benefits are of suit therapy. However, there was a lack of scholarly resources on the Therasuit. Most of the information on the Therasuit and other related suits came from websites. The founders of the Therasuit run the websites that contained the most resources and information on the Therasuit.

References

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Background learning paper two.

This EBP project will focus on Therasuit as an intervention for Autism Spectrum Disorder. While much of the literature circulates around cerebral palsy, this paper will attempt to investigate whether TheraSuit is an effective intervention in occupational therapy. Background learning on this topic explored the elements and origin of the TheraSuit, the candidates and goals of therapy, cost and training of the TheraSuit, and criteria for participation in the program.

TheraSuit is a device equipped with distinct characteristics that is used in occupational therapy services. It is composed of a soft, form-fitting suit filled with weights (The Therapy Place, 2016). The suit includes shoulder pads, a vest, shorts, knee pads, a cap, and adapted shoes all connected by elastic bands (Kim, Lee, & Park, 2016). TheraSuit was adapted from the Adeli suit, a device developed by the Russian space program to help astronauts combat the effects of gravity in space by permitting movement of proprioceptive signals and avoiding muscular changes (Mehl-Madrona, 2001). The suit is also commonly known as the bungee cord suit, penguin suit, and therapy suit (Aetna Inc., 2015). The success of the suit in the original applications led to its widespread use in therapy programs focused on developing or regaining normal motor movements. The TheraSuit was created by physical therapists, Richard and Izabela Koscielny, the parents of a daughter with cerebral palsy (Neo-kinisis, n.d.). TheraSuit is available in 50 countries and over 425 clinics offer this type of therapy (TheraSuit Method, n.d.).

TheraSuit was proposed to help individuals with various neurological and developmental disorders. The device is believed to enhance motor movement and restore normal muscle function in people two and half years and older (Ability Plus Therapy, 2014; Mehl-Madrona, 2001). The proposed outcome of TheraSuit is improved proprioception, reduced pathological reflexes, and restored proper patterns of movement (The Therapy Place, 2016). TheraSuit has

been used to treat cerebral palsy and other disorders including hypertonia and hypotonia, stroke, traumatic brain injury, autism spectrum disorder, sensory-processing disorder, down syndrome, and developmental delay (Ability Plus Therapy, 2014). Proposed benefits from TheraSuit therapy include normalized muscle tone, proper body alignment, corrected gait patterns, improved coordination and spatial awareness, and decreased involuntary movements (TheraSuit Method, n.d.).

When deciding on TheraSuit therapy, one must consider certain factors, such as the cost, training, and additional exercise programs. There are a limited number of training courses for therapists and parents available in select parts of the world (TheraSuit LLC, 2006b). A two-day training course, at the price of \$850.00, is offered for parents to learn about the history, application, and benefits of TheraSuit (TheraSuit LLC, 2006a). The course presents exercises for the child to increase strength, trunk stabilization, and decrease tone (TheraSuit LLC, 2006a). TheraSuit is available in all sizes for the purchase of \$2,500.00 (Genius 4 Kids, 2011). On-site group training for therapists on the Therasuit Method is available for \$1,900.00 (Therasuit LLC, 2006a). Therapists are given an opportunity to wear the suit and resources for practice (TheraSuit LLC, 2006). In addition to these programs, an intense 2-3 week exercise course is offered for children to focus on strength enhancement using the TheraSuit, Universal Exercise Unit (suspension system), and the Spider (network of bungee cords and belts) (TheraSuit LLC, 2006a). This course is targeted toward improving the child's developmental abilities.

A typical TheraSuit therapy session includes many components. The program consists of 3-4 hour sessions, 5 days per week for 3-4 weeks, but may be modified according to the individual's needs (Ability Plus Therapy, 2014). At the first meeting, an evaluation is conducted and made into a plan of care based on observations. During the session, equipment is used to

begin the process of strengthening muscles and improving functional skills (Ability Plus Therapy, 2014). At the end of the program, the caregivers are sent home with an exercise program to continue progress (Ability Plus Therapy, 2014). Individuals with restrictions to participating in suit therapy include heart conditions, seizures, diabetes, high blood pressure, hip subluxation, and kidney problems (TheraSuit Method, n.d.). Claims have been made about TheraSuit and its success in restoring damaged reflexes and improving motor skills (Stern, 2016).

This summary of the TheraSuit emphasizes the device's numerous claimed benefits, use in occupational therapy, and the importance of understanding factors such as the cost, training, and expectations of therapy. Minimal research was found for its use with Autism Spectrum Disorder with the focus primarily on cerebral palsy. The effectiveness of the TheraSuit remains questionable due to the lack of scholarly articles promoting its use for certain disorders. It was difficult to find reliable sources with valid information. The websites with the most credible information was retrieved from the TheraSuit founders' site.

References

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Background learning paper three.

This EBP project will examine interventions for children with Autism Spectrum Disorder (ASD). This subgroup will specifically discuss if the Therasuit method of intervention is valid and should be used based on evidence. Background learning on this topic explored the development of the Therasuit, the most common disorders and diagnoses associated with Therasuit intervention, the reasoning behind why the suit is used in therapy, and the qualifications and cost associated with certification and Therasuit products.

The Therasuit is a fairly recent development as a therapeutic intervention. The suit was initially developed by the Russian space program to counteract the muscular atrophy and osteoporosis that astronauts were experiencing because of the lack of gravity during their time in space (Neo-kinisis. n.d.). It has also been called the Adeli Suit, Penguin Suit, Polish Suit, Stabilizing Pressure Input Orthoses, Therapy Suit, and TheraTogs in various countries (Aetna Inc., 2015). The Therasuit intervention for therapy was founded by Richard and Izabela Koscielny who both hold Master's degrees in Physical Therapy, are Certified Personal Fitness Trainers, and have a daughter diagnosed with cerebral palsy (Neo-kinisis. n.d.). This method was introduced internationally in the 1990s for children with neuromuscular trauma and then in the United States around 1997 (Neo-kinisis. n.d.). The Adeli Suit is classified by the U.S. Food and Drug Administration (FDA) as a class 1 limb orthosis, otherwise known as a brace (Aetna Inc., 2015).

The Therasuit has been used as an intervention for a variety of disorders and diagnoses. The Adeli Suit technique combines an exercise routine with a form-fitting suit that resists movement (Turner, 2006). The suit is made up of a vest, shorts, kneepads, and special shoes. Support and pressure are applied to various muscles and joints by adjustable hooks, rings, and elastic bands.

The bungee cords are designed to mimic extensor and flexor patterns of major muscle groups (Turner, 2006). The Therasuit Method has been proposed as an intervention for children with developmental delay, muscle tone disorders, Spina Bifida, spinal cord injury, stroke, and traumatic brain injury, as well as children with sensory processing disorders, genetic disorders like Down Syndrome, and for children in need of post-operative rehabilitation (Johns Hopkins All Children's Hospital, 2016). The suit is most frequently used as an intervention for children with cerebral palsy because it is claimed that the suit corrects the diminished capability to counteract gravitational forces by restarting the developmental process of the vestibular system (Mehl-Madrona, 2001).

There are a variety of claims about the reasons why the Therasuit is used for therapy. One study described the intervention as follows: "therapists adjusted the bungee-like cords to imitate normal flexor and extensor patterns of major muscle groups in an attempt to reposition the limbs to correct abnormal muscle alignment" (Ko, Lee, Kang, & Jeon, 2014, p. 275). It is proposed that the mechanism of the Adeli suit is that movement therapy stimulates the brain and retrains it to recognize and initiate the movement of the correct muscles. (Lee, 2016) When the body is in proper alignment, it is claimed that movement therapy will reeducate the brain to recognize the movements that the muscles can correctly perform (Turner, 2006). It is claimed that the Adeli suit has an impact on the antigravitational system and helps the neurons that transmit proprioceptive signals flow in an organized manner to normalize speech and fine motor movements (Mehl-Madrona, 2001).

The Therasuit intervention has a variety of costs associated with the training sessions and suit. The Therasuit itself comes in six different sizes and each suit costs \$2500 U.S. dollars (Genius 4 Kids, 2011). The Therasuit has a variety of accessories, including plastic hooks that

cost \$15 for 20 pieces, metal hooks that cost \$20 for 20 pieces, connectors that cost \$140 for 40 pieces, loop tape that costs \$4 for 1 ft., and special shoes that range in price from \$110-\$220 per pair with optional insoles that range from \$25-\$30 per pair (Genius 4 Kids, 2011). Training courses for therapists cost anywhere from \$850-\$1,900 depending on the level of the training course and the number of days of training (Therasuit LLC, 2006).

When conducting this background summary of the Therasuit intervention, it was difficult to find peer-reviewed, credible, scientific sources. There was also not much written about the suit's use as an intervention for children with autism. This, along with an understanding of the development, proposed mechanisms of, and costs of the Therasuit, is important contextual information to consider while starting this project.

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Johns Hopkins All Children's Hospital. (2016). Therasuit method intensive program (TMIP).

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<https://www.hopkinsallchildrens.org/services/rehabilitation/physicaltherapy/therasuit>

Ko, M., Lee, J., Kang, S., and Jeon, H. (2014). Effect of Adeli suit treatment on gait in a child with cerebral palsy: a single-subject report. *Physiotherapy Theory and Practice*, 31, 275-282. doi:10.3109/09593985.2014.996307

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Developmental Medicine & Child Neurology, 48, 324. doi:10.1017/S0012162206000715

Evidence searches.

Individual Assignment: Library Database

Library Database: CINAHL Plus with Full Text (Cumulative Index of Nursing and Allied Health Literature), EBSCOhost

Preparing the Search Process:

- “How to use CINAHL” tutorials assured its easy-to-use features when performing a basic or advanced search. The CINAHL database has robust search capabilities and provides access to nearly all English-language Nursing journals covering a wide range of topics.
- The database allows utilization of specific search parameters to limit results by author type, publication type, publication year, articles with illustrations, and more.
- CINAHL has peer-reviewed and full-text source search abilities.
- Potential search terms:
 - Autism spectrum disorder, autism, occupational therapy, cerebral palsy, Therasuit, treatment, Therapy suit, Adeli suit, suit therapy, Penguin suit, Polish Suit, Stabilizing Pressure Input Orthoses, and TheraTogs
- Final term list for Database search:
 - “Therasuit,” “Therapy suit,” “Adeli Suit,” “Penguin suit,” “Stabilizing pressure input orthoses,” “TheraTogs,” “Therasuit” AND “occupational therapy”[Mesh], “Suit therapy” AND “occupational therapy”[Mesh], “Adeli suit” AND “autism spectrum disorder,” “Adeli suit” AND “autism spectrum disorder” AND “occupational therapy”[Mesh], “Therasuit” AND “autism spectrum disorder” AND “occupational therapy”[Mesh], “suit therapy” AND “autism spectrum disorder,” “Penguin suit” AND “autism spectrum disorder,” “Polish suit” AND “autism spectrum disorder,” “stabilizing pressure input orthoses” AND “autism spectrum disorder,” “TheraTogs” AND “autism spectrum disorder,” “Therasuit” AND “cerebral palsy”[Mesh], “Adeli suit” AND “cerebral palsy”[Mesh], “Therapy suit” AND “cerebral palsy”[Mesh], “Penguin suit” AND “cerebral palsy”[Mesh], “Polish suit” AND “cerebral palsy”[Mesh], “Stabilizing pressure input orthoses” AND “cerebral palsy”[Mesh], “TheraTogs” AND “cerebral palsy”[Mesh].
- The only MeSH heading terms are “occupational therapy” and “cerebral palsy.” I used “Autism spectrum disorder,” which is not a MeSH heading. I tried “Autistic disorder” prior to the search, however it yielded no results.
- Database filters to be tried: I will try no filters.
- Boolean logic terms to be tried: I will use AND because all of the terms are important to the intervention.

Summarizing a Strategic Search Process

Filters/Years	Keywords	Total yield/Relevant hits	Date
None Years: Unlimited	“Therasuit”	2/2 Bailes et al., 2010 Bailes et al., 2011	Nov. 13 th , 2016

None Years: Unlimited	“Therapy suit”	25/4 Martins et al., 2016 Lee, 2016 Bailes et al., 2011 Mahani et al., 2011 Bailes et al., 2010	Nov. 13 th , 2016
None Years: Unlimited	“Adeli suit”	7/6 Ko et al., 2015 Mahani et al., 2011 Lee, 2016 Kim et al., 2016 Bar-Haim et al., 2006 Turner, 2006	Nov. 13 th , 2016
None Years: Unlimited	“Penguin suit”	0/0	Nov. 13 th , 2016
None Years: Unlimited	“Stabilizing pressure input orthoses”	140/0	Nov. 13 th , 2016
None Years: Unlimited	“TheraTogs”	9/0	Nov. 13 th , 2016
None Years: Unlimited	“Therasuit” AND “occupational therapy” [Mesh]	1/1 Bailes et al., 2010	Nov. 13 th , 2016
None Years: Unlimited	“Suit therapy” AND “occupational therapy”[Mesh]	2/2 Mahani et al., 2011 Bailes et al., 2010	Nov. 13 th , 2016
None Years: Unlimited	“Adeli suit” AND “autism spectrum disorder”	0/0	Nov. 13 th , 2016
None Years: Unlimited	“Adeli suit” AND “autism spectrum disorder” AND “occupational therapy”[Mesh]	0/0	Nov. 13 th , 2016
None Years: Unlimited	“Therasuit” AND “autism spectrum disorder” AND “occupational therapy”[Mesh]	0/0	Nov. 13 th , 2016
None Years: Unlimited	“Suit therapy” AND “autism spectrum disorder”	0/0	Nov. 13 th , 2016
None Years: Unlimited	“Penguin suit” AND “autism spectrum disorder”	0/0	Nov. 13 th , 2016

None Years: Unlimited	“Polish suit” AND “autism spectrum disorder”	0/0	Nov. 13 th , 2016
None Years: Unlimited	“Stabilizing pressure input orthoses” AND “autism spectrum disorder”	0/0	Nov. 13 th , 2016
None Years: Unlimited	“TheraTogs” AND “autism spectrum disorder”	0/0	Nov. 13 th , 2016
None Years: Unlimited	“Therasuit” AND “cerebral palsy”[Mesh]	2/2 Bailes et al., 2011 Bailes et al., 2010	Nov. 13 th , 2016
None Years: Unlimited	“Adeli suit” AND “cerebral palsy”[Mesh]	7/6 Ko et al., 2015 Lee, 2016 Kim et al., 2016 Turner, 2016 Bar-Haim et al., 2006 Bailes et al., 2010	Nov. 13 th , 2016
None Years: Unlimited	“Therapy suit” AND “cerebral palsy”[Mesh]	10/5 Lee, 2016 Martins et al., 2016 Bailes et al., 2011 Mahani et al., 2011 Bailes et al., 2010	Nov. 13 th , 2016
None Years: Unlimited	“Penguin suit” AND “cerebral palsy”[Mesh]	0/0	Nov. 13 th , 2016
None Years: Unlimited	“Polish suit” AND “cerebral palsy”[Mesh]	0/0	Nov. 13 th , 2016
None Years: Unlimited	“Stabilizing pressure input orthoses” AND “cerebral palsy”[Mesh]	1/1 Hylton & Allen, 1997	Nov. 13 th , 2016
None Years: Unlimited	“TheraTogs” AND “cerebral palsy”[Mesh]	2/1 Scales et al., 2008	Nov. 13 th , 2016

Summary of 5 BEST Research Articles

Bailes, A., Greve, K., & Schmitt, L. (2010). Changes in two children with cerebral palsy after intensive suit therapy: a case report. *Pediatric Physical Therapy*, 22(1), 76-85.

doi:10.1097/PEP.0b013e3181cbf224

PURPOSE: The purpose of this case report was to investigate effects of intensive suit therapy on gait, functional skills, caregiver assistance, and gross motor ability in children with cerebral palsy. **CASE DESCRIPTION:** Two children with spastic diplegia classified at level III on the Gross Motor Function Classification System participated. Outcomes were assessed using dimensions D and E of the Gross Motor Function Measure, the Pediatric Evaluation of Disability Inventory, and instrumented gait analysis. **INTERVENTION:** Each child participated in the Therasuit Method, 4 hours a day, 5 days a week for 3 weeks. **OUTCOMES:** Very small improvements in function were noted in dimension D of the Gross Motor Function Measure and Pediatric Evaluation of Disability Inventory Self-care Domain with decreased function in other areas. Improved walking speed, cadence, symmetry, joint motion, and posture were found with gait analysis. **CONCLUSION:** Further investigation is needed of the suit itself, and intensive therapy programs in children with cerebral palsy.

Ko, M., Lee, J., Kang, S., & Jeon, H. (2015). Effect of Adeli suit treatment on gait in a child with cerebral palsy: a single-subject report. *Physiotherapy Theory & Practice, 31*(4), 275-282. doi:10.3109/09593985.2014.996307

The purpose of this research report is to investigate the long-term effect of Adeli suit treatment (AST) in a child with cerebral palsy (CP) on spatial-temporal gait parameters, 10-meter walking speed, gross motor functional measure (GMFM) and performance on the pediatric balance scale (PBS). An eight-year-old girl with spastic diplegia classified as level III on the Gross Motor Function Classification System participated in this single-subject A-B design study, with a baseline and an intervention phase. The baseline phase was collected at one-week intervals for six weeks and then the AST intervention phase was carried out with 18 AST sessions, 50 min per session, once a week for an 18-week period. Spatial-temporal gait parameters significantly improved after the completion of 18 sessions. Furthermore, 10-meter walking speed, GMFM and PBS changed significantly from the baseline measurement ($p < 0.05$). In conclusion, the AST was effective in improving gait, gross motor function and balance in a child with diplegic CP. Clinically, neuro-rehabilitation with AST provided a complementary and alternative treatment for lower extremity rehabilitation in this child with CP. These findings provide preliminary evidence supporting the effectiveness of AST in children with spastic CP, and thus underscore the need for additional research in this area.

Lee, B. (2016). Clinical usefulness of Adeli suit therapy for improving gait function in children with spastic cerebral palsy: a case study. *Journal of Physical Therapy Science, 28*(6), 1949-1952.

[Purpose] The purpose of this study was to determine the effects of Adeli suit therapy (AST) on gross motor function and gait function in children with cerebral palsy. [Subjects and Methods] Two participants with spastic cerebral palsy were recruited to undergo AST. AST was applied in 60-minute sessions, five times per week, with 20 sessions total over 4 weeks. Assessments of gross motor function, spatiotemporal parameters, and functional ambulation performance for gait were conducted. [Results] Gross motor function, cadence, and functional ambulation

performance improved after the intervention in both cases. [Conclusion] Although additional follow-up studies are required, the results demonstrated improved gross motor function and functional ambulation performance in the children with cerebral palsy. These findings suggest a variety of applications for conservative therapeutic methods that require future clinical trials in children with cerebral palsy.

Mahani, M. K., Karimlo, M., & Amirsalari, S. (2011). Effects of modified Adeli Suit Therapy on improvement of gross motor function in children with cerebral palsy. *Hong Kong Journal of Occupational Therapy*, 21(1), 9-14. doi:10.1016/j.hkjot.2011.05.001

Objective: This study aimed to investigate the effects of the Modified Adeli suit therapy (MAST) on improvement of gross motor function in children with cerebral palsy (CP). Methods: Thirty-six children with CP assigned by match pairs to three equal groups such as the MAST, the AST, and the Neurodevelopmental Treatment. They were treated for 4 weeks, 2 hr/d, 5 d/wk. All children were tested by the Gross Motor Function Measure (GMFM) at baseline, immediately before and 16 weeks after treatments. Results: All groups had improvement in the GMFM after treatment ($p < .01$) and there were significant differences among groups ($p < .01$). In the follow-up study, no significant improvement in the GMFM was seen within groups ($p > .05$), but again there were significant differences among groups ($p < .01$). Conclusion: The MAST was more effective than using either the AST or the Neurodevelopmental treatment on improvement of gross motor function in children with CP after treatment and at follow-up.

Turner, A. (2006). The efficacy of Adeli suit treatment in children with cerebral palsy. *Developmental Medicine & Child Neurology*, 48(5), 324.

Adeli suit treatment (AST) is a pertinent and timely topic for research. Many families and clinicians are interested in the outcomes of treatment using the Adeli suit, but the rehabilitation community does not have adequate scientific support for its use as a generally accepted treatment for cerebral palsy (CP). Very little research has been completed around non-traditional treatments such as AST. The study reported in this issue of DMCN by Bar-Haim et al. compared the use of AST and traditional neurodevelopment treatment (NDT) in children with CP.

Individual Assignment: Other Evidence Resources

Evidence Resources: AOTA Website (<https://www.aota.org/>)

Preparing for Search Process

- AOTA is the national association that represents occupational therapists and occupational therapy students. The website provides resources about occupational therapy to the general public and strives to promote the development of the profession.
- Viewers are able to navigate the website and browse multiple pages about occupational therapy practice, advocacy and policy, education and careers, conferences and events, and publications.
- Membership to AOTA allows free access to the American Journal of Occupational Therapy.
- Potential search terms:
 - Autism spectrum disorder, autism, occupational therapy, cerebral palsy, Therasuit, treatment, intervention, Therapy suit, Adeli suit, suit therapy, Penguin suit, Polish Suit, Stabilizing Pressure Input Orthoses, and TheraTogs
- Final term list for resource:
 - “Therasuit,” “Therapy suit,” “Adeli Suit,” “Penguin suit,” “Stabilizing pressure input orthoses,” “TheraTogs,” “Therasuit occupational therapy,” “Adeli suit occupational therapy,” “TheraTogs occupational therapy,” “Therasuit autism spectrum disorder,” “Adeli suit autism spectrum disorder,” “stabilizing pressure input orthoses autism spectrum disorder,” “Autism spectrum disorder interventions,” “Therasuit cerebral palsy,” “Suit therapy cerebral palsy,” “Adeli suit cerebral palsy,” “Stabilizing pressure input orthoses cerebral palsy,” “TheraTogs cerebral palsy,” “Cerebral palsy interventions.”
- No filters will be tried. I will enter the terms in the search bar and identify any relevant sources.

Summarizing a Strategic Search Process

Filters/Years	Keywords	Total Yield/Relevant Hits	Date
None Years: Unlimited	“Therasuit”	0/0	Nov. 14 th , 2016
None Years: Unlimited	“Therapy suit”	283/0	Nov. 14 th , 2016
None Years: Unlimited	“Adeli suit”	24/1 Watling & Hauer, 2015	Nov. 14 th , 2016
None Years: Unlimited	“Penguin suit”	0/0	Nov. 14 th , 2016
None Years: Unlimited	“Stabilizing pressure input orthoses”	8/0	Nov. 14 th , 2016

None Years: Unlimited	“TheraTogs”	1/0	Nov. 14 th , 2016
None Years: Unlimited	“Therasuit occupational therapy”	5/0	Nov. 14 th , 2016
None Years: Unlimited	“Adeli suit occupational therapy”	15/0	Nov. 14 th , 2016
None Years: Unlimited	“TheraTogs occupational therapy”	4/0	Nov. 14 th , 2016
None Years: Unlimited	“Therasuit autism spectrum disorder”	5/0	Nov. 14 th , 2016
None Years: Unlimited	“Adeli suit autism spectrum disorder”	15/0	Nov. 14 th , 2016
None Years: Unlimited	“Stabilizing pressure input orthoses autism spectrum disorder”	8/0	Nov. 14 th , 2016
None Years: Unlimited	“Autism spectrum disorder interventions”	239/0	Nov. 14 th , 2016
None Years: Unlimited	“Therasuit cerebral palsy”	4/0	Nov. 14 th , 2016
None Years: Unlimited	“Suit therapy cerebral palsy”	28/0	Nov. 14 th , 2016
None Years: Unlimited	“Adeli suit cerebral palsy”	14/0	Nov. 14 th , 2016
None Years: Unlimited	“Stabilizing pressure input orthoses cerebral palsy”	7/0	Nov. 14 th , 2016
None Years: Unlimited	“TheraTogs cerebral palsy”	4/0	Nov. 14 th , 2016
None Years: Unlimited	“Cerebral palsy interventions”	121/0	Nov. 14 th , 2016

Summary of Best Research

Watling, R. & Hauer, S. (2015). Critically appraised topic: Evidence for weighted vests for children with autism spectrum disorder. Retrieved from <http://www.aota.org/Practice/ChildrenYouth/Evidence-based/CAT-weighted-vests-ASD.aspx>

Summary of Key Findings: One Level I systematic review, one Level III, and five Level IV studies that evaluated the effect of weighted vests on performance in daily life activities in children with ASD were found and included in the review. The Level I systematic review included seven peer reviewed studies, one non-peer reviewed study, and one poster. Findings of these studies were mixed. There is insufficient evidence from one Level I systematic review (Stephenson & Carter, 2009) to support the use of weighted vests to improve attention and behavior among individuals with ASD. There is insufficient evidence from one Level III study (Hodgetts, Magill-Evans, & Misiaszek, 2011a) to support the use of weighted vests for reducing motor stereotypy or heart rate. There is moderate evidence from five Level IV studies that weighted vests do not improve joint attention or problem behavior (Leew, Stein, & Gibbard, 2010), self-injurious or problem behavior (Quigley, Peterson, Frieder, & Peterson, 2011), engagement (Cox, Gast, Luscre, & Ayres, 2009), stereotypy or problem behavior (Reichow, Barton, Sewell, Good, & Wolery, 2010), or time in seat and time on task (Hodgetts, Magill-Evans, & Misiaszek, 2011b).

Individual Assignment: Library Database

Library Database: ERIC, Institute of Education Sciences of the U.S. Department of Education

Preparing for Search Process

- ERIC search tutorial videos emphasized the ease of searching and how there is not much use for the Advanced Search feature. All directions for the types of searches were easy to understand.
- There are a variety of “descriptors” to help narrow searches. Searches can also be narrowed by publication dates, sources, author, publication type, education level, and audience.
- Searches can be specifically for peer-reviewed sources or sources with the full text available on ERIC.
- “Occupational therapy” yielded more and better results than “OT” and “Autism Spectrum Disorder” yielded more and better results than “ASD.”
- Possible Search Terms:
 - Occupational therapy, autism spectrum disorder, cerebral palsy, intervention, Therasuit, Adeli Suit, Penguin Suit, Polish Suit, Stabilizing Pressure Input Orthoses, Therapy Suit, TheraTogs
 - Combinations of the above terms
- Finalization of Search Terms:
 - “Therasuit,” “Adeli Suit,” “Occupational therapy autism spectrum disorder Therasuit,” “occupational therapy autism spectrum disorder Adeli Suit,” “occupational therapy autism spectrum disorder Penguin Suit,” “occupational therapy autism spectrum disorder Polish Suit,” “occupational therapy autism spectrum disorder Stabilizing Pressure Input Orthoses,” “occupational therapy autism spectrum disorder Therapy Suit,” “occupational therapy autism spectrum disorder TheraTogs,” “occupational therapy cerebral palsy Therasuit,” “occupational therapy cerebral palsy Adeli Suit,” “occupational therapy cerebral palsy Penguin Suit,” “occupational therapy cerebral palsy Polish Suit,” “occupational therapy cerebral palsy Stabilizing Pressure Input Orthoses,” “occupational therapy cerebral palsy Therapy Suit,” “occupational therapy cerebral palsy TheraTogs,”
- Database Filters to Try: I will try no filters.
- Boolean Logic Terms to be tried: None because ERIC can be searched without Boolean search terms.

Summarizing a Strategic Search Process

Filters/Years	Keywords	Total Yield/Relevant Hits	Date
None Years: Unlimited	“Therasuit”	0/0	Nov. 10, 2016
None Years: Unlimited	“Adeli suit”	1/1 Liptak, G., 2005	Nov. 10, 2016

None Years: Unlimited	“occupational therapy autism spectrum disorder Therasuit”	439/0	Nov. 10, 2016
None Years: Unlimited	“occupational therapy autism spectrum disorder Adeli Suit”	440/0	Nov. 10, 2016
None Years: Unlimited	“occupational therapy autism spectrum disorder Penguin Suit”	441/0	Nov. 10, 2016
None Years: Unlimited	“occupational therapy autism spectrum disorder Polish Suit”	440/0	Nov. 10, 2016
None Years: Unlimited	“occupational therapy autism spectrum disorder Stabilizing Pressure Input Orthoses”	44/0	Nov. 10, 2016
None Years: Unlimited	“occupational therapy autism spectrum disorder Therapy Suit,”	952/0	Nov. 10, 2016
None Years: Unlimited	“occupational therapy autism spectrum disorder TheraTogs”	439/0	Nov. 10, 2016
None Years: Unlimited	“occupational therapy cerebral palsy Therasuit”	260/0	Nov. 10, 2016
None Years: Unlimited	“occupational therapy cerebral palsy Adeli Suit”	77/1 Liptak, G., 2005	Nov. 10, 2016
None Years: Unlimited	“occupational therapy cerebral palsy Penguin Suit”	77/0	Nov. 10, 2016
None Years: Unlimited	“occupational therapy cerebral palsy Polish Suit”	77/0	Nov. 10, 2016
None Years: Unlimited	“occupational therapy cerebral palsy Polish Suit”	77/0	Nov. 10, 2016
None Years: Unlimited	“occupational therapy cerebral palsy Stabilizing Pressure Input Orthoses”	2/0	Nov. 10, 2016
None Years: Unlimited	“occupational therapy cerebral palsy Therapy Suit”	244/0	Nov. 10, 2016
None Years: Unlimited	“occupational therapy cerebral palsy TheraTogs”	260/0	Nov. 10, 2016

Summary of Best Research Article(s)

Liptak, G. (2005). Complementary and alternative therapies for cerebral palsy. *Mental Retardation and Developmental Disabilities Research Reviews*, *11*, 156-163.

doi:10.1002/mrdd.20066

Abstract: The optimal practice of medicine includes integrating individual clinical expertise with the best available clinical evidence from systematic research. This article reviews nine treatment modalities used for children who have cerebral palsy (CP), including hyperbaric oxygen, the Adeli Suit, patterning, electrical stimulation, conductive education, equine-assisted therapy, craniosacral therapy, Feldenkrais therapy, and acupuncture. Unfortunately, these modalities have different degrees of published evidence to support or refute their effectiveness. Uncontrolled and controlled trials of hippotherapy have shown beneficial effects on body structures and functioning. Studies of acupuncture are promising, but more studies are required before specific recommendations can be made. Most studies of patterning have been negative and its use cannot be recommended. However, for the other interventions, such as hyperbaric oxygen, more evidence is required before recommendations can be made. The individual with CP and his or her family have a right to full disclosure of all possible treatment options and whatever knowledge currently is available regarding these therapies. (Contains 2 tables and 2 figures.)

Individual Assignment: Other Evidence Resources

Evidence Resource: OTSeeker

Preparing for Search Process

- OTSeeker is a database of abstracts of systematic reviews, randomized control trials, and other sources about OT interventions.
- OTSeeker has pages on the site that describe basic and advanced searches and how each can be used. The use of operators to combine terms as well as the punctuation needed to conduct different searches was explained.
- Possible Search Terms:
 - Therasuit, Adeli Suit, Penguin Suit, Polish Suit, Stabilizing Pressure Input Orthoses, Therapy Suit, TheraTogs, autism spectrum disorder, cerebral palsy
 - Combinations of the above terms
- Finalization of Search Terms:
 - Therasuit, “Adeli suit,” “Penguin Suit,” “Polish Suit,” “Stabilizing Pressure Input Orthoses,” “Therapy Suit,” TheraTogs, Therasuit AND “autism spectrum disorder,” Therasuit AND “cerebral palsy,” “Adeli suit” AND “autism spectrum disorder,” “Adeli suit” AND “cerebral palsy,” “Penguin suit” AND “autism spectrum disorder,” “Penguin suit” AND “cerebral palsy,” “Polish suit” AND “autism spectrum disorder,” “Polish suit” AND “cerebral palsy,” “Stabilizing pressure input orthoses” AND “autism spectrum disorder,” “Stabilizing pressure input orthoses” AND “cerebral palsy,” “Therapy suit” AND “autism spectrum disorder,” “Therapy suit” AND “cerebral palsy,” TheraTogs AND “autism spectrum disorder,” TheraTogs AND “cerebral palsy”
- Database Filters to Try: There are no filters to try
- Boolean Logic Terms to be tried: I will use quotation marks around phrases to search for those words in that order. I will also used AND to search for multiple terms to appear together in one abstract.

Documenting the Search Process

Filters/Years	Keywords	Total Yield/Relevant Hits	Date
None Years: Unlimited	Therasuit	1/1 Bailes, A., Greve, K., Burch, C., Reder, R., Lin, L., & Huth, M., 2011	Nov. 13, 2016
None Years: Unlimited	“Adeli suit”	1/1 Bar-Haim, S., Harries, N., Belokopytov, M., Frank, A., Copeliovitch, L., Kaplanski, J., & Lahat, E., 2006	Nov. 13, 2016
None	“Penguin Suit”	0/0	Nov. 13, 2016

Years: Unlimited			
None Years: Unlimited	“Polish Suit”	0/0	Nov. 13, 2016
None Years: Unlimited	“Stabilizing Pressure Input Orthoses”	0/0	Nov. 13, 2016
None Years: Unlimited	“Therapy Suit”	0/0	Nov. 13, 2016
None Years: Unlimited	TheraTogs	0/0	Nov. 13, 2016
None Years: Unlimited	Therasuit AND “autism spectrum disorder”	0/0	Nov. 13, 2016
None Years: Unlimited	Therasuit AND “cerebral palsy”	1/1 Bailes, A., Greve, K., Burch, C., Reder, R., Lin, L., & Huth, M., 2011	Nov. 13, 2016
None Years: Unlimited	“Adeli suit” AND “autism spectrum disorder”	0/0	Nov. 13, 2016
None Years: Unlimited	“Adeli suit” AND “cerebral palsy”	1/1 Bar-Haim, S., Harries, N., Belokopytov, M., Frank, A., Copeliovitch, L., Kaplanski, J., & Lahat, E., 2006	Nov. 13, 2016
None Years: Unlimited	“Penguin suit” AND “autism spectrum disorder”	0/0	Nov. 13, 2016
None Years: Unlimited	“Penguin suit” AND “cerebral palsy”	0/0	Nov. 13, 2016
None Years: Unlimited	“Polish suit” AND “autism spectrum disorder”	0/0	Nov. 13, 2016
None Years: Unlimited	“Polish suit” AND “cerebral palsy”	0/0	Nov. 13, 2016
None Years: Unlimited	“Stabilizing pressure input orthoses” AND “autism spectrum disorder”	0/0	Nov. 13, 2016

None Years: Unlimited	“Stabilizing pressure input orthoses” AND “cerebral palsy”	0/0	Nov. 13, 2016
None Years: Unlimited	“Therapy suit” AND “autism spectrum disorder”	0/0	Nov. 13, 2016
None Years: Unlimited	“Therapy suit” AND “cerebral palsy”	1/1 Bailes, A., Greve, K., Burch, C., Reder, R., Lin, L., & Huth, M., 2011	Nov. 13, 2016
None Years: Unlimited	TheraTogs AND “autism spectrum disorder”	0/0	Nov. 13, 2016
None Years: Unlimited	TheraTogs AND “cerebral palsy”	0/0	Nov. 13, 2016

Summary of Best Research Articles

Bailes, A., Greve, K., Burch, C., Reder, R., Lin, L., & Huth, M. (2011). The effect of suit wear during an intensive therapy program in children with cerebral palsy. *Pediatric Physical Therapy*, 23, 136-142. doi:10.1097/PEP.0b013e318218ef58

Abstract: Purpose: To examine the effects of suit wear during an intensive therapy program on motor function among children with cerebral palsy. Method: Twenty children were randomized to an experimental (TheraSuit) or a control (control suit) group and participated in an intensive therapy program. The Pediatric Evaluation of Disability Inventory (PEDI) and Gross Motor Function Measure (GMFM)-66 were administered before and after (4 and 9 weeks). Parent satisfaction was also assessed. Results: No significant differences were found between groups. Significant within-group differences were found for the control group on the GMFM-66 and for the experimental group on the GMFM-66, PEDI Functional Skills Self-care, PEDI Caregiver Assistance Self-care, and PEDI Functional Skills Mobility. No adverse events were reported. Conclusions: Children wearing the TheraSuit during an intensive therapy program did not demonstrate improved motor function compared with those wearing a control suit during the same program.

Bar-Haim, S., Harries, N., Belokopytov, M., Frank, A., Copeliovitch, L., Kaplanski, J., & Lahat, E. (2006). Comparison of efficacy of Adeli suit and neurodevelopmental treatments in

children with cerebral palsy. *Developmental Medicine & Child Neurology*, 48, 325-330.

doi:10.1017/S0012162206000727

Abstract: This study compared the efficacy of Adeli suit treatment (AST) with neurodevelopmental treatment (NDT) in children with cerebral palsy (CP). Twenty-four children with CP, Levels II to IV according to the Gross Motor Function Classification System (GMFCS), were matched by age and functional status and randomly assigned to the AST or NDT treatment groups. In the AST group (n=12; eight males, four females; mean age 8.3y [SD 2.0]), six children had spastic/ataxic diplegia, one triplegia and five spastic/mixed quadriplegia. In the NDT group (n=12; nine males, three females; mean age 8.1y [SD 2.2]), five children had spastic diplegia and seven had spastic/mixed quadriplegia. Both groups were treated for 4 weeks (2 hours daily, 5 days per week, 20 sessions). To compare treatments, the Gross Motor Function Measure (GMFM-66) and the mechanical efficiency index (EIHB) during stair-climbing were measured at baseline, immediately after 1 month of treatment, and 10 months after baseline. The small but significant time effects for GMFM-66 and EIHB that were noted after 1 month of both intensive physiotherapy courses were greater than expected from natural maturation of children with CP at this age. Improvements in motor skills and their retention 9 months after treatment were not significantly different between the two treatment modes. Post hoc analysis indicated a greater increase in EIHB after 1 month ($p=0.16$) and 10 months ($p=0.004$) in AST than that in NDT, predominantly in the children with higher motor function (GMFCS Levels II and III). The results suggest that AST might improve mechanical efficiency without a corresponding gain in gross motor skills, especially in children with higher levels of motor function.

Individual Assignment: Library Database

Library Database: PubMed

Preparing for Search Process

PubMed utilized Mesh headings for searches.

The only keywords with mesh headings were cerebral palsy and autistic disorder

1. Subject Heading or Indexing Terms of Database:
Neurodevelopmental Disorders> Child development disorders> Autistic Disorder
Brain Diseases>Brain Damage>Cerebral Palsy
2. Final Concept or Term List for the Database:
“Therasuit”, “Adeli Suit”, “Penguin Suit”, “Polish Suit”, “Suit Therapy”, “Autistic Disorder”[Mesh], “Cerebral Palsy”[Mesh]
3. Database filters to be tried: I will try no filters and years since 2006
4. Boolean Logic Terms to be tried: I will try using ‘AND’

Summarizing a Strategic Search Process

Filters/Years	Keywords	Total Yield/Relevant results	Date
None Years: Unlimited	“Penguin suit”	5/0	Nov, 11, 2016
None Years: Unlimited	“Penguin suit” AND “cerebral palsy” [Mesh]	0/0	Nov, 11, 2016
None Years: Unlimited	“Penguin suit” AND “Autistic Disorder” [Mesh]	0/0	Nov, 11, 2016
None Years: Unlimited	“Polish Suit”	15/0	Nov, 11, 2016
None Years: Unlimited	“Polish Suit” AND “cerebral palsy” [Mesh]	0/0	Nov, 11, 2016
None Years: Unlimited	“Polish Suit” AND “Autistic Disorder” [Mesh]	0/0	Nov, 11, 2016
None Years: Since 2006	“Adeli Suit”	6/4 Bar-Haim et al., 2006 Ko et al., 2015 Lee, 2016 Turner, 2006	Nov, 11, 2016
None Years: Since 2006	“Adeli Suit” AND “cerebral palsy” [Mesh]	5/4 Bar-Haim et al., 2006 Ko et al., 2015 Lee, 2016 Turner, 2006	Nov, 11, 2016

None Years: Unlimited	“Adeli Suit” AND “Autistic Disorder“ [Mesh]	0/0	Nov, 11, 2016
None Years: Unlimited	“Therasuit”	3/3 Christy et al., 2012 Bailes et al., 2010 Bailes et al., 2011	Nov, 11, 2016
None Years: Unlimited	“Therauit” AND “cerebral palsy” [Mesh]	3/3 Christy et al., 2012 Bailes et al., 2010 Bailes et al., 2011	Nov, 11, 2016
None Years: Unlimited	“Therauit” AND “Austistic Disorder“ [Mesh]	0/0	Nov, 11, 2016
None Years: Unlimited	“Suit Therapy”	1324/- try to narrow focus further	Nov, 11, 2016
None Years: Unlimited	“Suit Therapy” AND “cerebral palsy” [Mesh]	4/4 Bailes, 2016 Bailes et al., 2011 Lee, 2016 Martins et al., 2016	Nov, 11, 2016
None Years: Unlimited	“Suit Therapy” AND “Autistic Disorder“ [Mesh]	0/0	Nov, 13, 2016

Summary of 5 best research articles:

Bailes, A. F., Greve, K., Burch, C. K., Reder, R., Lin, L., & Huth, M. M. (2011). The effect of suit wear during an intensive therapy program in children with cerebral palsy. *Pediatric Physical Therapy : The Official Publication of the Section on Pediatrics of the American Physical Therapy Association*, 23(2), 136-142. doi:10.1097/PEP.0b013e318218ef58

Purpose: To examine the effects of suit wear during an intensive therapy program on motor function among children with cerebral palsy. Method: Twenty children were randomized to an experimental (TheraSuit) or a control (control suit) group and participated in an intensive therapy program. The Pediatric Evaluation of Disability Inventory (PEDI) and Gross Motor Function

Measure (GMFM)–66 were administered before and after (4 and 9 weeks). Parent satisfaction was also assessed. Results: No significant differences were found between groups. Significant within-group differences were found for the control group on the GMFM-66 and for the experimental group on the GMFM-66, PEDI Functional Skills Self-care, PEDI Caregiver Assistance Self-care, and PEDI Functional Skills Mobility. No adverse events were reported. Conclusions: Children wearing the TheraSuit during an intensive therapy program did not demonstrate improved motor function compared with those wearing a control suit during the same program.

Bar-Haim, S., Harries, N., Belokopytov, M., Frank, A., Copeliovitch, L., Kaplanski, J., & Lahat, E. (2006). Comparison of efficacy of adeli suit and neurodevelopmental treatments in children with cerebral palsy. *Developmental Medicine and Child Neurology*, 48(5), 325-330. doi:S0012162206000727

This study compared the efficacy of Adeli suit treatment (AST) with neurodevelopmental treatment (NDT) in children with cerebral palsy (CP). Twenty-four children with CP, Levels II to IV according to the Gross Motor Function Classification System (GMFCS), were matched by age and functional status and randomly assigned to the AST or NDT treatment groups. In the AST group (n=12; eight males, four females; mean age 8.3y [SD 2.0]), six children had spastic/ataxic diplegia, one triplegia and five spastic/mixed quadriplegia. In the NDT group (n=12; nine males, three females; mean age 8.1y [SD 2.2]), five children had spastic diplegia and seven had spastic/mixed quadriplegia. Both groups were treated for 4 weeks (2 hours daily, 5 days per week, 20 sessions). To compare treatments, the Gross Motor Function Measure (GMFM-66) and the mechanical efficiency index (EIHB) during stair-climbing were measured at baseline, immediately after 1 month of treatment, and 10 months after baseline. The small but significant time effects for GMFM-66 and EIHB that were noted after 1 month of both intensive physiotherapy courses were greater than expected from natural maturation of children with CP at this age. Improvements in motor skills and their retention 9 months after treatment were not significantly different between the two treatment modes. Post hoc analysis indicated a greater increase in EIHB after 1 month (p=0.16) and 10 months (p=0.004) in AST than that in NDT, predominantly in the children with higher motor function (GMFCS Levels II and III). The results suggest that AST might improve mechanical efficiency without a corresponding gain in gross motor skills, especially in children with higher levels of motor function.

Ko, M. S., Lee, J. A., Kang, S. Y., & Jeon, H. S. (2015). Effect of adeli suit treatment on gait in a child with cerebral palsy: A single-subject report. *Physiotherapy Theory and Practice*, 31(4), 275-282. doi:10.3109/09593985.2014.996307

The purpose of this research report is to investigate the long-term effect of Adeli suit treatment (AST) in a child with cerebral palsy (CP) on spatial-temporal gait parameters, 10-meter walking

speed, gross motor functional measure (GMFM) and performance on the pediatric balance scale (PBS). An eight-year-old girl with spastic diplegia classified as level III on the Gross Motor Function Classification System participated in this single-subject A-B design study, with a baseline and an intervention phase. The baseline phase was collected at one-week intervals for six weeks and then the AST intervention phase was carried out with 18 AST sessions, 50 min per session, once a week for an 18-week period. Spatial-temporal gait parameters significantly improved after the completion of 18 sessions. Furthermore, 10-meter walking speed, GMFM and PBS changed significantly from the baseline measurement ($p < 0.05$). In conclusion, the AST was effective in improving gait, gross motor function and balance in a child with diplegic CP. Clinically, neuro-rehabilitation with AST provided a complementary and alternative treatment for lower extremity rehabilitation in this child with CP. These findings provide preliminary evidence supporting the effectiveness of AST in children with spastic CP, and thus underscore the need for additional research in this area.

Lee, B. H. (2016). Clinical usefulness of adeli suit therapy for improving gait function in children with spastic cerebral palsy: A case study. *Journal of Physical Therapy Science*, 28(6), 1949-1952. doi:10.1589/jpts.28.1949

[Purpose] The purpose of this study was to determine the effects of Adeli suit therapy (AST) on gross motor function and gait function in children with cerebral palsy. [Subjects and Methods] Two participants with spastic cerebral palsy were recruited to undergo AST. AST was applied in 60-minute sessions, five times per week, with 20 sessions total over 4 weeks. Assessments of gross motor function, spatiotemporal parameters, and functional ambulation performance for gait were conducted. [Results] Gross motor function, cadence, and functional ambulation performance improved after the intervention in both cases. [Conclusion] Although additional follow-up studies are required, the results demonstrated improved gross motor function and functional ambulation performance in the children with cerebral palsy. These findings suggest a variety of applications for conservative therapeutic methods that require future clinical trials in children with cerebral palsy.

Martins, E., Cordovil, R., Oliveira, R., Letras, S., Lourenco, S., Pereira, I., . . . Marques, M. (2016). Efficacy of suit therapy on functioning in children and adolescents with cerebral palsy: A systematic review and meta-analysis. *Developmental Medicine and Child Neurology*, 58(4), 348-360. doi:10.1111/dmcn.12988

Aim This systematic review and meta-analysis presents an overview of the efficacy of suit therapy on functioning in children and adolescents with cerebral palsy (CP).

Method A systematic review with meta-analysis was conducted. A comprehensive search of peer-reviewed articles was performed on electronic databases, from their inception to May 2014. Studies included were rated for methodological quality using the Physiotherapy Evidence Database scale. Effects of suit therapy on functioning were assessed using meta-analytic

techniques. **Results** From the 46 identified studies, four met the inclusion criteria and were included in the meta-analysis. Small, pooled effect sizes were found for gross motor function at post-treatment ($g=0.46$, 95% confidence interval [CI] 0.10–0.82) and follow-up ($g=0.47$, 95% CI 0.03–0.90). **Interpretation** The small number of studies, the variability between them, and the low sample sizes are limitations of this review. Findings suggest that to weigh and balance benefits against harms, clinicians, patients, and families need better evidence to examine and prove the effects of short intensive treatment such as suit therapy on gross motor function in children and adolescents with CP. Therefore, more research based on high-quality studies focusing on functioning in all dimensions of the International Classification of Functioning, Disability and Health perspective is necessary to clarify the impact of suit therapy.

Individual Assignment: Other Evidence Resources**Evidence Resource:** Google Scholar**Preparing for Search Process**

- Google Scholar is a simplified way to find scholarly literature
 - Google Scholar provides a broad search of the information
 - This resource can search across many sources and disciplines
 - It can pull information from journal articles, court opinions, universities and etc.
1. Final Concept or Term List for the Database:
 - a. “Therasuit”, “Adeli Suit”, “Penguin Suit”, “Polish Suit”, “Suit Therapy”, “Autism”, “Cerebral Palsy”
 2. Database filters to be tried: I will try no filters and the year filter set at 2006 and after.
 3. Boolean Logic Terms to be tried: I will try using ‘AND’

Documenting the Search Process

On 11/13, I did a Google Scholar search.

Step 1: I searched “Penguin Suit” in Google scholar. There were 361 results. I narrowed it down by searching for articles after 2006. There were then 219 results and only 1 relevant result.

- Relevant Results:
 - Turner, 2006

Step 2: I searched “Penguin Suit” AND “Cerebral Palsy” and there were 41 results. I then picked only articles after 2006. There were 24 results and 3 relevant results.

- Relevant Results:
 - Turner, 2006
 - Martins et al., 2015
 - Ko et al., 2015

Step 3: I searched “Penguin Suit” AND “Autism”. There were 6 results and 1 relevant result.

- Relevant Results:
 - Martins et al., 2015

Step 4: I searched “Therasuit” in Google scholar with no filters. There were 131 results. Many of the sources were in other languages. I found 6 relevant sources.

- Relevant Results:
 - **Koscielny, 2004.**
 - **Bailes et al., 2010**
 - Bailes et al., 2011
 - Mildren, 2010
 - Elnggar, 2011
 - Wade, 2008

Step 5: I searched “Therasuit” AND “Austim”. There were 14 results and 5 were relevant.

- Relevant Results:
 - **Koscielny, 2004**
 - **Bailes et al., 2010**
 - Bailes et al., 2011

- Martins et al., 2015
- Mildren, 2010

Step 6: I searched “Therasuit” AND “Cerebral Palsy”. There were 116 results. I then narrowed them down by setting the range of articles since 2006. There were then 102 results. There were 7 relevant results.

- Relevant Results:
 - **Bailes et al., 2010**
 - Bailes et al., 2011
 - Christy et al., 2012
 - Carr et al., 2006
 - Braswell., 2006
 - Mildren, 2010
 - Martins, 2015

Step 7: I searched “Polish Suit”. There were 16 results and 1 relevant result.

- Relevant Results:
 - Rosenbaum, 2003

Step 8: I searched “Polish Suit” AND “Autism”. There were no relevant results.

Step 9: I searched “Polish Suit” AND “Cerebral Palsy”. There were 4 results and 1 relevant result.

- Relevant Results:
 - Rosenbaum, 2003

Step 10: I searched “Adeli Suit” and there were 180 results. I then narrowed them down by adding some key words.

Step 11: I searched “Adeli Suit” AND “Autism”. There were 34 results, and 6 relevant results.

- Relevant Results:
 - Bailes et al., 2011
 - Mildren, 2010
 - **Weisleder, 2010**
 - Martins, 2015
 - **Bailes et al., 2010**
 - Scheeren et al., 2012

Step 12: I searched “Adeli Suit” AND “Cerebral Palsy”. There were 173 results. I narrowed it down by searching articles only published 2006 and later. There were 134 results. There were 8 relevant results.

- Relevant Results:
 - Bar-Haim et al., 2006
 - Turner, 2006
 - **Domiano, 2009**
 - Oppenheim, 2009
 - Bailes, 2011
 - Mahani, 2011
 - Bailes, 2010
 - **Weisleder, 2010**

Step 13: I searched “Suit Therapy” in Google scholar and got 113 results. I narrowed the results by searching with more terms.

Step 14: I then searched “Suit Therapy” AND “Cerebral Palsy”. I narrowed it down by filtering for articles 2006 and later. There were 73 results and there were 11 relevant results.

- Relevant Results:
 - **Bailes et al., 2010**
 - Bailes et al., 2011
 - Turner, 2006
 - Oppenheim, 2009
 - Mahani et al., 2011
 - **Weisleder, 2010**
 - Christy et al., 2012
 - Scheeren et al., 2012
 - Mildren, 2010
 - Martins et al. 2015
 - Lee, 2016

Step 15: I searched “Suit Therapy” AND “Autism”. There were 13 results and 6 were relevant.

- Relevant Results:
 - **Bailes et al., 2010**
 - Bailes et al., 2011
 - Mildren, 2010
 - Scheeren et al., 2012
 - Martins et al., 2015
 - **Koscielny, 2004**
 - **Weisleder, 2010**

Summary of the 5 best articles

Bailes, A. F., Greve, K., & Schmitt, L. C. (2010). Changes in two children with cerebral palsy

after intensive suit therapy: A case report. *Pediatric Physical Therapy*, 22(1), 76-85. doi:

10.1097/PEP.0b013e3181cbf224

Purpose: The purpose of this case report was to investigate effects of intensive suit therapy on gait, functional skills, caregiver assistance, and gross motor ability in children with cerebral palsy. **Case Description:** Two children with spastic diplegia classified at level III on the Gross Motor Function Classification System participated. Outcomes were assessed using dimensions D and E of the Gross Motor Function Measure, the Pediatric Evaluation of Disability Inventory, and instrumented gait analysis. **Intervention:** Each child participated in the Therasuit Method, 4 hours a day, 5 days a week for 3 weeks. **Outcomes:** Very small improvements in function were noted in dimension D of the Gross Motor Function Measure and Pediatric Evaluation of Disability Inventory Self-care Domain with decreased function in other areas. Improved walking speed, cadence, symmetry, joint motion, and posture were found with gait analysis. **Conclusion:** Further investigation is needed of the suit itself, and intensive therapy programs in children with cerebral palsy.

Damino, D. L. (2009). Rehabilitative therapies in cerebral palsy: The good, the not as good, and the possible. *Journal of Child Neurology*, 24(9), 1200-1204. Doi:

10.1177/0883073809337919

In the past decade, growing recognition of the importance of motor activity for the development and maintenance of central nervous system pathways and for recovery of function post injury has provided new avenues for rehabilitation. Physical therapy is likely to have a prominent role in stimulating neuroplastic changes in damaged developing nervous systems that may finally alter the natural history of these disorders, which has not yet been possible. In this article, we discuss the scientific evidence for various physical therapy treatment options for children with cerebral palsy. Newer, more intense, and task-related exercise programs show the strongest level of evidence. Traditional approaches and newer “packaged” approaches have failed to provide evidence of superiority. Their continued prevalence among clinicians is puzzling and disconcerting, as evidence supporting other approaches continues to accumulate.

Koscielny, I. (2004, June). Therasuit: Soft dynamic proprioceptive orthotic. *Cerebral Palsy Magazine*, 2(1), 8-13. Retrieved from <http://www.suittherapy.com/images/TheraSuit%20Article.pdf>

Objectives: This study is part of a multi-site ongoing study and was designed to evaluate the effectiveness of an intensive exercise program (TheraSuit Method™) using a Soft Dynamic Proprioceptive Orthotic (TheraSuit™) on children with cerebral palsy by measuring changes which occurred after participating in a treatment session at the Pediatric Fitness Center, Keego Harbor, Michigan. The primary goal of the outcome study was the assessment of functional skills which have the most influence on the quality of life. **Design:** Ongoing study using a group pre-test/post-test design. A four-level diagnostic algorithm has been designed for the complex evaluation of all participants. It includes the preliminary selection, obtaining the initial data necessary to develop the individual exercise program, collection of changes during and after the program and preparation of the individual home exercise program. **Interventions:** An intensive exercise program (consisting of 3 hours of exercises, 5 times a week for 3 weeks) was provided for the qualified participants. Treatment was administered by therapists/trainers trained in the Therasuit Method™. The intense program protocol included individually-designed exercise programs for all participants including exercise with and without the TheraSuit™.

Measurements and Main Results: All results were statistically evaluated. The results obtained from the study are presented in Fig.1 and Fig.2. In this publication we included only part of the collected outcomes. The study reveals functional improvements in 92% of the participants. Additional progress was made in coordination by 56%, strength by 100%, range of motion by 100%, balance by 62% and movement control by 64%. We noticed a significant improvement in the level of new functional skills learned by our participants during the exercise sessions. In the study group, 90% learned to roll independently, 75% learned to sit without assistance, 49% learned to crawl, 39% gained the ability to stand independently, 33% learned to walk with assistive devices and 21% gained the ability to walk independently. **Conclusions:** The results of our study confirm the high level of effectiveness of the intensive exercise method (TheraSuit Method™) in conjunction with the Soft Dynamic Proprioceptive Orthotic (TheraSuit™). In

the future, Therasuit LLC will continue to collect, analyze and compare data obtained from other facilities using the TheraSuit™ and TheraSuit Method™ according to the standards and quality established in the industry.

Mahani, M. K., Karimloo, M., & Amirjalali, S. (2011). Effects of modified adeli suit therapy on improvement of gross motor function in children with cerebral palsy. *Hong Kong Journal of Occupational Therapy*, 21(1), 9-14. <http://dx.doi.org/10.1016/j.hkjot.2011.05.001>

Objective This study aimed to investigate the effects of the Modified Adeli suit therapy (MAST) on improvement of gross motor function in children with cerebral palsy (CP). **Methods** Thirty-six children with CP assigned by match pairs to three equal groups such as the MAST, the AST, and the Neurodevelopmental Treatment. They were treated for 4 weeks, 2 hr/d, 5 d/wk. All children were tested by the Gross Motor Function Measure (GMFM) at baseline, immediately before and 16 weeks after treatments. **Results** All groups had improvement in the GMFM after treatment ($p < .01$) and there were significant differences among groups ($p < .01$). In the follow-up study, no significant improvement in the GMFM was seen within groups ($p > .05$), but again there were significant differences among groups ($p < .01$). **Conclusion** The MAST was more effective than using either the AST or the Neurodevelopmental treatment on improvement of gross motor function in children with CP after treatment and at follow-up.

Weisleder, P. (2010). Unethical prescriptions: Alternative therapies for children with cerebral palsy. *Clinical Pediatrics*, 49(1), 7-11. DOI: 10.1177/0009922809340438

Abstract The US National Center for Complementary and Alternative Medicine (CAM) defines CAM as “a group of diverse medical and health care systems, practices, and products that are not presently considered to be part of conventional medicine.” The problem with said therapies is that, for the most part, their effectiveness is questionable and their side effect profile is essentially unknown. Furthermore, as stated by Rosenbaum, many CAM treatments are based on “at best, anecdotal evidence and at times rather unusual ideas about the biology of the conditions to which they are being applied.” In spite of the data shortage, Americans are forecasted to spend more than \$42 billion on CAM during 2009. Using a patient for illustration purposes, the author presents 3 CAM treatments that have been advocated for children with cerebral palsy. The current scientific literature on these remedies and their purported benefit is reviewed. The article ends with a discussion on the reasons why prescribing said therapies is contrary to the concept of evidence-based medicine and the tenets of medical ethics.

Appraisal of Evidence

Initial Appraisal: Primary Research Studies.

Type of article	Overall Type: Primary Research Study Specific Type: Quantitative
APA Reference	Bailes, A. F., Greve, K., Burch, C. K., Reder, R., Lin, L., & Huth, M. M. (2011). The effect of suit wear during an intensive therapy program in children with cerebral palsy. <i>Pediatric Physical Therapy: The Official Publication of the Section on Pediatrics of the American Physical Therapy Association</i> , 23(2), 136-142. doi:10.1097/PEP.0b013e318218ef58
Abstract	Purpose: To examine the effects of suit wear during an intensive therapy program on motor function among children with cerebral palsy. Method: Twenty children were randomized to an experimental (TheraSuit) or a control (control suit) group and participated in an intensive therapy program. The Pediatric Evaluation of Disability Inventory (PEDI) and Gross Motor Function Measure (GMFM)-66 were administered before and after (4 and 9 weeks). Parent satisfaction was also assessed. Results: No significant differences were found between groups. Significant within-group differences were found for the control group on the GMFM-66 and for the experimental group on the GMFM-66, PEDI Functional Skills Self-care, PEDI Caregiver Assistance Self-care, and PEDI Functional Skills Mobility. No adverse events were reported. Conclusions: Children wearing the TheraSuit during an intensive therapy program did not demonstrate improved motor function compared with those wearing a control suit during the same program.
Author	Credentials: PT, PhD, specialist certification through the American Physical Therapy Association, Pediatric Clinical Specialist (PCS), 1993 to present Position and Institution: Clinician researcher in the Division of Occupational Therapy and Physical Therapy, assistant professor at the University of Cincinnati Department of Allied Health, leadership team member of the Cerebral Palsy Research Network Publication History in Peer-Reviewed Journals: Moderate
Publication	Type of publication: Peer-reviewed journal Publisher: The Academy of Pediatric Physical Therapy of the American Physical Therapy Association, Andrea A. Williams, Senior Publisher
Date and Citation History	2011 Google Scholar Cited By: 21
Stated Purpose or Research Question	“Therefore, the purpose of this randomized, controlled, single-blinded study was to determine the effect of wearing a suit during an intensive therapy program on motor function among children with CP, specifically to evaluate (a) the improvement of motor function, (b) to what extent the suit (TheraSuit) affects improvement in motor function, and (c) parent satisfaction with the intensive therapy program.” (p.137)
Author’s Conclusion	“The results from this study demonstrate that children with CP who wore the TheraSuit with attached bungee cords during an intensive therapy program did not increase function more than children who wore a control suit (TheraSuit vest and shorts) during the same intensive therapy program.” (p. 140)
Overall Relevance to PICO	Overall Relevance to PICO: Moderate Relevance Rationale: Directly related to our I (Therasuit), and targeted to part of our P (pediatrics), but this study only focused on children with CP, not ASD. Some C on p. 141 but not many other studies available with which to compare data. Directly related to our O asking if sensory-manipulative therapies are effective.
Overall Quality	Overall Quality of Article: Good Rationale: Reputable author. Peer-reviewed journal. Published within the last 10 years. Discusses the effectiveness of our specific intervention.

Type of article	Overall Type: Primary Research Study Specific Type: Case Report
APA Reference	Bailes, A. F., Greve, K., & Schmitt, L. C. (2010). Changes in two children with cerebral palsy after intensive suit therapy: A case report. <i>Pediatric Physical Therapy</i> , 22(1), 76-85. doi: 10.1097/PEP.0b013e3181cbf224
Abstract	Purpose: The purpose of this case report was to investigate effects of intensive suit therapy on gait, functional skills, caregiver assistance, and gross motor ability in children with cerebral palsy. Case Description: Two children with spastic diplegia classified at level III on the Gross Motor Function Classification System participated. Outcomes were assessed using dimensions D and E of the Gross Motor Function Measure, the Pediatric Evaluation of Disability Inventory, and instrumented gait analysis. Intervention: Each child participated in the Therasuit Method, 4 hours a day, 5 days a week for 3 weeks. Outcomes: Very small improvements in function were noted in dimension D of the Gross Motor Function Measure and Pediatric Evaluation of Disability Inventory Self-care Domain with decreased function in other areas. Improved walking speed, cadence, symmetry, joint motion, and posture were found with gait analysis. Conclusion: Further investigation is needed of the suit itself, and intensive therapy programs in children with cerebral palsy.
Author	Credentials: PT, PhD Position and Institution: Division of Occupational Therapy and Physical Therapy, Cincinnati Children's Hospital Medical Center, Cincinnati, Ohio Publication History in Peer-Reviewed Journals: <i>moderate amount of publications (7)</i>
Publication	Type of publication: Scholarly Publisher: Academy of Pediatric Physical Therapy of the American Physical Therapy Association Other: The official journal of the academy of pediatric physical therapy of the American physical therapy association
Date and Citation History	Date of publication: Spring 2010 Cited By: 20
Stated Purpose or Research Question	"The purpose of this case report was to investigate effects of intensive suit therapy on gait, functional skills, caregiver assistance, and gross motor ability in children with cerebral palsy" (p. 76).
Author's Conclusion	"We noted small but potentially important changes in gait movement patterns after participation in this intensive program. Further investigation with larger samples sizes is needed to examine the different components of the Therasuit Method before conclusions can be drawn as to the effectiveness of the program" (pg. 84).
Overall Relevance to PICO	Overall Relevance to PICO: Moderate Rationale: Focuses on the I (therasuit) and the C (compares the pre and posttest), but for the O it looks more at gait and movement than at the effectiveness of the intervention on sensory and manipulation. Is not the right P (cerebral palsy instead of autism).
Overall Quality of Article	Overall Quality of Article: Moderate Rationale: The study was well written and structured, but they looked at a very small sample size. The author has some other publications, but the article has only been cited 20 times since 2010.

Type of article	Overall Type: Primary Research Study Specific Type: Quantitative
APA Reference	Bar-Haim, S., Harries, N., Belokopytov, M., Frank, A., Copeliovitch, L., Kaplanski, J., & Lahat, E. (2006). Comparison of efficacy of adeli suit and neurodevelopmental treatments in children with cerebral palsy. <i>Developmental Medicine and Child Neurology</i> , 48(5), 325-330. doi:S0012162206000727
Abstract	This study compared the efficacy of Adeli suit treatment (AST) with eurodevelopmental treatment (NDT) in children with cerebral palsy (CP). Twenty-four children with CP, Levels II to IV according to the Gross Motor Function Classification System (GMFCS), were matched by age and functional status and randomly assigned to the AST or NDT treatment groups. In the AST group ($n=12$; eight males, for females; mean age 8.3y [SD 2.0]), six children had spastic/ataxic diplegia, one triplegia and five spastic/mixed quadriplegia. In the NDT group ($n=12$; nine males, three females; mean age 8.1y [SD 2.2]), five children had spastic diplegia and seven had spastic/mixed quadriplegia. Both groups were treated for 4 weeks (2 hours daily, 5 days per week, 20 sessions). To compare treatments, the Gross Motor Function Measure (GMFM-66) and the mechanical efficiency index (EIHB) during stair-climbing were measured at baseline, immediately after 1 month of treatment, and 10 months after baseline. The small but significant time effects for GMFM-66 and EIHB that were noted after 1 month of both intensive physiotherapy courses were greater than expected from natural maturation of children with CP at this age. Improvements in motor skills and their retention 9 months after treatment were not significantly different between the two treatment modes. Post hoc analysis indicated a greater increase in EIHB after 1 month ($p=0.16$) and 10 months ($p=0.004$) in AST than that in NDT, predominantly in the children with higher motor function (GMFCS Levels II and III). The results suggest that AST might improve mechanical efficiency without a corresponding gain in gross motor skills, especially in children with higher levels of motor function.
Author	Credentials: PhD, PT Position and Institution: Faculty of Health Science, Ben-Gurion University, Beer-Sheva Publication History in Peer-Reviewed Journals: Extensive
Publication	Type of publication: Scholarly peer-reviewed journal Publisher: Blackwell Publishing Other: The official journal of the American Academy for Cerebral Palsy and Developmental Medicine (ACPDMD)
Date and Citation History	2006 Google Scholar Cited By: 64
Stated Purpose or Research Question	“The objective of this study was to evaluate the efficacy of AST by comparing it with neurodevelopmental treatment (NDT) in children with CP. Specifically investigated were the effects of AST on gross motor functions and energy cost quantified by mechanical efficiency.” (p.326)
Author’s Conclusion	“In summary, the results suggest improved EI _{HB} [mechanical efficiency index] in the AST group, especially for children with higher levels of motor function, without the gain of additional gross motor skills. This implies that AST can serve to optimize these skills in children with a higher level of gross motor skills, as reflected by a reduced metabolic cost of external work.” (p. 330)
Overall Relevance to PICO	Overall Relevance to PICO: Moderate Relevance Rationale: Directly related to our I (Adeli Suit), and targeted to part of our P (pediatrics), but this study only focused on children with CP, not ASD. Some C between Adeli Suit and neurodevelopmental treatment but not many other studies available with which to compare data. Directly related to our O asking if sensory-manipulative therapies are effective.
Overall Quality	Overall Quality of Article: Good Rationale: Peer-reviewed journal. Published within the last 10 years. Discusses the effectiveness of our specific intervention.

Type of article	Overall Type: Primary Research Study Specific Type: Case Review
APA Reference	Ko, M. S., Lee, J. A., Kang, S. Y., & Jeon, H. S. (2015). Effect of adeli suit treatment on gait in a child with cerebral palsy: A single-subject report. <i>Physiotherapy Theory and Practice</i> , 31(4), 275-282. doi:10.3109/09593985.2014.996307
Abstract	The purpose of this research report is to investigate the long-term effect of Adeli suit treatment (AST) in a child with cerebral palsy (CP) on spatial-temporal gait parameters, 10-meter walking speed, gross motor functional measure (GMFM) and performance on the pediatric balance scale (PBS). An eight-year-old girl with spastic diplegia classified as level III on the Gross Motor Function Classification System participated in this single-subject A-B design study, with a baseline and an intervention phase. The baseline phase was collected at one-week intervals for six weeks and then the AST intervention phase was carried out with 18 AST sessions, 50 min per session, once a week for an 18-week period. Spatial-temporal gait parameters significantly improved after the completion of 18 sessions. Furthermore, 10-meter walking speed, GMFM and PBS changed significantly from the baseline measurement (p<0.05). In conclusion, the AST was effective in improving gait, gross motor function and balance in a child with diplegic CP. Clinically, neuro-rehabilitation with AST provided a complementary and alternative treatment for lower extremity rehabilitation in this child with CP. These findings provide preliminary evidence supporting the effectiveness of AST in children with spastic CP, and thus underscore the need for additional research in this area.
Author	Credentials: MSc, PT Position and Institution: Department of Physical Therapy, Graduate School, Yonsei University, Wonju, Korea; Department of Physical Therapy, Purme Rehabilitation Center, Seoul, Korea Publication History in Peer-Reviewed Journals: Minimal
Publication	Type of publication: Scholarly peer-reviewed journal Publisher: Informa Healthcare
Date and Citation History	2015 Google Scholar Cited By: 0
Stated Purpose or Research Question	“The purpose of this study was to evaluate the effect of AST on spatial-temporal gait parameters, 10-meter walking speed, pediatric balance scale (PBS) and GMFM in a child with CP.” (p. 276)
Author’s Conclusion	“This single-subject study demonstrates the effectiveness of AST on gait, walking speed and functional motor performance in a child with CP...however, there has been lack of adequate scientific research evidence to support its use as an intervention tool for CP.” (p. 278)
Overall Relevance to PICO	Overall Relevance to PICO: Limited Rationale: Directly related to our I (Adeli Suit), and targeted to part of our P (pediatrics), but this study only focused on one child with CP, not ASD. No C in this study. Directly related to our O asking if sensory-manipulative therapies are effective.
Overall Quality	Overall Quality of Article: Moderate Rationale: Peer-reviewed journal. Published within the last 10 years. Author is not very reputable. Discusses the effectiveness of our specific intervention.

Type of article	Overall Type: Primary Research Study Specific Type: Pilot study, ongoing study using pre-/post-test design
APA Reference	Koscielny, I. (2004). Therasuit: Soft dynamic proprioceptive orthotic. <i>Cerebral Palsy Magazine</i> , 2(1), 8-13. Retrieved from http://www.suiththerapy.com/images/TheraSuit%20Article.pdf
Abstract	Objectives: This study is part of a multi-site ongoing study and was designed to evaluate the effectiveness of an intensive exercise program (TheraSuit Method™) using a Soft Dynamic Proprioceptive Orthotic (TheraSuit™) on children with cerebral palsy by measuring changes which occurred after participating in a treatment session. The primary goal of the outcome study was the assessment of functional skills which have the most influence on the quality of life. Design: Ongoing study using a group pre-test/post-test design. A four-level diagnostic algorithm has been designed for the complex evaluation of all participants. It includes the preliminary selection, obtaining the initial data necessary to develop the individual exercise program, collection of changes during and after the program and preparation of the individual home exercise program. Interventions: An intensive exercise program (consisting of 3 hours of exercises, 5 times a week for 3 weeks) was provided for the qualified participants. Treatment was administered by therapists/trainers trained in the Therasuit Method™. The intense program protocol included individually-designed exercise programs for all participants including exercise with and without the TheraSuit™. Measurements and Main Results: All results were statistically evaluated. The study reveals functional improvements in 92% of the participants. Additional progress was made in coordination by 56%, strength by 100%, range of motion by 100%, balance by 62% and movement control by 64%. We noticed a significant improvement in the level of new functional skills learned by our participants during the exercise sessions. In the study group, 90% learned to roll independently, 75% learned to sit without assistance, 49% learned to crawl, 39% gained the ability to stand independently, 33% learned to walk with assistive devices and 21% gained the ability to walk independently. Conclusions: The results of our study confirm the high level of effectiveness of the intensive exercise method (TheraSuit Method™) in conjunction with the Soft Dynamic Proprioceptive Orthotic (TheraSuit™). In the future, Therasuit LLC will continue to collect, analyze and compare data obtained from other facilities using the TheraSuit™ and TheraSuit Method™ according to the standards and quality established in the industry.
Author	Credentials: M.S., PT Position and Institution: Founder and owner of Therasuit LLC, Editor and publisher of Cerebral Palsy Magazine, President of American Association of Pediatric Physical Therapy Publication History in Peer-Reviewed Journals: limited
Publication	Type of publication: popular magazine Publisher: Legal referral company Other: quarterly publication of personal articles about issues around cerebral palsy problems
Date and Citation History	2004 Google Scholar Cited By: 0
Stated Purpose or Research Question	“to evaluate the effectiveness of an intensive exercise program (TheraSuit Method™) using a Soft Dynamic Proprioceptive Orthotic (TheraSuit™) on children with cerebral palsy. The primary goal of the outcome study was the assessment of functional skills which have the most influence on the quality of life.” (p. 12)
Author’s Conclusion	“The results of our study confirm the high level of effectiveness of the intensive exercise method (TheraSuit Method™) in conjunction with the Soft Dynamic Proprioceptive Orthotic (TheraSuit™).” (p. 13)
Overall Relevance to PICO	Overall Relevance to PICO: Moderate Relevance

	<p>PICO: Directly related to the O (effectiveness of intervention) and C (comparison of pre-test and post-test), but partially targeted to a different P (CP, not autism, but focuses on children). Relates to the I (Therasuit).</p>
<p>Overall Quality</p>	<p>Overall Quality of Article: Poor Quality Poor citation history, credibility of publication source unknown, publication over 10 years ago</p>

Type of article	Overall Type: Primary Research Study Specific Type: Case Study
APA Reference	Lee, B. H. (2016). Clinical usefulness of adeli suit therapy for improving gait function in children with spastic cerebral palsy: A case study. <i>Journal of Physical Therapy Science</i> , 28(6), 1949-1952. doi:10.1589/jpts.28.1949
Abstract	[Purpose] The purpose of this study was to determine the effects of Adeli suit therapy (AST) on gross motor function and gait function in children with cerebral palsy. [Subjects and Methods] Two participants with spastic cerebral palsy were recruited to undergo AST. AST was applied in 60-minute sessions, five times per week, with 20 sessions total over 4 weeks. Assessments of gross motor function, spatiotemporal parameters, and functional ambulation performance for gait were conducted. [Results] Gross motor function, cadence, and functional ambulation performance improved after the intervention in both cases. [Conclusion] Although additional follow-up studies are required, the results demonstrated improved gross motor function and functional ambulation performance in the children with cerebral palsy. These findings suggest a variety of applications for conservative therapeutic methods that require future clinical trials in children with cerebral palsy.
Author	Credentials: PT, PhD Position and Institution: Department of Physical Therapy, College of Health Science, Sahmyook University, South Korea Publication History in Peer-Reviewed Journals: <i>extensive</i>
Publication	Type of publication: Scholarly Publisher: J-Stage
Date and Citation History	Date of publication: June 24, 2016 Cited By: 0
Stated Purpose or Research Question	“The purpose of this study was to determine the effects of Adeli suit therapy (AST) on gross motor function and gait function in children with cerebral palsy” (p. 1949).
Author’s Conclusion	“Although additional follow-up studies are required, the results demonstrated improved gross motor function and functional ambulation performance in the children with cerebral palsy. These findings suggest a variety of applications for conservative therapeutic methods that require future clinical trials in children with cerebral palsy” (p. 1949)
Overall Relevance to PICO	Overall Relevance to PICO: Moderate Rationale: It has the I (Adeli suit) and the C (pretest/posttest group) and the O (effectiveness of the intervention). However it does not relate to the P (is for cerebral palsy and not autism).
Overall Quality of Article	Overall Quality of Article: Good Rationale: The study was well written with identified limitations and a detailed methods section. The author has written many studies, and while this study has not been cited yet, it was published not long ago.

Type of Article	Overall type: Primary Research Study Specific type: Randomized control trial
APA Reference	Mahani, M. K., Karimloo, M., & Amirsalari, S. (2011). Effects of modified adeli suit therapy on improvement of gross motor function in children with cerebral palsy. <i>Hong Kong Journal of Occupational Therapy</i> , 21(1), 9-14. http://dx.doi.org/10.1016/j.hkjot.2011.05.001
Abstract	Objective This study aimed to investigate the effects of the Modified Adeli suit therapy (MAST) on improvement of gross motor function in children with cerebral palsy (CP). Methods Thirty-six children with CP assigned by match pairs to three equal groups such as the MAST, the AST, and the Neurodevelopmental Treatment. They were treated for 4 weeks, 2 hr/d, 5 d/wk. All children were tested by the Gross Motor Function Measure (GMFM) at baseline, immediately before and 16 weeks after treatments. Results All groups had improvement in the GMFM after treatment ($p < .01$) and there were significant differences among groups ($p < .01$). In the follow-up study, no significant improvement in the GMFM was seen within groups ($p > .05$), but again there were significant differences among groups ($p < .01$). Conclusion The MAST was more effective than using either the AST or the Neurodevelopmental treatment on improvement of gross motor function in children with CP after treatment and at follow-up.
Author	Credentials: OTR Position and Institution: Assistant Professor of Occupational Therapy, Department of Occupational Therapy, Ahvaz Jundishapoor University of Medical Sciences Publication History in Peer-Reviewed Journals: Fair
Publication	Type of Publication: scholarly peer-reviewed journal Publisher: Elsevier Science Other: Official publication of the Hong Kong Occupational Therapy Association
Date and Citation History	Date of publication: 2011 Cited by: 6
Stated Purpose or Research Question	“The aim of this study was to test the efficacy of the MAST compared with the AST, with the NDT on improvement of GMF in children with CP during intensive course and at follow-up.” (p. 10)
Author’s Conclusion	“The MAST was more effective than the AST or the NDT on treatment of children with CP.” (p. 13)
Overall Relevance to PICO	Overall Relevance to PICO: Moderate relevance PICO: Directly relates to the I (Adeli suit) and O (measures effectiveness). Does not relate to C since it uses 3 treatment groups. Partially targeted to a different P (CP, not autism), but focuses on children.
Overall Quality of Article	Overall Quality of Article: Moderate quality Publication within last 10 years, credible journal and publisher, weak citation history

Initial Appraisal: Review of Research Studies

Type of article	Overall Type: Review of Research Studies Specific Type: Informal review
APA Reference	Damino, D. L. (2009). Rehabilitative therapies in cerebral palsy: The good, the not as good, and the possible. <i>Journal of Child Neurology</i> , 24(9), 1200-1204. Doi: 10.1177/0883073809337919
Abstract	In the past decade, growing recognition of the importance of motor activity for the development and maintenance of central nervous system pathways and for recovery of function post injury has provided new avenues for rehabilitation. Physical therapy is likely to have a prominent role in stimulating neuroplastic changes in damaged developing nervous systems that may finally alter the natural history of these disorders, which has not yet been possible. In this article, we discuss the scientific evidence for various physical therapy treatment options for children with cerebral palsy. Newer, more intense, and task-related exercise programs show the strongest level of evidence. Traditional approaches and newer ‘‘packaged’’ approaches have failed to provide evidence of superiority. Their continued prevalence among clinicians is puzzling and disconcerting, as evidence supporting other approaches continues to accumulate.
Author	Credentials: PhD, PT Position and Institution: National Institutes of Health, Rehabilitation Medicine Department, Bethesda, Maryland Publication History in Peer-Reviewed Journals: <i>extensive</i>
Publication	Type of publication: Scholarly Publisher: <i>National Institute of Health</i> Other: Peer-reviewed clinical and investigative studies
Date and Citation History	Date of publication: September, 2009 Cited By: 65
Stated Purpose or Research Question	‘‘In this article, we discuss the scientific evidence for various physical therapy treatment options for children with cerebral palsy’’ (p. 1).
Author’s Conclusion	‘‘Therapies that involve multiple types of exercises, such as neurodevelopmental therapy and, more recently, Adeli Suit programs and Conductive Education, are an issue from a scientific standpoint because they each have multiple components that are likely to have varying degrees of evidence’’ (p. 4).
Overall Relevance to PICO	Overall Relevance to PICO: Moderate Rationale: It focuses on the I (Adeli suit). However, it does not identify the C or O. The P does not fit (it is for cerebral palsy and not autism).
Overall Quality of Article	Overall Quality of Article: Moderate Rationale: The author has written numerous other articles and this article has been cited many times. Has good information, but it does not go into good depth on any of the interventions.

Type of article	Overall Type: Review of Research Studies Specific Type: Scoping Review
APA Reference	Liptak, G. (2005). Complementary and alternative therapies for cerebral palsy. <i>Mental Retardation and Developmental Disabilities Research Reviews</i> , 11, 156-163. doi:10.1002/mrdd.20066
Abstract	The optimal practice of medicine includes integrating individual clinical expertise with the best available clinical evidence from systematic research. This article reviews nine treatment modalities used for children who have cerebral palsy (CP), including hyperbaric oxygen, the Adeli Suit, patterning, electrical stimulation, conductive education, equine-assisted therapy, craniosacral therapy, Feldenkrais therapy, and acupuncture. Unfortunately, these modalities have different degrees of published evidence to support or refute their effectiveness. Uncontrolled and controlled trials of hippotherapy have shown beneficial effects on body structure and functioning. Studies of acupuncture are promising, but more studies are required before specific recommendations can be made. Most studies of patterning have been negative and its use cannot be recommended. However, for the other interventions, such as hyperbaric oxygen, more evidence is required before recommendations can be made. The individual with CP and his or her family have a right to full disclosure of all possible treatment options and whatever knowledge currently is available regarding these therapies. (Contains 2 tables and 2 figures.)
Author	Credentials: MD, MPH Position and Institution: Division Chief of the Center for Behavior, Development, and Genetics, and of Child Development in the Department of Pediatrics at the Upstate Golisano Children’s Hospital, part of the State University of New York Upstate Medical University; Chairperson of the AAP Council on Children with Disabilities (COCWD) Publication History in Peer-Reviewed Journals: Extensive
Publication	Type of publication: Scholarly peer-reviewed journal Publisher: Society for Developmental Pediatrics; Mental Retardation and Developmental Disabilities Research Centers; John Wiley and Sons
Date and Citation History	2005 Google Scholar Cited By: 148
Stated Purpose or Research Question	“Before a practitioner uses or recommends any therapy, whether complementary or allopathic, evidence on its effectiveness, safety, costs, and utility should be published... The following review of selected complementary and alternative therapies is not meant to be exhaustive either in topic or scope, but highlights those therapies that are currently most controversial... Table 1 summarizes the findings.” (p. 157)
Author’s Conclusion	“No conclusive evidence either in support of or against the use of the Adeli suit is available.” (p.158) “The nine modalities reviewed here have different degrees of evidence to support or refute their effectiveness. For example, equine assisted therapy has several studies of various degrees of soundness that support its use, whereas the Adeli suit does not.” (p.162)
Overall Relevance to PICO	Overall Relevance to PICO: Moderate Relevance Rationale: Is not targeted to our P (children with autism spectrum disorder), but is directly related to our I (the Adeli suit). No direct C made between the Adeli suit and any other assessment. Some factors of O were discussed (improved strength, posture, and coordination, discomfort from suit, expensive)
Overall Quality	Overall Quality of Article: Good Rationale: Reputable author and journal. Concise evaluation of research and evidence on the Adeli suit. Good recommendation for continued use based on findings.

Type of article	Overall Type: Review of Research Studies Specific Type: Systematic Review and meta-analysis
APA Reference	Martins, E., Cordovil, R., Oliveira, R., Letras, S., Lourenco, S., Pereira, I., . . . Marques, M. (2016). Efficacy of suit therapy on functioning in children and adolescents with cerebral palsy: A systematic review and meta-analysis. <i>Developmental Medicine and Child Neurology</i> , 58(4), 348-360. doi:10.1111/dmcn.12988
Abstract	Aim This systematic review and meta-analysis presents an overview of the efficacy of suit therapy on functioning in children and adolescents with cerebral palsy (CP). Method A systematic review with meta-analysis was conducted. A comprehensive search of peer-reviewed articles was performed on electronic databases, from their inception to May 2014. Studies included were rated for methodological quality using the Physiotherapy Evidence Database scale. Effects of suit therapy on functioning were assessed using meta-analytic techniques. Results From the 46 identified studies, four met the inclusion criteria and were included in the meta-analysis. Small, pooled effect sizes were found for gross motor function at post-treatment ($g=0.46$, 95% confidence interval [CI] 0.10–0.82) and follow-up ($g=0.47$, 95% CI 0.03–0.90). Interpretation The small number of studies, the variability between them, and the low sample sizes are limitations of this review. Findings suggest that to weigh and balance benefits against harms, clinicians, patients, and families need better evidence to examine and prove the effects of short intensive treatment such as suit therapy on gross motor function in children and adolescents with CP. Therefore, more research based on high-quality studies focusing on functioning in all dimensions of the International Classification of Functioning, Disability and Health perspective is necessary to clarify the impact of suit therapy.
Author	Credentials: No information given Position and Institution: Laboratory of Motor Behavior, University of Lisboa, Lisboa, Portugal Publication History in Peer-Reviewed Journals: <i>extensive</i>
Publication	Type of publication: Scholarly Publisher: Wiley-Blackwell Other: Leading journal in the field of pediatrics
Date and Citation History	Date of publication: November 27, 2015 Cited By: 1
Stated Purpose or Research Question	“This systematic review and meta-analysis presents an overview of the efficacy of suit therapy on functioning in children and adolescents with cerebral palsy (CP)” (p. 348).
Author’s Conclusion	“Findings suggest that to weigh and balance benefits against harms, clinicians, patients, and families need better evidence to examine and prove the effects of short intensive treatment such as suit therapy on gross motor function in children and adolescents with CP. Therefore, more research based on high-quality studies focusing on functioning in all dimensions of the International Classification of Functioning, Disability and Health perspective is necessary to clarify the impact of suit therapy” (P. 348).
Overall Relevance to PICO	Overall Relevance to PICO: Moderate Rationale: Focuses on the I (Suit therapy). However the article was a systematic review and did not have the C, and was not conclusive on the O. The P is not the same (focuses on cerebral palsy and not autism in pediatrics).
Overall Quality of Article	Overall Quality of Article: Strong Rationale: Well-written systematic review that looks at many different studies. The author has written many articles. Peer-reviewed journal.

Type of Article	Overall Type: Review of Research Studies Specific Type: Critically appraised topic
APA Reference	Watling, R. & Hauer, S. (2015). Critically appraised topic: Evidence for weighted vests for children with autism spectrum disorder. Retrieved from http://www.aota.org/Practice/ChildrenYouth/Evidence-based/CAT-weighted-vests-ASD.aspx
Abstract	Summary of Key Findings: One Level I systematic review, one Level III, and five Level IV studies that evaluated the effect of weighted vests on performance in daily life activities in children with ASD were found and included in the review. The Level I systematic review included seven peer reviewed studies, one non-peer reviewed study, and one poster. Findings of these studies were mixed. There is insufficient evidence from one Level I systematic review (Stephenson & Carter, 2009) to support the use of weighted vests to improve attention and behavior among individuals with ASD. There is insufficient evidence from one Level III study (Hodgetts, Magill-Evans, & Misiaszek, 2011a) to support the use of weighted vests for reducing motor stereotypy or heart rate. There is moderate evidence from five Level IV studies that weighted vests do not improve joint attention or problem behavior (Leew, Stein, & Gibbard, 2010), self-injurious or problem behavior (Quigley, Peterson, Frieder, & Peterson, 2011), engagement (Cox, Gast, Luscre, & Ayres, 2009), stereotypy or problem behavior (Reichow, Barton, Sewell, Good, & Wolery, 2010), or time in seat and time on task (Hodgetts, Magill-Evans, & Misiaszek, 2011b).
Author	Credentials: PhD, OTR/L, FAOTA Position and Institution: Assistant Professor of Occupational Therapy, University of Puget Sound Publication History in Peer-Reviewed Journals: extensive
Publication	Type of publication: Grey literature: Report Publisher: American Occupational Therapy Association Other: AOTA’s critically appraised topics and papers series
Date and Citation History	Date of publication: 2015 Cited by: unavailable
Stated Purpose or Research Question	“What is the evidence for using weighted vests to improve behavior and performance in daily life activities and occupations for children with autism spectrum disorder (ASD).” (p. 1)
Author’s Conclusion	“Overall, there is moderately strong evidence against using weighted vests to support improved behavior or performance in daily life activities for children with ASD. In light of the current evidence base, it is recommended that occupational therapy practitioners do not incorporate weighted vests into their practice for children with ASD.” (p. 2)
Overall Relevance to PICO	Overall Relevance to PICO: Limited relevance PICO: Directly relates to the P (ASD and children) and the O (effectiveness of intervention), but targeted to a different I (weighted vest). No C group in this article.
Overall Quality of Article	Overall Quality of Article: Poor quality Not related to intervention (Therasuit), but reputable publisher

Type of Article	Overall Type: Review of Research Studies Specific Type: Informal research review
APA Reference	Weisleder, P. (2010). Unethical prescriptions: Alternative therapies for children with cerebral palsy. <i>Clinical Pediatrics</i> , 49(1), 7-11. DOI: 10.1177/0009922809340438
Abstract	The US National Center for Complementary and Alternative Medicine (CAM) defines CAM as “a group of diverse medical and health care systems, practices, and products that are not presently considered to be part of conventional medicine.” The problem with said therapies is that, for the most part, their effectiveness is questionable and their side effect profile is essentially unknown. Furthermore, as stated by Rosenbaum, many CAM treatments are based on “at best, anecdotal evidence and at times rather unusual ideas about the biology of the conditions to which they are being applied.” In spite of the data shortage, Americans are forecasted to spend more than \$42 billion on CAM during 2009. Using a patient for illustration purposes, the author presents 3 CAM treatments that have been advocated for children with cerebral palsy. The current scientific literature on these remedies and their purported benefit is reviewed. The article ends with a discussion on the reasons why prescribing said therapies is contrary to the concept of evidence-based medicine and the tenets of medical ethics.
Author	Credentials: MD, PhD, FAAP Position and Institution: Division of Child Neurology, Nationwide Children’s Hospital, Ohio State University Publication History in Peer-Reviewed Journals: extensive
Publication	Type of publication: scholarly peer-reviewed journal Publisher: Sage Publications Inc. Other: Credible journal containing valuable information about everyday childcare
Date and Citation History	Date of publication: 2010 Cited by: 10
Stated Purpose or Research Question	“I present 3 CAM treatments that have been advocated for children with cerebral palsy. The scientific literature on these remedies and their purported benefit is reviewed.” (p. 8)
Author’s Conclusion	“Physicians, while remaining compassionate and supportive, ought to consider steering away from unproven, unconventional treatments.” (p. 11)
Overall Relevance to PICO	Overall Relevance to PICO: Moderate relevance PICO: Directly relates to the I (Adeli suit) and O (effectiveness and benefits). Partially targeted to a different P (CP, not autism), but focuses on children. No C group in this article.
Overall Quality of Article	Overall Quality of Article: Good quality Established author, reputable journal, publication within the last 10 years.

Initial Appraisal: Conceptual or Theoretical Articles.

Type of Article	Overall Type: Conceptual Article Specific Type: Commentary
APA Reference	Turner, A. (2006). The efficacy of Adeli suit treatment in children with cerebral palsy. <i>Developmental Medicine & Child Neurology</i> , 48(5), 324.
Abstract	Adeli suit treatment (AST) is a pertinent and timely topic for research. Many families and clinicians are interested in the outcomes of treatment using the Adeli suit, but the rehabilitation community does not have adequate scientific support for its use as a generally accepted treatment for cerebral palsy (CP). Very little research has been completed around non-traditional treatments such as AST. The study reported in this issue of DMCN by Bar-Haim et al. compared the use of AST and traditional neurodevelopment treatment (NDT) in children with CP.
Author	Credentials: not available Position and Institution: not available Publication History in Peer-Reviewed Journals: limited
Publication	Type of publication: Scholarly peer-reviewed journal Publisher: Wiley-Blackwell Other: leading journal in the field of pediatrics
Date and Citation History	Date of publication: 2006 Cited by: 19
Stated Purpose or Research Question	“The study reported in this issue of DMCN by Bar-Haim et al. compared the use of AST and traditional neurodevelopment treatment (NDT) in children with CP.” (p. 324)
Author’s Conclusion	“Several questions are left unanswered and suggest future research before AST can be accepted as an effective treatment. In this study, AST seemed to work best for Gross Motor Function Classification System level II.” (p. 324)
Overall Relevance to PICO	Overall Relevance to PICO: Moderate relevance PICO: Directly relates to the I (Adeli suit) and O (discusses effectiveness). Partially targeted to a different P (CP, not autism), but focuses on children. No C group in this article.
Overall Quality of Article	Overall Quality of Article: Moderate quality Reputable journal and publisher, moderate citation history, author’s credentials unknown

Critical Appraisals.

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- Martins, E., Cordovil, R., Oliveira, R., Letras, S., Lourenco, S., Pereira, I., . . . Marques, M. (2016). Efficacy of suit therapy on functioning in children and adolescents with cerebral palsy: A systematic review and meta-analysis. *Developmental Medicine and Child Neurology, 58*(4), 348-360. doi:10.1111/dmcn.12988

CranioSacral Therapy (CST)

Executive Summary

Final EBP Question and PICO.

Are sensory/manipulation therapies effective for improving occupational performance and participation for children with Autism Spectrum Disorder (ASD)?

Themes.

After a review of the current literature regarding CST, it was clear that not much research is present and the existing research is mainly conducted by those affiliated with Upledger and CST. The amount of research presented that is directly related to the PICO question is very limited. Most articles found focused on either ASD or CST, but fewer than five of the articles addressed both. Additionally, no research was found directly related to occupational therapy and CST. There needs to be more credible research done by those outside the realm of CST. Most sources concluded that more research was necessary or dismissed the entire mechanism of CST. Some sources reported risk of injury or even death. Out of the eight expert review groups found, only three specifically looked into CST and ASD. These three concluded that there is insufficient evidence for the use of CST with ASD, the mechanisms behind CST are unsupported by strong scientific evidence, there are concerns about the validity of tools being used to measure the effects of CST, and that CST is overall untested and unlikely to be effective. The information found when looking into CST is deeply concerning in that families are being charged for a service that is clearly not evidence based. In conclusion, CST for ASD is assigned the Wisconsin Treatment Intervention Advisory Committee evidence level of 4. This level means no high quality studies were found, but there is not wide-spread agreement among experts that CST is potentially dangerous (which would move the intervention to level 5).

Description of the Intervention.

CranioSacral Therapy (CST), implemented by CranioSacral Therapists, has been used with a variety of conditions producing a range of outcomes. Upledger (2000) is credited with creating CST and claims that restriction of the cerebrospinal fluid within the craniosacral system causes changes in tension to occur in the dura mater of the central nervous system. This build in tension, he explained, may cause bones of the skull and spine to move. He believed that when an ailment inhibits the movement of the skull, spine, and cerebrospinal fluid, the function of the craniosacral system, and central nervous system, is obstructed (Upledger, 2000). CST is implemented to remedy this; the therapist works their way up the client's body, taking more time at the head and sacrum, making slight adjustments and using soft pressure while paying close attention to any small movements or restrictions in the tissues of the body (Hahn, 2004). Upledger (2000) claims CST is said to be useful for a variety of ailments including pain, headaches, traumatic injuries, degenerative diseases, spinal dysfunctions, Autism, Cerebral Palsy, learning disabilities, and more, as manipulating the craniosacral system is believed to affect the "sensory, motor, cognitive and emotional processes in the nervous system" (Jäkel & von Hauenschild, 2012, p. 475). After treatment, patients report decreased pain, immobility, neuromusculoskeletal dysfunction, stiffness of temporal bones, impairments in mental alertness and function, and vertigo, as well as other symptoms (Upledger, 2000). The frequency and duration of visits should be decided on a case by case basis according to Upledger. The Oasis Center for CranioSacral Therapy (2016) charges \$125 for an hour session of CST, and the Upledger Institute International (2016) lists training courses and certification for CranioSacral Therapists totaled to cost up to \$3,880 and upon reviewing multiple providers of CST.

Developers/Proponents, Researchers, and Organization/Company.

CST builds on a long history of Western medical practitioners seeking links between body and spirit (Fuller, 2012; Museum of Osteopathic Medicine, 2012; Swedenborg Foundation, 2016). William Sutherland (1873-1954) laid the groundwork for contemporary CST (Fuller, 2012; Gilchrist, 2006). While examining a disarticulated skull during his senior year of medical school, he noted that the suture joints where the temporal and parietal bones meet resemble a fish's gills, a human mechanism of "primary respiration" (Fuller, 2012; Gilchrist, 2006). Sutherland performed experiments which he claimed refuted Western medicine's fixed idea that the cranial sutures are fused and immobile; he proposed that – as medical traditions of Russia, Persia, India, and China have always maintained – there is slight movement in these joints (Gilchrist, 2006). Dr. John Upledger (1932-2012), the founder of modern CST, further developed hands-on techniques and began training non-osteopaths in his technique which he termed CranioSacral Therapy (Kern, 2005). Some argue that moving craniosacral manipulation out of the domain of osteopathy compromises safety and competency in the practice (Kern, 2005), but there are now over 100,000 practitioners trained in Upledger's techniques practicing in over 100 nations around the world (Grossinger, 2012), and though many of those countries have established professional associations, CST is largely unregulated by law (Kern, 2005). Upledger Institute training does not satisfy state licensure requirements for hands-on practice, but the institute certifies already licensed massage therapists and healthcare professionals in the specific techniques of CST (Upledger, 2016). Much of the literature advocating CST is written by Upledger-trained practitioners largely because the diplomate level of certification requires students to present to an organized group or publish an article related to CST (Upledger, 2016). In 1986, Franklyn Sills (1947-) introduced the biodynamic approach to CranioSacral Therapy, emphasizing the essential curative power of the 'breath of life,' the

body's own healing wisdom; this is a perceptual and intuitive practice using as little external force as possible (Kern, 2005; Gilchrist, 2006; Sills, 2013). The Biodynamic CranioSacral Therapy Association of North America (BCTA/NA) credentials a student as a Registered CranioSacral Therapist (RCST) upon completion of a series of trainings and recommendation from a recognized BCTA/NA teacher (Biodynamic Craniosacral Therapy Association of North America [BCTA/NA], 2016). The total training is approximately 700 hours including 350 hours of in-class hours, 150 hours of study at home, and a 40 hour project (BCTA/NA, 2016).

Description of the Quality and Quantity of Available Evidence.

When doing initial research, 26 articles were found to be relevant to the PICO question or CST in some way. These articles included: 10 systematic reviews, 10 primary research articles, six theoretical/conceptual articles, and one advertorial. Of the systematic reviews, six were ranked at a quality of 'good', three as 'moderate', and one as 'poor' in quality. This ranking was determined by the credentials of the authors, how recent the review was performed, any biases present, and other such factors. Of the primary research articles, six were considered 'moderate' and four were considered 'good' in quality. Two of the conceptual articles were ranked as 'good' and 'moderate' each, and one was ranked as 'poor'. While some of these articles were strongly related to the PICO, others fell short, offering links to only parts of the theme such as CST used for migraines or sleep problems. Most articles found focused on either ASD or CST, but only two of the articles addressed both (Gasalberti, 2006; Levy & Hyman, 2008). Neither of them were primary research studies.

Non-peer reviewed sources were found in the background learning research. See Background Learning for more information.

Summary of the Current Evidence and Reviews of Evidence.

Three articles were given a more detailed assessment: two systematic reviews (Hartman & Norman, 2002; Jakel & von Hauenschild, 2012) and one original research study (Harrison & Page, 2011). The original research study was a moderate quality descriptive outcome study conducted by two CST practitioners investigating the effectiveness of CST for various populations and conditions (Harrison & Page, 2011). The authors reported improvement for clients with anxiety, stress, migraines, neck and back pain, and depression after CST treatments (Harrison & Page, 2011). This study had several flaws, however, and did not report their limitations of the study. It also did not test the effectiveness of CST in the target population: children with ASD. The two systematic reviews evaluated either the reliability of the mechanism of craniosacral manipulation or the current literature on the effectiveness of CST on various populations (Hartman & Norman, 2002; Jakel & von Hauenschild, 2012). Both concluded that further research is needed before practitioners can make claims that CST is effective. Hartman and Norman dismiss the very basis of CST outright, though they refute CST's claims based mostly on their own expertise as educators in the Western medical tradition. Strong research designs are needed to determine whether CST is effective for improving performance and participation of children with autism spectrum disorder. These studies do not address outcomes of CST relevant to occupational therapy practice: improved occupational engagement and performance in children with ASD. No publications concerning CST were found in AJOT or the AOTA database. Much of the literature on CST has been written by individuals who are connected to Upledger or who benefit in some way from the success of this intervention.

Eight expert review groups were also consulted on the use of CST. The results of the reviews are in the table below.

Expert Review Table.

Table 1
Summary of Evidence by Expert Review Groups for CranioSacral Therapy

Review Organization	Summary and Recommendations	Citation and Source
Wisconsin Treatment Intervention Advisory Committee	“In sum, it is the decision of the committee that Cranio sacral Therapy continues to meet the criteria for a Level 4 treatment (Insufficient Evidence).” (p. 2)	Wisconsin Department of Health Services Autism and Other Developmental Disabilities Treatment Intervention Advisory Committee (2016). https://tiac.wisconsin.gov/summary-determinations-regarding-level-evidence.htm
Evidence-Based Practices for Children, Youth, and Young Adults with Autism Spectrum Disorder	CranioSacral Therapy was not evaluated.	Wong, C., Odom, S. L., Hume, K., Cox, A. W., Fettig, A., Kucharczyk, S., ... Schultz, T. R. (2013). <i>Evidence-based practices for children, youth, and young adults with Autism Spectrum Disorder</i> . Chapel Hill: The University of North Carolina, Frank Porter Graham Child Development Institute, Autism Evidence-Based Practice Review Group. http://autismpdc.fpg.unc.edu/sites/autismpdc.fpg.unc.edu/files/2014-EBP-Report.pdf
Association for Science in Autism Treatment (ASAT)	"It is implausible that gentle touch would alter central nervous system functions associated with autism spectrum disorders, and there have been no scientific studies with strong experimental designs to support this approach...Researchers may wish to conduct studies with strong scientific designs to evaluate craniosacral therapy. Professionals should present	Association for Science in Autism Treatment (n.d.) Treatments in alphabetical order. http://www.asatonline.org/for-parents/learn-more-about-specific-treatments/treatments-in-alphabetical-order/

	<p>craniosacral therapy as untested and unlikely to be effective; families who are considering this intervention should be encouraged to evaluate it carefully." (n.p.)</p>	
Cochrane Collaboration	<p>No articles found directly related to CranioSacral Therapy or Cranial Osteopathy and Autism.</p>	<p>Cochrane Collaboration (2016). http://www.cochrane.org/</p>
U.S. Department of Health and Human Services, Centers for Medicare & Medicaid Services.	<p>CranioSacral Therapy was not evaluated.</p>	<p>U.S. Department of Health and Human Services, Centers for Medicare & Medicaid Services. (2010). Autism spectrum disorders (ASDs) services final report on environmental scan. Retrieved from http://www.impactint.com/sites/default/files/files/Autism_Spectrum_Disorders.pdf</p>
National Autism Center	<p>CranioSacral Therapy was not evaluated.</p>	<p>National Autism Center (2015). National Standards Project, Phase 2. Retrieved from http://www.nationalautismcenter.org/national-standards-project/phase-2/</p>
National Guideline Clearinghouse	<p>“There is insufficient evidence and a lack of consensus to make a recommendation on using craniosacral therapy (CST) to improve the behavior of children with autism and sensory processing disorder. Note: Concerns are raised in the literature about the validity of the tools used to measure the craniosacral rhythm, identify craniosacral dysfunction and efficacy of craniosacral treatment” (n.p.)</p>	<p>National Guideline Clearinghouse (NGC). (2011) “Guideline summary: Best evidence statement (BEST). Craniosacral therapy for children with autism and/or sensory processing disorder.” In: National Guideline Clearinghouse (NGC) [Web site]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ) Available: https://www.guideline.gov</p>
American Academy of Pediatrics	<p>Studies of Complementary and Alternative Medicines (CAM) interventions are limited or flawed. Not recommended as an evidence-based intervention.</p>	<p>Myers, S. M., & Johnson, C. P. (2007). Management of children with autism spectrum disorders. <i>Pediatrics</i>, 120(5), 1162-1182. http://pediatrics.aappublications.org/content/pediatrics/120/5/1162.full.pdf</p>

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Background Learning and Evidence Searches

Table of Resources.

Table 1.

Journals, Magazine and Books that Address CranioSacral Therapy

Title/Name	Brief Description	Source
The Indian Journal of Occupational Therapy	Unclear if the journal is peer reviewed Publishes original scientific research from global sources related to OT Accessed through SCU library Contains article outlining trial of Craniosacral Therapy with Autism Spectrum Disorder	All India Occupational Therapists Association
Massage Today Magazine	A non-peer reviewed, trade publication aimed at Massage Therapists Several articles related Craniosacral Therapy written by John M. Upledger, the creator of Craniosacral Therapy	MPA Media, a publisher for alternative health and wellness professions
Journal of the Australian Traditional-Medicine Society	Peer reviewed journal focusing on natural medicine Published a few articles and a clinical report on information on Craniosacral Therapy	Australian Traditional-Medicine Society
European Journal of Integrative Medicine	Peer reviewed journal focused on medical science and alternative medicine Accessed through SCU library Published article focusing on interviews of participants of Craniosacral Therapy	Research Council for Complementary Medicine http://www.rccm.org.uk/
CranioSacral Therapy and the energetic body: an overview of craniosacral body dynamics	Book written by Roger Gilchrist, a practitioner of CranioSacral Therapy, outlining the history and current trends in the practice of Craniosacral Therapy	Author: Roger Gilchrist North Atlantic Books

Background learning paper one.

This EBP project will concentrate on Craniosacral Therapy (CST), specifically for children with autism spectrum disorder. This paper will summarize CST, its history, proposed outcomes of CST therapy and current applications.

An understanding of the central nervous system, craniosacral system, and cerebrospinal fluid is central to the practice of CST. John Upledger, the developer of CST, described it as a therapy targeting the craniosacral system to aid the body's healing process. According to Upledger, (2000) CST focuses on the body's craniosacral system which consists of the skull, spinal cord, and cerebral spinal fluid. This system encases the central nervous system which is believed to be the center of all neurological processing in the body and consists of the spinal cord and brain ("Central Nervous System," n.d.). Cerebrospinal fluid provides a cushion for the central nervous system as well as "likely serves metabolic, nutritional, immunologic, and scavenging functions" (Kapoor, Katz, Grzybowski, & Lubow, 2008, p. 327). Upledger focused on the craniosacral system after reviewing Sutherland's work relating to the mobility of the cranial bones (Kratz, Kerr, and Porter, 2016).

CST was proposed to aid in the body's natural healing process. Upledger created CST in the 1970's, and it is used now in various clinic settings to treat a variety of conditions across the lifespan (Jäkel & von Hauenschild, 2012). Upledger (2000) claimed that restriction of the cerebrospinal fluid within the craniosacral system caused changes in tension to occur in a membrane, specifically the dura mater, of the central nervous system. This build in tension, he explained, may cause bones of the skull and spine to move. He believed that when an ailment inhibits this movement, the cerebrospinal fluid does not flow freely and the function of the

craniosacral system is obstructed. The central nervous system, which is surrounded by the craniosacral system, was claimed to be compromised as well (Upledger, 2000).

CST uses a particular process that is believed to be non-invasive and gentle (Kratz, Kerr, & Porter, 2016). According to Hahn, (2004) CST works to create balance in the craniosacral system in a typical hour session. This treatment consists of a soft touch method with minimal amounts of pressure applied to evaluate the ability of the craniosacral system (Upledger, 2000). The session begins with a 10-Step protocol that is reported to be risk-free to the patient if done correctly (Kratz, Kerr, & Porter, 2016). In this time the client, fully clothed, lies on their back on a massage table. Starting at the feet, the therapist works their way up the client's body, taking more time at the head and sacrum, making slight adjustments and using soft pressure with while paying close attention to any small movements or restrictions in the tissues of the body. The goal of this intervention is to identify any points of restriction and create a stillness that will cause a release in the muscles in the area (Hahn, 2004).

CranioSacral Therapy (CST) is said to be useful for a variety of ailments and diagnoses. Manipulating the craniosacral system is believed to affect the "sensory, motor, cognitive and emotional processes in the nervous system" (Jäkel & von Hauenschild, 2012, p. 475). According to Upledger, (2000) patients have been treated for various ailments including pain, headaches, traumatic injuries, degenerative diseases, spinal dysfunctions, Autism, Cerebral Palsy, learning disabilities, and more. After treatment, patients report decreased pain, immobility, neuromusculoskeletal dysfunction, stiffness of temporal bones, impairments in mental alertness and function, and vertigo, as well as other symptoms (Upledger, 2000).

This paper including background information touching on processes, definitions, outcomes, and uses of CranioSacral Therapy will be useful in the overall project relating CST to

Autism Spectrum Disorders. CST is claimed to be a non-invasive and gentle way to decrease a variety of symptoms from many different conditions. These improvements are said to be possible through its work in the craniosacral system and its relations to the central nervous system.

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Background learning paper two.

Autism, referred to as Autism Spectrum Disorder as of May 2013 (Autism Speaks, 2016; Lai, Lombardo, & Baron-Cohen, 2014), affects roughly one percent of the world's population and is four to five times more common in boys than girls (Lai, et al., 2014). This first EBP project will focus on interventions used with individuals with Autism Spectrum Disorder (ASD). My work here will explore ASD specifically, including symptoms, possible causes, and various interventions. The other members of my group will be exploring a specific intervention, Craniosacral Therapy, and the history behind it.

Autism Spectrum Disorder (ASD) encompasses a range of deficits but has some definite identifiable features and symptoms. Some of the earliest signs are lack of motor control, minimal pretend play or imitation, trouble with verbal and nonverbal communication, and exceedingly repetitive behaviors or interests (Lai, et al., 2014). These can appear in the first few months and years of life. It is most common for ASD to be diagnosed in young children, but some older individuals might also be diagnosed, perhaps not until early adulthood (Autism Science Foundation, 2016). These individuals might show inappropriate social skills, trouble with mental tasks and focus, difficulty empathizing with others, and anxiety in social situations and with making eye contact (Autism Science Foundation, 2016).

There are many suspected causes or risk factors for developing ASD. A few years ago, there was some concern that vaccines were causing ASD, but this has been tested and proven to be false (Autism Science Foundation, 2016; Autism Speaks, 2016). While no single thing has been labeled as the actual cause for ASD, scientists continue to discover more risk factors (Autism Speaks, 2016). They have found that the main indicator for developing ASD is certain genetic mutations (Autism Speaks, 2016; Lai, et al., 2014). These mutations produce the

cognitive deficits and behaviors present in individuals with ASD. Scientists believe that it's a complex combination of these genetic dispositions and certain environmental factors that cause ASD to present itself in the individual (Lai, et al., 2014). Abnormal neural activity that develops in the womb is thought to also be a part of the disorder. Other risk factors might include parents having children at an older age, a lack of folic acid during pregnancy, or any complications or chemical exposure during pregnancy (Lai, et al., 2014).

This epidemiology concept of genetics and abnormal neural activity is the most common and widely accepted view, but there are others that might be considered by some groups or individuals. One of these is environmental-induced Autism, which posits that the symptoms are caused by pollutants in the environment and within the body which in turn create an unbalance in the individual (Discover CranioSacral, 2016). This view makes particular assumptions about the cause of the disorder and therefore makes certain claims about how which the disorder can be treated or even cured, which will be discussed later in this work as well as in the project as a whole.

There are many interventions available that are designed to help individuals on the Autism Spectrum. Research shows that early intervention is very beneficial for children with ASD (Autism Science Foundation, 2016; Autism Speaks, 2016). Therapy and intervention goals “are to maximize an individual’s functional independence and quality of life through development and learning, improvements in social skills and communication, reductions in disability and comorbidity, promotion of independence, and provision of support to families” (Lai, et al., 2014, p. 904). Behavioral and cognitive approaches are often used, as well as sensory integration, group therapy to increase socialization and communication skills, and other assistive techniques for communication (Autism Science Foundation, 2016; Lai, et al., 2014).

Individuals with ASD might work with a Speech Pathologist, an Occupational Therapist, a Physical Therapist, and others. Some drugs have also been used to help minimize some of the behaviors seen with ASD (Autism Science Foundation, 2016; Lai, et al., 2014).

Most of these interventions are based on research and evidence of their success and validity. There are some less common interventions, though, that are being used before they have been tested with significant successful results. One of these interventions is called Craniosacral Therapy (CST). The intervention is used for a plethora of ailments, including ASD (Discover CranioSacral, 2016). The Upledger Institute claims that health induced ASD is caused by a weak immune system when a baby is born and then toxins and environmental attacks on the baby cause the symptoms of ASD (Discover CranioSacral, 2016). They claim that CST uses light pressure on the sutures of the skull to align the cerebral spinal fluid and nervous system and allows the body to naturally heal itself and rid itself of these toxins (Discover CranioSacral, 2016). In a sense, this organization believes that ASD is a disease that can be cured. More research must be done to uncover if this technique legitimately helps alleviate the symptoms of ASD or should be prescribed to clients with ASD.

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<https://www.autismspeaks.org/>

Background learning paper three.

Craniosacral therapy builds on a long history of Western medical practitioners seeking links between the human body and the human spirit. Emanuel Swedenborg (1688-1772), a scientist, inventor, and theologian laid the groundwork for the field (Swedenborg Foundation, 2016). The Swedenborg Foundation notes that their namesake accurately described the role of the cerebral cortex as well as the hierarchy of the nervous system and the localization of cerebrospinal fluid (Swedenborg Foundation, 2016). Swedenborg was not solely interested in cold anatomical fact, however; his primary drive was to illuminate the connection of the body and the soul (Swedenborg Foundation, 2016). He theorized that “spirituous fluid” in the blood, lymph, and cerebrospinal fluid contained the power of the soul, and this fluid aspect of the body – demonstrated in homeostasis and self-healing – exhibited an inherent wisdom (Swedenborg Foundation, 2016; Fuller, 2012). Swedenborg’s research was set aside for over 100 years until evidence revealing the accuracy of his neurological findings brought his work back into study (Fuller, 2012; Museum of Osteopathic Medicine, 2012).

A.T. Still (1828 – 1917) built upon Swedenborg’s work and founded the science of Osteopathy (Fuller, 2012; Museum of Osteopathic Medicine, 2012). Like Swedenborg, A.T. Still was a well-read intellectual with a dual passion for philosophy and mechanical engineering (Museum of Osteopathic Medicine, 2012). He believed that the movement of bodily fluids and “nerve force” was the key to health, and that disease could be relieved or cured by manual manipulation to eliminate anatomical deviations and restore proper flow of fluid and energy (Fuller, 2012; Museum of Osteopathic Medicine, 2012). Still named his drug-free, hands-on treatment osteopathy in 1885, and he drew so many patients that the railroad had to increase service to the town (Museum of Osteopathic Medicine, 2012). Many practitioners also came,

hoping to learn his methods, so Still founded the American School of Osteopathy in 1892 in Kirksville, MO (Museum of Osteopathic Medicine, 2012). By his death in 1917, the school had trained over 3,000 practicing osteopaths (Museum of Osteopathic Medicine, 2012).

One of Still's student's, William Sutherland (1873-1954) expanded upon the work of Swedenborg and Still and laid the groundwork for contemporary CranioSacral Therapy (Fuller, 2012). While examining a disarticulated skull during his senior year of medical school, Sutherland noted that the suture joints where the temporal and parietal bones meet resemble a fish's gills, a human mechanism of "primary respiration" (2006). Sutherland performed experiments which refuted Western medicine's fixed idea that the cranial sutures are fused and immobile; he found that – as medical traditions of Russia, Persia, India, and China have always maintained – there is slight movement in these joints (Gilchrist, 2006). Sutherland developed many techniques intended to free the "breath of life" through subtle manipulation of the cranial sutures (Kern, 2005; Fuller, 2012).

Dr. John Upledger (1932-2012), the founder of modern CranioSacral Therapy, saw first-hand the movement of the "breath of life" while assisting in a cervical spinal surgery; he was asked to hold aside the dural membrane, but the membrane was impossible to grip, due to a rhythmic pulsation of the fluid below (Gilchrist, 2006; Kern, 2005). Upledger further developed Still's and Sutherland's hands-on techniques of Cranio Osteopathy, but later, as he began training non-osteopaths in his technique he coined the term CranioSacral Therapy (Kern, 2005). Some argue that moving craniosacral manipulation out of the domain of osteopathy safety and competency in the practice (Kern, 2005), but there are now over 100,000 practitioners trained in Upledger's techniques practicing in over 100 nations around the world (Grossinger, 2012), and

though many of those countries have established professional associations, CranioSacral Therapy is largely unregulated by law (Kern, 2005).

Current trends in CranioSacral Therapy show a return to the holistic, mind/body/spirit approach of Swedenborg and Still. In 1986, Franklyn Sills (1947-) introduced a new approach to craniosacral therapy, the biodynamic view, emphasizing the essential curative power of the Breath of Life, the body's own healing wisdom; this is a perceptual and intuitive practice using as little external force as possible (Kern, 2005; Gilchrist, 2006; Sills, 2013). This is in line with the later work of Dr. Sutherland, as he advocated presence and stillness, a focus on the "breath of life" and its sacred, unerring potency and intelligence in the healing process (Kern, 2005). The therapist develops perception and palpation as a fine art, and ultimately merely reflects the work of the central nervous system while the client engages with and builds and balances his or her own inner vitality (Gilchrist, 2012). This modern trend draws heavily on Eastern medical tradition. Contemporary practitioners have said that their work addresses "the breath of life," a potent, vital energy that is linked to consciousness, physical function, and psychological/spiritual well-being (Gilchrist, 2006; Kern, 2005). In his yoga sutras (core texts of yogic philosophy, written in the 2nd century BCE,) the sage, Patanjali, uses the term "the breath of life" to refer to prana, a potent, vital energy linked to consciousness, physical function, and psychological/spiritual well-being (Desikachar, 1995; Bailey, 2008). Proper flow of prana (also known as qi [chi]) is a primary goal of yoga, qigong, and other Eastern health traditions (Desikachar, 1995; Bailey, 2008; National Qigong Association [NQA], 2016).

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Sills, Franklyn. (2013). *A history of craniosacral biodynamics*. Retrieved from: <http://www.craniosacral-biodynamics.org/history.html>

Swedenborg Foundation. (2016). *Swedenborg's Scientific Writings*. Retrieved from: <http://www.swedenborg.com/emanuel-swedenborg/scientific-writings/>

Evidence Searches.

Individual Assignment: Library Databases

Library Database: MEDLINE/PUBMED

Preparing for Search Process

To begin I researched Medline/Pubmed and put the most important information below. I also watched tutorials and read directions on using MeSH titles as well as other important information to successfully navigate the database.

“MEDLINE is the National Library of Medicine's bibliographic covering all fields of medicine and medical research. MEDLINE contains bibliographic citations and author abstracts from more than 4,300 biomedical journals published in the United States and 70 other countries. Coverage through PubMed begins in 1879.”

(http://libguides.stkate.edu/sb.php?subject_id=11869)

“A publisher or editor must submit an application for a journal to be considered for inclusion in MEDLINE. If a journal is selected for MEDLINE, its article citations will be reviewed and processed. Metadata, including Medical Subject Headings (MeSH), are added to the citations. MEDLINE content is presented through the PubMed database and also distributed through the NLM Data Distribution program as it has been for decades.”

(https://www.nlm.nih.gov/pubs/factsheets/j_sel_faq.html)

Summarizing a Strategic Search Process

- a. Craniosacral or CranioSacral Therapy is not a MeSH heading, since there was no way to broaden my MeSH heading while staying specific to CranioSacral Therapy, I went to the advanced search.
 - 1) Here I typed in ‘CranioSacral Therapy’ into the search and came up with 83 results.
 - 2) I then used the MeSH heading ‘autism spectrum disorders’ and 583 results came up, however when I joined the two searches in the advanced search, no results showed.
 - 3) I tried this same approach, joining ‘CranioSacral Therapy’ with ‘pediatrics’ and ‘children’ MeSH headings but there were no results.
- b. I went back to using ‘CranioSacral Therapy’ for my search since when I used the Boolean term ‘and,’ nothing came up. Using just the term ‘craniosacral therapy’ was the only search that was getting results.
- c. Final concept or Term List for the database:
 - 1) craniosacral[All Fields] AND ("therapy"[Subheading] OR "therapy"[All Fields] OR "therapeutics"[MeSH Terms] OR "therapeutics"[All Fields])
 - 2) After selecting the ‘human,’ ‘full texts,’ and ‘last 10 years’ filters, 31 results showed
 - 3) From these 31 I selected the five most relevant articles
 - 4) There were no articles specifically relevant to children and CST or ASK and CST so I focused on the most broad studies

Summary of 5 BEST Research Articles

Raith, W., Marschik, P., Sommer, C., Maurer-Fellbaum, U., Amhofer, C., Avian, A., . . .

Urlesberger, B. (2016). General movements in preterm infants undergoing craniosacral therapy: A randomised controlled pilot-trial. *Bmc Complementary and Alternative Medicine*, 16, 12. doi:10.1186/s12906-016-0984-5

BACKGROUND:

The objective of this study was to investigate neurological short-term effects of craniosacral therapy as an ideal form of osteopathic manipulative treatment (OMT) due to the soft kinaesthetic stimulation.

METHODS:

Included were 30 preterm infants, with a gestational age between 25 and 33 weeks, who were admitted to the neonatal intensive care unit of the University Hospital of Graz, Austria. The infants were randomized either into the intervention group (IG) which received standardised craniosacral therapy, or the control group (CG) which received standard care. To guarantee that only preterm infants with subsequent normal neurodevelopment were included, follow up was done regularly at the corrected age (= actual age in weeks minus weeks premature) of 12 and 24 months. After 2 years 5 infants had to be excluded (IG; n = 12; CG: n = 13). General Movements (GMs) are part of the spontaneous movement repertoire and are present from early fetal life onwards until the end of the first half year of life. To evaluate the immediate result of such an intervention, we selected the General Movement Assessment (GMA) as an appropriate tool. Besides the global GMA (primary outcome) we used as detailed GMA, the General Movement Optimality Score (GMOS- secondary outcome), based on Prechtl's optimality concept. To analyse GMOS (secondary outcome) a linear mixed model with fixed effects for session, time point (time point refers to the comparisons of the measurements before vs. after each session) and intervention (IG vs. CG), random effect for individual children and a first order autoregressive covariance structure was used for calculation of significant differences between groups and interactions. Following interaction terms were included in the model: session*time point, session*intervention, time point*intervention and session*time point*intervention. Exploratory post hoc analyses (interaction: session*time point*intervention) were performed to determine group differences for all twelve measurement (before and after all 6 sessions) separately.

RESULTS:

Between groups no difference in the global GMA (primary outcome) could be observed. The GMOS (secondary outcome) did not change from session to session (main effect session: $p = 0.262$) in the IG or the CG. Furthermore no differences between IG and CG (main effect group: $p = 0.361$) and no interaction of time*session could be observed ($p = 0.658$). Post hoc analysis showed a trend toward higher values before ($p = 0.085$) and after ($p = 0.075$) the first session in CG compared to IG. At all other time points GMOS were not significantly different between groups.

CONCLUSION:

We were able to indicate that a group of "healthy" preterm infants undergoing an intervention with craniosacral therapy (IG) showed no significant changes in GMs compared to preterm infants without intervention (CG). In view of the fact that the global GMA (primary outcome) showed no difference between groups and the GMOS (detailed GMA-secondary outcome) did not deteriorate in the IG, craniosacral therapy seems to be safe in preterm infants.

TRIAL REGISTRATION:

German Clinical Trials Register DRKS00004258.

Jakel, A., & von Hauenschild, P. (2012). A systematic review to evaluate the clinical benefits of craniosacral therapy. *Complementary Therapies in Medicine*, 20(6), 456-465.

doi:10.1016/j.ctim.2012.07.009

OBJECTIVE:

Craniosacral therapy (CST) is an alternative treatment approach, aiming to release restrictions around the spinal cord and brain and subsequently restore body function. A previously conducted systematic review did not obtain valid scientific evidence that CST was beneficial to patients. The aim of this review was to identify and critically evaluate the available literature regarding CST and to determine the clinical benefit of CST in the treatment of patients with a variety of clinical conditions.

METHODS:

Computerised literature searches were performed in Embase/Medline, Medline(®) In-Process, The Cochrane library, CINAHL, and AMED from database start to April 2011. Studies were identified according to pre-defined eligibility criteria. This included studies describing observational or randomised controlled trials (RCTs) in which CST as the only treatment method was used, and studies published in the English language. The methodological quality of the trials was assessed using the Downs and Black checklist.

RESULTS:

Only seven studies met the inclusion criteria, of which three studies were RCTs and four were of observational study design. Positive clinical outcomes were reported for pain reduction and improvement in general well-being of patients. Methodological Downs and Black quality scores ranged from 2 to 22 points out of a theoretical maximum of 27 points, with RCTs showing the highest overall scores.

CONCLUSION:

This review revealed the paucity of CST research in patients with different clinical pathologies. CST assessment is feasible in RCTs and has the potential of providing valuable outcomes to further support clinical decision making. However, due to the current moderate methodological quality of the included studies, further research is needed.

Harrison, R. E., & Page, J. S. (2011). Multipractitioner upledger CranioSacral therapy:

Descriptive outcome study 2007–2008. *The Journal of Alternative and Complementary Medicine*, 17(1), 13-17. doi:10.1089/acm.2009.0644

OBJECTIVES:

This study describes patients presenting for CranioSacral treatment, the conditions they present with, and the impact of treatment on both their symptoms and lives.

DESIGN:

The records of 157 patients treated with Upledger CranioSacral Therapy (UCST) were reviewed. Seventy-three (73) patients had been treated by 10 different practitioners working independently and 84 patients were treated by a single practitioner working within the National Health Service.

RESULTS:

Patients' ages ranged from neonates to 68 years. Seventy-four percent (74%) of patients reported a valuable improvement in their presenting problem. Sixty-seven percent (67%) also reported a valuable improvement in their general well-being and/or a second health problem. Outcome by diagnostic groups suggested that UCST is particularly effective for patients with headaches and migraine, neck and back pain, anxiety and depression, and unsettled babies. Seventy percent (70%) of patients on medication decreased or discontinued it, and patients' average general practitioner consultation rate fell by 60% in the 6 months following treatment.

CONCLUSIONS:

The study suggests that further research into UCST as a treatment modality would be valuable for the abovementioned problems in particular.

Summarizing a Strategic Search Process (continued)

- a. After finding the first three articles I could not find any others relevant and decided to broaden my scope
- b. I used the Final concept or Term List for the database:
 - a) craniosacral[All Fields] AND ("therapy"[Subheading] OR "therapy"[All Fields] OR "therapeutics"[MeSH Terms] OR "therapeutics"[All Fields])
 - i) I did not select any filters and had 40 results

Summary of 5 Best Research Articles (continued)

Whedon, J., & Glassey, D. (2009). cerebrospinal fluid stasis and its clinical significance.

Alternative Therapies in Health and Medicine, 15(3), 54-60.

We hypothesize that stasis of the cerebrospinal fluid (CSF) occurs commonly and is detrimental to health. Physiologic factors affecting the normal circulation of CSF include cardiovascular, respiratory, and vasomotor influences. The CSF maintains the electrolytic environment of the central nervous system (CNS), influences systemic acid-base balance, serves as a medium for the supply of nutrients to neuronal and glial cells, functions as a lymphatic system for the CNS by removing the waste products of cellular metabolism, and transports hormones, neurotransmitters, releasing factors, and other neuropeptides throughout the CNS. Physiologic impedance or cessation of CSF flow may occur commonly in the absence of degenerative changes or pathology and may compromise the normal physiologic functions of the CSF. CSF appears to be particularly prone to stasis within the spinal canal. CSF stasis may be associated with adverse mechanical cord tension, vertebral subluxation syndrome, reduced cranial rhythmic impulse, and restricted respiratory function. Increased sympathetic tone, facilitated spinal segments, dural

tension, and decreased CSF flow have been described as closely related aspects of an overall pattern of structural and energetic dysfunction in the axial skeleton and CNS. Therapies directed at affecting CSF flow include osteopathic care (especially cranial manipulation), craniosacral therapy, chiropractic adjustment of the spine and cranium, Network Care (formerly Network Chiropractic), massage therapy (including lymphatic drainage techniques), yoga, therapeutic breath-work, and cerebrospinal fluid technique. Further investigation into the nature and causation of CSF stasis, its potential effects upon human health, and effective therapies for its correction is warranted.

Gillespie, B. R. (2009). Case study in attention-Deficit/Hyperactivity disorder: The corrective aspect of craniosacral fascial therapy. *Explore: The Journal of Science and Healing*, 5(5), 296-298. doi:10.1016/j.explore.2009.06.003

Attention-deficit/hyperactivity disorder (ADHD) describes a range of pediatric behavioral disorders, including such symptoms as poor concentration, hyperactivity, and impulsivity. Approximately 1.6 million, or 7% of American children from ages six to 11, have been diagnosed with ADHD.¹ The prevalence of ADHD is three times more in boys than in girls.¹ Conventional treatment consists of behavioral interventions and the use of stimulants such as methylphenidate. Although these treatments can be very effective, recently concern has arisen over potential adverse cardiac side effects.² An alternative method of care includes the evaluation and treatment of the child's craniosacral fascial system as a contributing factor to the underlying neurological dysfunction. This system is an integration of the craniosacral and fascial or connective tissue components.

Individual Assignment: Other Evidence Resources**Other Evidence Resources:** Governmental websites**Preparing for Search Process**

- a. According to the University of Wisconsin .gov sites are governmental sites and are seen as credible.

Summarizing Startegic Process

- a. I searched google with ‘‘CranioSacral Therapy and Autism Spectrum Disorder’ site:.gov’ and 0 sites came up, however when I took off the quotes around ‘CranioSacral Therapy and Autism Spectrum Disorder,’ 1,870 sites showed up
 - 1) Most of these results did not have the words ‘CranioSacral Therapy’ in the title
 - 2) Two articles came up labeled ‘scholarly’ but they were not relevant
- b. Next I added filtered out results before the year 2000 and had them sorted by relevancy
 - 1) After this I had 27 results 2 of which appeared to be relevant (some mentioned the word craniosacral just once)

Summary of 5 Best Research Articles or Credible Resources

Levy, S. E., & Hyman, S. L. (2008). “Complementary and Alternative Medicine Treatments for Children with Autism Spectrum Disorders.” *Child and Adolescent Psychiatric Clinics of North America*, 17(4), 803–ix. <http://doi.org/10.1016/j.chc.2008.06.004>

Complementary and alternative medical treatments are commonly used for children with autism spectrum disorders. This review discusses the evidence supporting the most frequently used treatments, including categories of mind-body medicine, energy medicine, biologically based, manipulative and body-based practices, with the latter two the most commonly selected by families. It is important for clinical providers to understand the evidence for efficacy (or lack thereof) and potential side effects. Some CAM practices have evidence to reject their use, such as secretin, others have emerging evidence to support their use, like melatonin. Most treatments, however, have not been adequately studied and do not have evidence to support their use.

National Guideline Clearinghouse (NGC). (2011) “Guideline summary: Best evidence statement (BEST). Craniosacral therapy for children with autism and/or sensory processing disorder.” In: National Guideline Clearinghouse (NGC) [Web site]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ) Available: <https://www.guideline.gov>

Major Recommendations

There is insufficient evidence and a lack of consensus to make a recommendation on using craniosacral therapy (CST) to improve the behavior of children with autism and sensory processing disorder.

Note: Concerns are raised in the literature about the validity of the tools used to measure the craniosacral rhythm, identify craniosacral dysfunction and efficacy of craniosacral treatment (Green et al., 1999 [1a]; Levy & Hyman, 2005 [5b]).

Summarizing a Strategic Search Process (cont)

- a. After finding the first two articles I could not find any others relevant and decided to broaden my scope
- b. I again searched ‘CranioSacral Therapy and Autism Spectrum Disorder site:.gov,’ again without quotes, and this time without any additional filters
 - a) From here I searched for the term ‘craniosacral’ in the results and sifted through to look for three more of the most relevant articles
 - i) From here I found many lists of classes offered for continuing education for chiropractors, school classes, lists of classes no longer offered, insurance plans, and health care plans
- c. At this point I took a different approach to again broaden my search. I searched “CranioSacral Therapy” in quotes and site:.gov
 - a) I had 1,740 results so I added the filter 2010-2016 and was down to 375
 - i) The setting was on ‘sort by relevance’ and I sifted through to find the three most relevant articles

Summary of 5 Best Research Articles or Credible Resources (cont)

Ernst, E. (2012). Craniosacral therapy: A systematic review of the clinical evidence: Review.

Focus on Alternative and Complementary Therapies, 17(4), 197-201. doi:10.1111/j.2042-

7166.2012.01174.x

Aim

Craniosacral therapy (CST) is a popular treatment for a wide range of conditions. This systematic review evaluates the evidence of effectiveness for CST for any human condition.

Method

An electronic search for relevant studies was conducted across three databases; this was complemented by extensive hand-searching of departmental files and bibliographies. Articles were included if they reported RCTs of CST for any human condition. Data were extracted according to predefined criteria and trial quality was determined using the Jadad score.

Results

Six studies were included. Except for one, all were associated with a high risk of bias. Low quality studies suggested positive effects, while the high-quality trial failed to demonstrate effectiveness.

Conclusion

The notion that CST is associated with more than non-specific effects is not based on evidence from rigorous RCTs.

Haller, H., Lauche, R., Cramer, H., Rampp, T., Saha, F. J., Ostermann, T., & Dobos, G. (2016).

Craniosacral Therapy for the Treatment of Chronic Neck Pain: A Randomized Sham-controlled Trial. *The Clinical Journal of Pain*, 32(5), 441–449.

<http://doi.org/10.1097/AJP.0000000000000290>

Objectives:

With growing evidence for the effectiveness of craniosacral therapy (CST) for pain management, the efficacy of CST remains unclear. This study therefore aimed at investigating CST in comparison with sham treatment in chronic nonspecific neck pain patients.

Materials and Methods:

A total of 54 blinded patients were randomized into either 8 weekly units of CST or light-touch sham treatment. Outcomes were assessed before and after treatment (week 8) and again 3 months later (week 20). The primary outcome was the pain intensity on a visual analog scale at week 8; secondary outcomes included pain on movement, pressure pain sensitivity, functional disability, health-related quality of life, well-being, anxiety, depression, stress perception, pain acceptance, body awareness, patients' global impression of improvement, and safety.

Results:

In comparison with sham, CST patients reported significant and clinically relevant effects on pain intensity at week 8 (−21 mm group difference; 95% confidence interval, −32.6 to −9.4; $P=0.001$; $d=1.02$) and at week 20 (−16.8 mm group difference; 95% confidence interval, −27.5 to −6.1; $P=0.003$; $d=0.88$). Minimal clinically important differences in pain intensity at week 20 were reported by 78% within the CST group, whereas 48% even had substantial clinical benefit. Significant between-group differences at week 20 were also found for pain on movement, functional disability, physical quality of life, anxiety and patients' global improvement. Pressure pain sensitivity and body awareness were significantly improved only at week 8. No serious adverse events were reported.

Discussion:

CST was both specifically effective and safe in reducing neck pain intensity and may improve functional disability and the quality of life up to 3 months after intervention.

Matrán-Peñarrocha, G. A., Castro-Sánchez, A. M., García, G. C., Moreno-Lorenzo, C., Carreño, T. P., & Zafra, M. D. O. (2011). Influence of Craniosacral Therapy on Anxiety,

Depression and Quality of Life in Patients with Fibromyalgia. *Evidence-Based*

Complementary and Alternative Medicine : eCAM, 2011, 178769.

<http://doi.org/10.1093/ecam/nep125>

Fibromyalgia is considered as a combination of physical, psychological and social disabilities. The causes of pathologic mechanism underlying fibromyalgia are unknown, but fibromyalgia

may lead to reduced quality of life. The objective of this study was to analyze the repercussions of craniosacral therapy on depression, anxiety and quality of life in fibromyalgia patients with painful symptoms. An experimental, double-blind longitudinal clinical trial design was undertaken. Eighty-four patients diagnosed with fibromyalgia were randomly assigned to an intervention group (craniosacral therapy) or placebo group (simulated treatment with disconnected ultrasound). The treatment period was 25 weeks. Anxiety, pain, sleep quality, depression and quality of life were determined at baseline and at 10 minutes, 6 months and 1-year post-treatment. State anxiety and trait anxiety, pain, quality of life and Pittsburgh sleep quality index were significantly higher in the intervention versus placebo group after the treatment period and at the 6-month follow-up. However, at the 1-year follow-up, the groups only differed in the Pittsburgh sleep quality index. Approaching fibromyalgia by means of craniosacral therapy contributes to improving anxiety and quality of life levels in these patients.

Individual Assignment: Library Database

Library Database: psycINFO

Brief overview of the database:

- Published by the American Psychological Association, psycINFO is a database that includes behavioral/social science resources from around the world. The database is updated two times a week. It includes around 2,500 journals (a bulk of its content), some books and dissertations, and other sources of scholarly work. 100% of the records from 1995 to now have abstracts. The database is classified under 22 main categories and includes 135 small subcategories. Its thesaurus features 8400 terms and cross references. <http://www.apa.org/pubs/databases/psycinfo/index.aspx?tab=3>

Preparing for the Search:

- To prepare for this search, I made a list of possible search words I could use.
 - Craniosacral therapy, autism, ASD, alternative medicine or therapy, craniosacral system.
 - I started with a basic search of craniosacral therapy and then added more filters (years, types of articles, population, etc). I tried combining several keywords together.
 - Most of what I found was more related to autism in general or autism and other alternative therapy options. There seemed to be a very limited amount of sources on Craniosacral Therapy specifically.

Summarizing a Strategic Search Process

Filters/Years	Keywords	Total Yield / Relevant Hits	Date
None Years: Unlimited	(craniosacral therapy)	22/2 Wedel, 2006 Gasalberti, 2006	Nov. 14, 2016
Type of article: Peer reviewed journal article Years: Unlimited	(autism AND alternative therapy)	363/ - narrow search more, but found a couple relevant hits Abbey, 2009 Matteo et al., 2012	Nov. 14, 2016
Type of article: Peer reviewed journal article Years: Unlimited	(autism AND alternative therapy) AND (craniosacral therapy)	No results	Nov. 14, 2016
Type of article: Peer reviewed journal article Years: Unlimited	(autism AND craniosacral)	No results	Nov. 14, 2016
Type of article: Peer reviewed journal article	(autism AND alternative therapy)	50/2 Huang et al., 2013	Nov. 14, 2016

Years: 2010-present Age group: school age (6-12 years)		Owen-Smith et al., 2015	
Type of article: Peer reviewed journal article Years: 2010-present Age group: school age (6-12 years) Language: English	(occupational therapy AND autism)	226/ - narrow results more, but none really touched on CST as far as I could tell	Nov. 14, 2016
Type of article: Peer reviewed journal article Years: 2010-present Age group: school age (6-12 years) Language: English	(occupational therapy AND autism) AND (craniosacral therapy)	No results	Nov. 14, 2016

Summary of 5 BEST Research Articles

Abbey, D. (2009). Helping families find the best evidence: CAM therapies for autism spectrum

disorders and asperger's disorder. *Journal for Specialists in Pediatric Nursing*, 14(3),

200-202. Retrieved from

<http://pearl.stkate.edu/login?url=http://search.proquest.com.pearl.stkate.edu/docview/622>

055347?accountid=26879

A nationwide survey found that approximately 38% of adults and 12% of children used some form of complimentary or alternative medicine (CAM). Unfortunately, few CAM therapies have been put through the rigors of scientific study to determine their effectiveness and safety, and even less has been done to study unconventional therapies for Autism Spectrum Disorders (ASD) and Asperger’s Disorder (AD). This presents a challenge when attempting to locate evidence-based research in either of these arenas. Due to a limited number of studies to substantiate alternative therapies, coupled with myriad Web resources with little to no evidence supporting their claims, families can be overwhelmed by information they find on the Internet. There are numerous components to evaluating health information and understanding the validity

of information reported in print and online. (PsycINFO Database Record (c) 2016 APA, all rights reserved)

Gasalberti, D. (2006). Alternative therapies for children and youth with special health care needs.

Journal of Pediatric Health Care, 20(2), 133-136. Retrieved from

<http://pearl.stkate.edu/login?url=http://search.proquest.com.pearl.stkate.edu/docview/621113012?accountid=26879>

Aside from the well-known interventions, there are many other therapies Children and youth with special health care needs (CYSHCN) can be helped with. Animals have been used with success in therapies such as animal-assisted psychotherapy, in which animals such as dogs, cats, and birds are used to help those with psychological problems. Positive interaction with animals, even if it is just one's physical presence with them or an empathetic feeling toward them, seems to benefit children. Hippotherapy uses the unique movement of a horse to achieve a child's health care goals. Children receive a therapeutic benefit simply by sitting on the horse. As they work to maintain balance, they receive numerous additional therapeutic benefits--physical, developmental and social. Music therapy uses music as a tool to induce positive behavioral changes. It is particularly useful with autistic children in the area of speech remediation. There is much in the scientific literature to illustrate the positive effects of music. The goal of most massage therapy is relaxation. Massage therapy has been shown to benefit children with a wide variety of disorders. Craniosacral massage corrects and restore the flow of cerebral spinal fluid through the head and spine and lymphatic massage improves the flow of lymph. Light therapy has for many years been used to treat newborn jaundice and seasonal affective disorder. Color therapy uses human sensitivity to color to identify imbalances in energy patterns. Color is believed to have specific physical, emotional, and spiritual effects on human beings. (PsycINFO Database Record (c) 2016 APA, all rights reserved)

Huang, A., Seshadri, K., Matthews, T. A., & Ostfeld, B. M. (2013). Parental perspectives on use,

benefits, and physician knowledge of complementary and alternative medicine in

children with autistic disorder and attention-deficit/hyperactivity disorder. *The Journal of*

Alternative and Complementary Medicine, 19(9), 746-750. Retrieved from

<http://pearl.stkate.edu/login?url=http://search.proquest.com.pearl.stkate.edu/docview/1511555997?accountid=26879>

Complementary and alternative medicine (CAM) use appears to be increasing in children with developmental disorders. However, it is not clear whether parents perceive their healthcare providers as resources who are knowledgeable about CAM therapies and are interested in further

developing their knowledge. Objectives: (1) To establish and compare use of, and perceived satisfaction with, traditional medicine and CAM in children with attention-deficit/hyperactivity disorder (ADHD) and autism spectrum disorders (ASDs) and (2) to assess parental perceptions of physician knowledge of CAM and physician interest in continuing education about CAM for the two groups of parents. Methods: Families of children with a diagnosis of ADHD or ASD were surveyed regarding the frequency of use of traditional treatment and CAM, parental perceptions of the helpfulness of each therapy, parental perceptions regarding physicians' knowledge level about CAM, and physician interest in continuing education. Results: Thirty-six percent ($n = 135$) of 378 surveys were returned: 41 contained a diagnosis of ADHD and 22 of ASD. Traditional therapies were used by 98% of children with ADHD and 100% of those with ASD. Perceived helpfulness of medication was 92% for children with ADHD and 60% for children with ASD ($p < 0.05$). CAM was used for 19.5% of children with ADHD and 82% of children with ASD. Perceived satisfaction for any form of CAM in the children with ADHD was at an individual patient level. Satisfaction for two of the most commonly used CAM treatments in children with ASD ranged from 50% to 78%. In children with ASD (the diagnostic group with the highest use of and satisfaction with CAM), physician's perceived knowledge of CAM was lower (14% versus 38%; $p < 0.05$), as was perceptions of the physician's interest in learning more ($p < 0.05$). Conclusion: CAM use is significant, especially in children with ASD. Physicians are not perceived as a knowledgeable resource. (PsycINFO Database Record (c) 2016 APA, all rights reserved)(journal abstract)

Owen-Smith, A., Bent, S., Lynch, F. L., Coleman, K. J., Yau, V. M., Pearson, K. A., . . . Croen,

L. A. (2015). Prevalence and predictors of complementary and alternative medicine use in a large insured sample of children with autism spectrum disorders. *Research in Autism Spectrum Disorders*, 17, 40-51. Retrieved from

<http://pearl.stkate.edu/login?url=http://search.proquest.com.pearl.stkate.edu/docview/1752357349?accountid=26879>

The purpose of the present study was to examine the prevalence and predictors of complementary and alternative medicine (CAM) use as well as parental perceptions of CAM efficacy in a large, geographically diverse sample of children with Autism Spectrum Disorders (ASD). Methodology: Data were obtained from a web-based survey administered to parents of children with ASD at four sites participating in the Mental Health Research Network (MHRN). The web survey obtained information about services and treatments received by children with ASD as well as the caregivers' experiences with having a child with ASD. Results: Approximately 88% of the sample had either used CAM in the past or had recently used some type of CAM. The following characteristics were associated with CAM use: greater parental education, younger child age, a mix of regular and special classroom settings and prescription drug use in the past three months. Conclusions: The use of CAM was very prevalent in this large, geographically diverse sample of children with ASD. It is critical that providers be prepared to discuss the advantages and potential side effects with families to help them make well-informed

health care decisions and prevent possible CAM-drug interactions. (PsycINFO Database Record (c) 2016 APA, all rights reserved)(journal abstract)

Wedel, A. (2006). Craniosacral therapy for traumatic brain injury clients with neurobehavioral

disorders. *Alternate therapies in the treatment of brain injury and neurobehavioral*

disorders: A practical guide. (pp. 149-180) Haworth Press, New York, NY. Retrieved

from

[http://pearl.stkate.edu/login?url=http://search.proquest.com.pearl.stkate.edu/docview/621](http://pearl.stkate.edu/login?url=http://search.proquest.com.pearl.stkate.edu/docview/621337358?accountid=26879)

[337358?accountid=26879](http://pearl.stkate.edu/login?url=http://search.proquest.com.pearl.stkate.edu/docview/621337358?accountid=26879)

Craniosacral therapy is a gentle, nonintrusive, hands-on healing technique utilized by experienced therapists to help the physical body release restricted tissues and restore optimal physical, emotional, behavioral, and cognitive functions (Burget, 2002). It is an alternative medicine technique that is readily able to work with and enhance the effects of traditional allopathic treatments. It can be a very effective means of helping people work through and release chronic pain. Basically, it is a transformational manual therapy technique used to help people suffering from orthopedic and neurological problems to function at a higher level (Reuben, 1987; Smoley, 1991; Upledger, 1996). This chapter examines the philosophy of craniosacral therapy, the craniosacral therapeutic process, and the use of craniosacral therapy in a hospital-based TBI rehabilitation program. (PsycINFO Database Record (c) 2016 APA, all rights reserved)

Individual Assignment: Other Evidence Resources**Evidence Resource(s):** AOTA and AJOT

My goal in this search was to see if there were any articles or sources discussing Craniosacral Therapy in the mainstream OT journals/resources. I found that there is really nothing out there in AOTA and AJOT that directly focuses on Craniosacral Therapy. My search entries of (craniosacral therapy) and (autism AND alternative therapy) and (craniosacral AND autism) yielded little to virtually no results. I finally found a few articles discussing evidence-based practice and interventions, which was closer to my desired topic. I was able to access a few of these articles through the tab “related articles” that popped up from my other searches. Some, however, on the AOTA site sent me to a “page not found” message, which was frustrating. It looks like maybe (evidence-based) might be a good keyword to use in future research.

One article I found was an “Evidence-Based Review of Interventions for Autism Used in or of Relevance to Occupational Therapy” from 2008 (Case-Smith & Arbesman, 2008). This briefly discussed a research-based assessment of different types of interventions for children with ASD, including sensory interventions (Case-Smith & Arbesman, 2008). It did not mention Craniosacral Therapy by name, however. It was concluded that, while sensory interventions seem to have positive effects on children with ASD, there is no real evidence that they improve their overall quality of life and function (Case-Smith & Arbesman, 2008). It appears there is a consensus that more research is needed to prove these types of interventions are successful long term. This was the only source that I found that came close to my initial topic.

The fact that I was not able to find Craniosacral Therapy anywhere in my initial searches on these two prominent OT resources said a lot to me. If this is a common intervention for ASD, why is it not mentioned more? Where are the research articles discussing the great benefits

of this practice? It appears that there is plenty of literature out there about how sensory interventions are being used with children with ASD, but Craniosacral Therapy does not seem to have a place in the forefront of the literature.

Summary of best article

Case-Smith, J. & Arbesman, M. (2008). Evidence-based review of interventions for autism used in or of relevance to occupational therapy. *American Journal of Occupational Therapy*, 62. 416-429. doi:10.5014/ajot.62.4.416

Occupational therapy practitioners are among the professionals who provide services to children and adults with autism spectrum disorder (ASD), embracing both leadership and supportive roles in service delivery. The study's primary aims were as follows: (1) to identify, evaluate, and synthesize the research literature on interventions for ASD of relevance to occupational therapy and (2) to interpret and apply the research literature to occupational therapy. A total of 49 articles met the authors' criteria and were included in the review. Six categories of research topics were identified, the first 3 of which are most closely related to occupational therapy: (1) sensory integration and sensory-based interventions; (2) relationship-based, interactive interventions; (3) developmental skill-based programs; (4) social cognitive skill training; (5) parent-directed or parent-mediated approaches; and (6) intensive behavioral intervention. Under each category, themes supported by research evidence and applicable to occupational therapy were defined. The findings have implications for intervention methods, communication regarding efficacious practices to professionals and consumers, and future occupational therapy research.

Individual Assignment: Library Database

Library Database: CINAHL

Filter	Keywords	Total yield/relevant hits	Date
Craniosacral Therapy (subject terms – Evaluation + Standards + Methods)	Craniosacral therapy	26 – 20 periodicals 6 academic journals	11/15/16
	Autism (subheading cerebrospinal fluid)	4 academic journal articles	11/15/16
Full Text + Scholarly, Reviewed Articles	Autism (subheading therapy)	755	11/15/16
All above + subject major headings “alternative therapies”		22	11/15/16
	Autism + CranioSacral Therapy	0	11/15/16
Search within full text	Autism + CranioSacral Therapy	16	11/15/16

5 out of 20 periodical articles in first search above were from what is apparently a series of articles in “Massage Today” magazine: “CranioSacrally Speaking” by John Upledger, the founder of CranioSacral Therapy.

Summary of the best articles

Hartman, S., & Norton, J. (2002). Interexaminer reliability and cranial osteopathy. *Scientific*

Review Of Alternative Medicine, 6(1), 23-34.

We assess the mechanism purported to underlie the health treatment regime labeled 'cranial osteopathy' or 'craniosacral therapy.' We then summarize all published reports on interexaminer reliability associated with this modality, reanalyze some previously published data, and critique Upledger's often-cited study. Our own and previously published findings suggest that the proposed mechanism for cranial osteopathy is invalid and that interexaminer (and, therefore, diagnostic) reliability is approximately zero. Since no properly randomized, blinded, and placebo-controlled outcome studies have been published, we conclude that cranial osteopathy should be removed from curricula of colleges of osteopathic medicine and from osteopathic licensing examinations.

Biodynamic Craniosacral Therapy. (2016). *Journal of the Australian Traditional-Medicine Society*, 22(3), 181.

An “advertorial” in a peer reviewed journal about CranioSacral Therapy as “energy medicine.”

Hallahan, B., Daly, E., McAlonan, G., Loth, E., Toal, F., O'Brien, F., & ... Murphy, D. (2009).

Brain morphometry volume in autistic spectrum disorder: a magnetic resonance imaging study of adults. *Psychological Medicine*, 39(2), 337-346.

doi:10.1017/S0033291708003383

BACKGROUND: Several prior reports have found that some young children with autism spectrum disorder [ASD; including autism and Asperger's syndrome and pervasive developmental disorder - not otherwise specified (PDD-NOS)] have a significant increase in head size and brain weight. However, the findings from older children and adults with ASD are inconsistent. This may reflect the relatively small sample sizes that were studied, clinical heterogeneity, or age-related brain differences. **METHOD:** Hence, we measured head size (intracranial volume), and the bulk volume of ventricular and peripheral cerebrospinal fluid (CSF), lobar brain, and cerebellum in 114 people with ASD and 60 controls aged between 18 and 58 years. The ASD sample included 80 people with Asperger's syndrome, 28 with autism and six with PDD-NOS. **RESULTS:** There was no significant between-group difference in head and/or lobar brain matter volume. However, compared with controls, each ASD subgroup had a significantly smaller cerebellar volume, and a significantly larger volume of peripheral CSF. **CONCLUSIONS:** Within ASD adults, the bulk volume of cerebellum is reduced irrespective of diagnostic subcategory. Also the significant increase in peripheral CSF may reflect differences in cortical maturation and/or ageing.

Huang, A., Seshadri, K., Matthews, T. A., & Ostfeld, B. M. (2013). Parental Perspectives on

Use, Benefits, and Physician Knowledge of Complementary and Alternative Medicine in Children with Autistic Disorder and Attention-Deficit/Hyperactivity Disorder. *Journal of Alternative & Complementary Medicine*, 19(9), 746-750. doi:10.1089/acm.2012.0640

Background: Complementary and alternative medicine (CAM) use appears to be increasing in children with developmental disorders. However, it is not clear whether parents perceive their healthcare providers as resources who are knowledgeable about CAM therapies and are interested in further developing their knowledge. **Objectives:** (1) To establish and compare use of, and perceived satisfaction with, traditional medicine and CAM in children with attention-deficit/hyperactivity disorder (ADHD) and autism spectrum disorders (ASDs) and (2) to assess parental perceptions of physician knowledge of CAM and physician interest in continuing education about CAM for the two groups of parents. **Methods:** Families of children with a diagnosis of ADHD or ASD were surveyed regarding the frequency of use of traditional treatment and CAM, parental perceptions of the helpfulness of each therapy, parental perceptions regarding physicians' knowledge level about CAM, and physician interest in continuing

education. Results: Thirty-six percent (n=135) of 378 surveys were returned: 41 contained a diagnosis of ADHD and 22 of ASD. Traditional therapies were used by 98% of children with ADHD and 100% of those with ASD. Perceived helpfulness of medication was 92% for children with ADHD and 60% for children with ASD ($p<0.05$). CAM was used for 19.5% of children with ADHD and 82% of children with ASD. Perceived satisfaction for any form of CAM in the children with ADHD was at an individual patient level. Satisfaction for two of the most commonly used CAM treatments in children with ASD ranged from 50% to 78%. In children with ASD (the diagnostic group with the highest use of and satisfaction with CAM), physician's perceived knowledge of CAM was lower (14% versus 38%; $p<0.05$), as was perceptions of the physician's interest in learning more ($p<0.05$). Conclusion: CAM use is significant, especially in children with ASD. Physicians are not perceived as a knowledgeable resource.

Senel, H. (2010). Parents' views and experiences about complementary and alternative medicine treatments for their children with autistic spectrum disorder. *Journal Of Autism & Developmental Disorders*, 40(4), 494-503. doi:10.1007/s10803-009-0891-4

Use of complementary and alternative medicine (CAM) treatments have been increasing for children with autistic spectrum disorder (ASD). In this study, 38 Turkish parents of children with ASD were surveyed related with their use of CAM treatments, experiences, and views for each treatment. They mentioned 'Vitamins and minerals', 'Special Diet', 'Sensory Integration', 'Other Dietary Supplements', and 'Chelation' as five frequently used CAM treatments. Communication, learning, health, and behavior were the main four areas rated as 'improved' after five CAM treatments. Negative sides of treatments were listed as being expensive, difficult to apply, or harmful. The parents' views on some treatments have varied from great improvement to worse. Reported improvements were considerably higher than the negative sides of the treatments.

Baranek, G. (2002). Efficacy of sensory and motor interventions for children with autism. *Journal Of Autism & Developmental Disorders*, 32(5), 397-422.

Idiosyncratic responses to sensory stimuli and unusual motor patterns have been reported clinically in young children with **autism**. The etiology of these behavioral features is the subject of much speculation. Myriad sensory- and motor-based interventions have evolved for use with children with **autism** to address such issues; however, much controversy exists about the efficacy of such **therapies**. This review paper summarizes the sensory and motor difficulties often manifested in **autism**, and evaluates the scientific basis of various sensory and motor interventions used with this population. Implications for education and further research are described.

Levy, S., & Hyman, S. (2002). Alternative/complementary approaches to treatment of children with autistic spectrum disorders. *Infants & Young Children: An Interdisciplinary Journal Of Early Childhood Intervention*, 14(3), 33-42.

Early diagnosis of autistic spectrum disorders (ASD) allows for early referral for treatment and remediation of core deficits in communication, socialization, and behavior. The cornerstone of treatment is a comprehensive, intensive program of educational, developmental, and behavioral strategies. Since the etiology for most cases is not well defined, progress may be slow, and treatment may be intense, interest in alternative theories of causation and novel treatments is high. Families may pursue complementary and alternative medicine (CAM) **therapies** in addition to the standard treatments. There are two types of CAM: biologic and nonbiologic. Some of the treatments have been examined using standard research techniques, while others have not yet undergone such scrutiny. Families should be supported in their quest for effective treatments and assisted in learning about potential benefits and harm of each CAM. Copyright © 2002 by Aspen Publishers, Inc.

Individual Assignment: Other Evidence Resources

Other Evidence Resources: Google Scholar

Filter	Keywords	Total yield/relevant hits	Date
None	Craniosacral therapy autism	770	11/13/16
Unchecked “include patents” and “include citations” at Left	craniosacral therapy autism	732	11/13/16
Unchecked “include patents” and “include citations” at Left	“craniosacral therapy” autism	378	11/13/16

Summary of 5 best articles

Jäkel, A., & von Hauenschild, P. (2012). A systematic review to evaluate the clinical benefits of craniosacral therapy. *Complementary therapies in medicine, 20*(6), 456-465.

Objective

Craniosacral therapy (CST) is an alternative treatment approach, aiming to release restrictions around the spinal cord and brain and subsequently restore body function. A previously conducted systematic review did not obtain valid scientific evidence that CST was beneficial to patients. The aim of this review was to identify and critically evaluate the available literature regarding CST and to determine the clinical benefit of CST in the treatment of patients with a variety of clinical conditions.

Methods

Computerised literature searches were performed in Embase/Medline, Medline® In-Process, The Cochrane library, CINAHL, and AMED from database start to April 2011. Studies were identified according to pre-defined eligibility criteria. This included studies describing observational or randomised controlled trials (RCTs) in which CST as the only treatment method was used, and studies published in the English language. The methodological quality of the trials was assessed using the Downs and Black checklist.

Results

Only seven studies met the inclusion criteria, of which three studies were RCTs and four were of observational study design. Positive clinical outcomes were reported for pain reduction and improvement in general well-being of patients. Methodological Downs and Black quality scores ranged from 2 to 22 points out of a theoretical maximum of 27 points, with RCTs showing the highest overall scores.

Conclusion

This review revealed the paucity of CST research in patients with different clinical pathologies. CST assessment is feasible in RCTs and has the potential of providing valuable outcomes to further support clinical decision making. However, due to the current moderate methodological quality of the included studies, further research is needed.

Fowles, K. (2004). What is the evidence for the effectiveness of craniosacral therapy?. *International Journal of Therapy and Rehabilitation*, 11(3), 98-98.

Craniosacral therapy (CST) is a complementary therapy widely used by a variety of practitioners including physiotherapists, osteopaths and chiropractors. It is a gentle manual therapy, reported to give clinical improvements in conditions that include musculoskeletal and neurological disorders, stress and emotionally-derived problems and autism. It is described as being holistic in its activation of inherent self-healing mechanisms, resolving dysfunctions together with any associated physical or emotional issues (Hollenbury and Dennis, 1994).

Kostopoulos, D. C., & Keramidas, G. (1992). Changes in elongation of falx cerebri during craniosacral therapy techniques applied on the skull of an embalmed cadaver. *CRANIO®*, 10(1), 9-12.

CranioSacral therapy supports that light forces applied to the skull may be transmitted to the dura membrane having a therapeutic effect to the cranial system. This study examines the changes in elongation of falx cerebri during the application of some of the craniosacral therapy techniques to the skull of an embalmed cadaver. The study demonstrates that the relative elongation of the falx cerebri changes as follows: for the frontal lift, 1.44 mm; for the parietal lift, 1.08 mm; for the sphenobasilar compression, -0.33 mm; for the sphenobasilar decompression, 0.28 mm; and for the ear pull, inconclusive results. The present study offers validation for the scientific basis of craniosacral therapy and the contention for cranial suture mobility.

Dimitrios C. Kostopoulos

Mr. Dimitrios C. Kostopoulos is a registered physical therapist practicing in New York City, New York. He earned his undergraduate degree in physical therapy from the University of Athens, Greece, and his master's degree in physical therapy from New York University. He is currently a doctorate candidate at New York University concentrating in pathokinesiology. Mr. Kostopoulos specializes in craniosacral therapy, myofascial release, acupressure therapy, trigger point therapy, and other manual techniques, treating both adult and pediatric populations. He is also researching projects involving craniosacral therapy and myofascial release.

Smith, T. (2008). Empirically supported and unsupported treatments for autism spectrum disorders. *Scientific Review of Mental Health Practice*, 6(1).

While evidence-based interventions for individuals with autism spectrum disorder (ASD) are available, unvalidated interventions abound. These interventions include bonding therapies, sensorimotor treatments, and a variety of complementary and alternative medicine approaches. Both single-case experiments and between-group studies can be useful in evaluating such interventions. However, unvalidated interventions are likely to remain prevalent for many years, and interventionists in general-practice settings can expect to encounter them. An appendix summarizes many of these interventions and the status of research on them.

Ravindran, N., & Myers, B. J. (2012). Cultural influences on perceptions of health, illness, and disability: A review and focus on autism. *Journal of Child and Family Studies, 21*(2), 311-319.

This conceptual paper considers the role of culture in shaping family, professional, and community understanding of developmental disabilities and their treatments. The meanings of health, illness, and disability vary greatly across cultures and across time. We use Bronfenbrenner's ecological model to provide a theoretical framework for examining disability, with special attention to autism spectrum disorders. Cultural beliefs about the cause of a disorder influence families' decision-making about what treatments to use and what outcomes to expect. Autism provides an example that is especially challenging, as there is no agreed-upon cause. Also, an overwhelming array of treatments is available in the West for autism, including behavioral, cognitive, pharmaceutical, sensory, relational, vitamin, and diet therapies. Other cultures contribute additional views on cause (e.g., *Karma*, Allah's will) and treatments (e.g., acupuncture, herbal medicines, *Ayurveda*). We suggest how a broad cultural view can help us understand treatments and the treatment delivery system of a nation and a culture. For the best course of care, professionals need to understand and respect families' views of autism and work toward mutually agreeable treatments that may involve a combination of biomedical and cultural practices. Although a family-focused, open teamwork model that aims to acknowledge the context of the child, take into consideration the strengths and limitations of the child and the family, and introduce appropriate, sustainable, and sensitive interventions is regarded as best practice in the United States, it will take sensitive work to find out whether it will suit other cultural groups across the world.

Appraisal of Evidence

Initial Appraisal: Review of Research Studies.

Type of article	Overall Type: Review of Research Studies Specific Type: Systematic Review
APA Reference	Case-Smith, J. & Arbesman, M. (2008). Evidence-based review of interventions for autism used in or of relevance to occupational therapy. <i>American Journal of Occupational Therapy</i> , 62. 416-429. doi:10.5014/ajot.62.4.416
Abstract	Occupational therapy practitioners are among the professionals who provide services to children and adults with autism spectrum disorder (ASD), embracing both leadership and supportive roles in service delivery. The study's primary aims were as follows: (1) to identify, evaluate, and synthesize the research literature on interventions for ASD of relevance to occupational therapy and (2) to interpret and apply the research literature to occupational therapy. A total of 49 articles met the authors' criteria and were included in the review. Six categories of research topics were identified, the first 3 of which are most closely related to occupational therapy: (1) sensory integration and sensory-based interventions; (2) relationship-based, interactive interventions; (3) developmental skill-based programs; (4) social cognitive skill training; (5) parent-directed or parent-mediated approaches; and (6) intensive behavioral intervention. Under each category, themes supported by research evidence and applicable to occupational therapy were defined. The findings have implications for intervention methods, communication regarding efficacious practices to professionals and consumers, and future occupational therapy research.
Author	Credentials: EdD, OTR/L, FAOTA Position and Institution: editor for OTJR, professor and chair of OT dept. at Ohio State University. Publication History in Peer-Reviewed Journals: wrote textbook <i>Occupational Therapy for Children</i> , over 100 peer-reviewed journal articles, contributed to over 20 book chapters
Publication	Type of publication: scholarly Publisher: American Occupational Therapy Association Other: The American Occupational Therapy Association is the national professional association established in 1917 to represent the interests and concerns of occupational therapy practitioners and students
Date and Citation History	Date of publication: 2008 Cited By: 173
Stated Purpose or Research Question	"The study's primary aims were as follows: (1) to identify, evaluate, and synthesize the research literature on interventions for ASD of relevance to occupational therapy and (2) to interpret and apply the research literature to occupational therapy." (p. 416)
Author's Conclusion	"The findings have implications for intervention methods, communication regarding efficacious practices to professionals and consumers, and future occupational therapy research." (p. 416)
Overall Relevance to PICO	Overall Relevance to PICO: Strong Rationale: same target population, did not focus on Craniosacral specifically but related well to our overall PICO question.
Overall Quality of Article	Overall Quality of Article: Good Rationale: Cited the most on Google Scholar out of all my articles, seems very unbiased, applies it to OT, and is published in a very credible source.

Type of article	Overall Type: Review of Research Studies Specific Type: Advisory Committee Resource does research on the intervention and determines if it is evidence-based.
APA Reference	Autism and Other Developmental Disabilities Treatment Intervention Advisory Committee. (2016, January 29). <i>Summary of Determinations Regarding Level of Evidence: Craniosacral Therapy</i> (United States, Wisconsin Department of Health Services). Retrieved November 18, 2016, from https://tiac.wisconsin.gov/tiacfiles/pdf/craniosacral-therapy.pdf
Abstract	When the need to review a treatment is identified or a treatment review is requested, DHS staff do research to specifically identify or define the discrete treatment or treatment package. DHS staff and members of the TIAC identify research studies through their own investigation and through communications with providers of the treatment or associations/industry groups that represent providers. TIAC members review the research studies and assess and document the level of evidence. Reviews are conducted independently by members of the TIAC and the findings are discussed at the quarterly open meetings of the TIAC. The purpose of the open meeting is to allow the public to hear the deliberations of the TIAC. Although groups may be invited to present and members of the public are able to address the TIAC, the purpose of the group is to review and make determinations based on the careful review of the available research. The members reach consensus and report out their findings to DHS. Treatments are reviewed and recommendations are made based on established levels of efficacy, ranging from Level 1 (Well Established or Strong Evidence) to Level 5 (Untested/Experimental Treatment and/or Potentially Harmful).
Author	Credentials: NA Position and Institution: NA Publication History in Peer-Reviewed Journals: NA
Publication	Type of publication: Expert Review Publisher: <i>Wisconsin Department of Health Services</i>
Date and Citation History	Date of publication: 2016 Cited By: NA
Stated Purpose or Research Question	“determination as to whether or not the committee views Craniosacral Therapy as a proven and effective treatment for children with autism spectrum disorder and/or other developmental disabilities.” (p. 1)
Author’s Conclusion	“In sum, it is the decision of the committee that Craniosacral Therapy continues to meet the criteria for a Level 4 treatment (Insufficient Evidence).” (p. 2)
Overall Relevance to PICO	Overall Relevance to PICO: Strong Rationale: The goal of this committee is basically answering our PICO question
Overall Quality of Article	Overall Quality of Article: Good Rationale: Credible, unbiased, and very recent (2016)


Type of article	Overall Type: Review of Research Studies Specific Type: Systematic Review
APA Reference	Ernst, E. (2012). Craniosacral therapy: A systematic review of the clinical evidence: Review. <i>Focus on Alternative and Complementary Therapies</i> , 17(4), 197-201. doi:10.1111/j.2042-7166.2012.01174.x
Abstract	Aim Craniosacral therapy (CST) is a popular treatment for a wide range of conditions. This systematic review evaluates the evidence of effectiveness for CST for any human condition. Method An electronic search for relevant studies was conducted across three databases; this was complemented by extensive hand-searching of departmental files and bibliographies. Articles were included if they reported RCTs of CST for any human condition. Data were extracted according to predefined criteria and trial quality was determined using the Jadad score. Results Six studies were included. Except for one, all were associated with a high risk of bias. Low quality studies suggested positive effects, while the high-quality trial failed to demonstrate effectiveness. Conclusion The notion that CST is associated with more than non-specific effects is not based on evidence from rigorous RCTs.
Author	Credentials: Edzard Ernst MD, PhD, FMedSci, FSB, FRCP, FRCPEd Position and Institution: Emeritus Professor of Complementary Medicine at the Peninsula School of Medicine, University of Exeter. Editor of Focus on Alternative and Complementary Therapies. Publication History in Peer-Reviewed Journals: extensive
Publication	Type of publication: scholarly Publisher: Royal Pharmaceutical Society Other: “quarterly review journal that aims to present the evidence on complementary and alternative medicine (CAM) in an analytical and impartial manner”
Date and Citation History	Date of publication: 2012 Cited By: 14
Stated Purpose or Research Question	“Craniosacral therapy (CST) is a popular treatment for a wide range of conditions. This systematic review evaluates the evidence of effectiveness for CST for any human condition.” (n.p.)
Author’s Conclusion	“The notion that CST is associated with more than non-specific effects is not based on evidence from rigorous RCTs.” (n.p.)
Overall Relevance to PICO	Overall Relevance to PICO: Moderate Rationale: This article directly relates to the sensory manipulation therapy CranioSacral Therapy and its effectiveness; however, it does not reference children or ASD.
Overall Quality of Article	Overall Quality of Article: Good Rationale: Publication in last 5 years. Established author.

Type of article	Overall Type: Review of the Research Specific Type: Survey research of parents
APA Reference	Abbey, D. (2009). Helping families find the best evidence: CAM therapies for autism spectrum disorders and asperger's disorder. <i>Journal for Specialists in Pediatric Nursing</i> , 14(3), 200-202. doi:10.1111/j.1744-6155.2009.00198.x
Abstract	A nationwide survey found that approximately 38% of adults and 12% of children used some form of complementary or alternative medicine (CAM). Unfortunately, few CAM therapies have been put through the rigors of scientific study to determine their effectiveness and safety, and even less has been done to study unconventional therapies for Autism Spectrum Disorders (ASD) and Asperger's Disorder (AD). This presents a challenge when attempting to locate evidence-based research in either of these arenas. Due to a limited number of studies to substantiate alternative therapies, coupled with myriad Web resources with little to no evidence supporting their claims, families can be overwhelmed by information they find on the Internet. There are numerous components to evaluating health information and understanding the validity of information reported in print and online. (PsycINFO Database Record (c) 2016 APA, all rights reserved)
Author	Credentials: MLS Position and Institution: University of Colorado, Anschutz Medical Campus Publication History in Peer-Reviewed Journals: a moderate amount of published works on various topics in community health, community partnerships, and other public information accessibility topics
Publication	Type of publication: scholarly Publisher: Wiley-Blackwell Publishing, Inc.
Date and Citation History	Date of publication: 2009 Cited by: 3
Stated Purpose or Research Question	"Helping families understand how to evaluate information, where to find authoritative, evidence-based information, and how to openly communicate with healthcare professionals regarding their use can facilitate the recognition of unsubstantiated treatments." (p. 200)
Author's Conclusion	She doesn't really have a conclusion. She briefly covers various ways to search for evidence and different treatment options. This is a short source for parents to find good info for the treatments their children are receiving.
Overall Relevance to PICO	Overall Relevance to PICO: Limited Rationale: It brings up the perspective of parents and the use of alternative therapies such as sensory integration, but it does not relate at all to my specific intervention, Craniosacral Therapy. It gives no research as to the effectiveness of sensory /manipulative therapies.
Overall Quality of Article	Overall Quality of Article: Moderate Rationale: Credible author, seems to be well informed.

Type of article	Overall Type: Review of Research Specific Type: Systematic Review
APA Reference	Jakel, A., & von Hauenschild, P. (2012). A systematic review to evaluate the clinical benefits of craniosacral therapy. <i>Complementary Therapies in Medicine</i> , 20(6), 456-465. doi:10.1016/j.ctim.2012.07.009
Abstract	<p>Abstract</p> <p>OBJECTIVE: Craniosacral therapy (CST) is an alternative treatment approach, aiming to release restrictions around the spinal cord and brain and subsequently restore body function. A previously conducted systematic review did not obtain valid scientific evidence that CST was beneficial to patients. The aim of this review was to identify and critically evaluate the available literature regarding CST and to determine the clinical benefit of CST in the treatment of patients with a variety of clinical conditions.</p> <p>METHODS: Computerised literature searches were performed in Embase/Medline, Medline(®) In-Process, The Cochrane library, CINAHL, and AMED from database start to April 2011. Studies were identified according to pre-defined eligibility criteria. This included studies describing observational or randomized controlled trials (RCTs) in which CST as the only treatment method was used, and studies published in the English language. The methodological quality of the trials was assessed using the Downs and Black checklist.</p> <p>RESULTS: Only seven studies met the inclusion criteria, of which three studies were RCTs and four were of observational study design. Positive clinical outcomes were reported for pain reduction and improvement in general well-being of patients. Methodological Downs and Black quality scores ranged from 2 to 22 points out of a theoretical maximum of 27 points, with RCTs showing the highest overall scores.</p> <p>CONCLUSION: This review revealed the paucity of CST research in patients with different clinical pathologies. CST assessment is feasible in RCTs and has the potential of providing valuable outcomes to further support clinical decision making. However, due to the current moderate methodological quality of the included studies, further research is needed.</p>
Author	<p>Credentials: DPhil, BSc (Hons) Ost</p> <p>Position and Institution: leading the Research Department of the ESO.</p> <p>Publication History in Peer-Reviewed Journals: multiple (around 20)</p>
Publication	<p>Type of publication: scholarly peer-reviewed</p> <p>Publisher: Elsevier Inc.</p> <p>Other: "Each issue features original, high quality research on complementary medicine, as well as information and experiences on integrating complementary medicine into mainstream care."</p>
Date and Citation History	<p>Date of publication: 2012</p> <p>Cited By: 24</p>
Stated Purpose or Research Question	<p>"The aim of this review was to identify and critically evaluate the available literature regarding CST and to determine the clinical benefit of CST in the treatment of patients with a variety of clinical conditions." (p. 456)</p>
Author's Conclusion	<p>"This review revealed the paucity of CST research in patients with different clinical pathologies. CST assessment is feasible in RCTs and has the potential of providing valuable outcomes to further support clinical decision making. However, due to the current moderate methodological quality of the included studies, further research is needed." (p. 456)</p>

<p>Overall Relevance to PICO</p>	<p>Overall Relevance to PICO: Moderate Rationale: This article directly relates to the sensory manipulation therapy CranioSacral Therapy and its effectiveness; however, it does not reference children or ASD specifically.</p>
<p>Overall Quality of Article</p>	<p>Overall Quality of Article: Good Rationale: Published in the last 5 years. Published by peer reviewed journal. Author has published multiple other articles and this one was cited by 24 other articles.</p>

Type of article	Overall Type: Review of Research Studies Specific Type: Review
APA Reference	Levy, S. E., & Hyman, S. L. (2008). "Complementary and alternative medicine treatments for children with autism spectrum disorders." <i>Child and Adolescent Psychiatric Clinics of North America</i> , 17(4), 803–ix. http://doi.org/10.1016/j.chc.2008.06.004
Abstract	SYNOPSIS Complementary and alternative medical treatments are commonly used for children with autism spectrum disorders. This review discusses the evidence supporting the most frequently used treatments, including categories of mind-body medicine, energy medicine, biologically based, manipulative and body-based practices, with the latter two the most commonly selected by families. It is important for clinical providers to understand the evidence for efficacy (or lack thereof) and potential side effects. Some CAM practices have evidence to reject their use, such as secretin, others have emerging evidence to support their use, like melatonin. Most treatments, however, have not been adequately studied and do not have evidence to support their use.
Author	Credentials: Susan E. Levy, M.D. Position and Institution: Clinical Professor of Pediatrics, University of Pennsylvania School of Medicine, The Children's Hospital of Philadelphia Publication History in Peer-Reviewed Journals: <i>extensive</i>
Publication	Type of publication: Scholarly Publisher: Elsevier Other: "Each issue focuses on a single topic in child and adolescent psychiatry and is presented under the direction of an experienced guest editor."
Date and Citation History	Date of publication: 2008 Cited By: 143
Stated Purpose or Research Question	"This review discusses the evidence supporting the most frequently used treatments, including categories of mind-body medicine, energy medicine, biologically based, manipulative and body-based practices, with the latter two the most commonly selected by families... Most treatments, however, have not been adequately studied and do not have evidence to support their use." (n.p.)
Author's Conclusion	"Most treatments, however, have not been adequately studied and do not have evidence to support their use. Although not direct effects of CAM practices, undesired side-effects may relate to the delay or discontinuation of otherwise effective treatments." (n.p.)
Overall Relevance to PICO	Overall Relevance to PICO: Moderate Rationale: This article directly relates to children on the Autism Spectrum and the effectiveness of interventions used with them; however, it only touches on CranioSacral Therapy for a short paragraph.
Overall Quality of Article	Overall Quality of Article: Good Rationale: The article was published in the last ten years and has been cited many times (143).

Type of article	Overall Type: Review of Research Studies Specific Type: Systematic Review
APA Reference	National Guideline Clearinghouse (NGC). (2011) “Guideline summary: Best evidence statement (BESt). Craniosacral therapy for children with autism and/or sensory processing disorder.” In: National Guideline Clearinghouse (NGC) [Web site]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ) Available: https://www.guideline.gov
Abstract	Major Recommendations (no abstract present) There is insufficient evidence and a lack of consensus to make a recommendation on using craniosacral therapy (CST) to improve the behavior of children with autism and sensory processing disorder. Note: Concerns are raised in the literature about the validity of the tools used to measure the craniosacral rhythm, identify craniosacral dysfunction and efficacy of craniosacral treatment (Green et al., 1999 [1a]; Levy & Hyman, 2005 [5b]).
Author	Credentials: “The NGC/NQMC Expert Panel is composed of health care professionals with collective expertise in all aspects of evidence-based health, clinical practice guidelines, quality measurement and reporting, health care policy and administration, and health informatics. The Expert Panel provides feedback and guidance to NQMC and NGC on broad project areas... The NGC Web site and its content were developed and are maintained by ECRI Institute (formerly ECRI) under contract to AHRQ  . ECRI Institute is an international nonprofit health services research agency, an AHRQ designated Evidence-based Practice Center (EPC), and a federally designated Patient Safety Organization (PSO).” Position and Institution: HRQ’s National Guideline Clearinghouse is a public resource for summaries of evidence-based clinical practice guidelines. Publication History in Peer-Reviewed Journals: extensive (summaries of evidence based practice clinical practice guidelines)
Publication	Type of publication: scholarly Publisher: Agency of Healthcare Research and Quality
Date and Citation History	Date of publication: 2011 Cited By: (not found in google scholar)
Stated Purpose or Research Question	“To evaluate, among children with autism spectrum disorder or sensory processing disorder, if the use of craniosacral therapy (CST) compared to standard care without CST improves behavior” (n.p.)
Author’s Conclusion	“There is insufficient evidence and a lack of consensus to make a recommendation on using craniosacral therapy (CST) to improve the behavior of children with autism and sensory processing disorder. Note: Concerns are raised in the literature about the validity of the tools used to measure the craniosacral rhythm, identify craniosacral dysfunction and efficacy of craniosacral treatment” (n.p.)
Overall Relevance to PICO	Overall Relevance to PICO: Strong Rationale: This article directly relates to the sensory manipulation therapy CranioSacral Therapy and its effectiveness with individuals on the Autism Spectrum.
Overall Quality of Article	Overall Quality of Article: Strong Rationale: Recent publication, good credentials, respected review organization

Type of article	Overall Type: Review of Research Studies Specific Type: Review Article
APA Reference	Whedon, J., & Glassey, D. (2009). cerebrospinal fluid stasis and its clinical significance. <i>Alternative Therapies in Health and Medicine</i> , 15(3), 54-60.
Abstract	We hypothesize that stasis of the cerebrospinal fluid (CSF) occurs commonly and is detrimental to health. Physiologic factors affecting the normal circulation of CSF include cardiovascular, respiratory, and vasomotor influences. The CSF maintains the electrolytic environment of the central nervous system (CNS), influences systemic acid-base balance, serves as a medium for the supply of nutrients to neuronal and glial cells, functions as a lymphatic system for the CNS by removing the waste products of cellular metabolism, and transports hormones, neurotransmitters, releasing factors, and other neuropeptides throughout the CNS. Physiologic impedance or cessation of CSF flow may occur commonly in the absence of degenerative changes or pathology and may compromise the normal physiologic functions of the CSF. CSF appears to be particularly prone to stasis within the spinal canal. CSF stasis may be associated with adverse mechanical cord tension, vertebral subluxation syndrome, reduced cranial rhythmic impulse, and restricted respiratory function. Increased sympathetic tone, facilitated spinal segments, dural tension, and decreased CSF flow have been described as closely related aspects of an overall pattern of structural and energetic dysfunction in the axial skeleton and CNS. Therapies directed at affecting CSF flow include osteopathic care (especially cranial manipulation), craniosacral therapy, chiropractic adjustment of the spine and cranium, Network Care (formerly Network Chiropractic), massage therapy (including lymphatic drainage techniques), yoga, therapeutic breath-work, and cerebrospinal fluid technique. Further investigation into the nature and causation of CSF stasis, its potential effects upon human health, and effective therapies for its correction is warranted.
Author	Credentials: DC Position and Institution: “instructor at The Dartmouth Institute for Health Policy and Clinical Practice in Lebanon, New Hampshire, and trauma registrar at Dartmouth- Hitchcock Medical Center, also in Lebanon. He maintains a private chiropractic practice in Grantham. New Hampshire.” Publication History in Peer-Reviewed Journals: few (around 3)
Publication	Type of publication: scholarly, peer-reviewed Publisher: Inner Doorway Health Media Other: “ <i>Alternative Therapies in Health and Medicine</i> was the first journal in this field to be indexed in the National Library of Medicine. In 2006, 2007, and 2008, ATHM had the highest impact factor ranking of any independently published peer-reviewed CAM journal in the United States—meaning that its research articles were cited more frequently than any other journal’s in the field.” (n.p.)
Date and Citation History	Date of publication: 2009 Cited By: 19
Stated Purpose or Research Question	“We hypothesize that stasis of the cerebrospinal fluid (CSF) occurs commonly and is detrimental to health” (p. 54)
Author’s Conclusion	“There is evidence to suggest that CSF stasis may occur commonly in the absence of pathology or symptomatology and may have adverse systemic health effects..... Various structural and energetic therapies may have the effect of enhancing CSF flow, but little is known about their mechanism of action and effectiveness in this regard. Further investigation into the nature and causation of CSF stasis, its effects upon human health, and effective therapies for its correction is warranted.” (p. 59)
Overall Relevance to PICO	Overall Relevance to PICO: Limited Rationale: It is related to cerebrospinal fluid, which is a key factor in CST, but there is no other relation.
Overall Quality of Article	Overall Quality of Article: Moderate Rationale: Author has only published three times. Article was published recently in a reputable journal.

Type of Article	Review Systematic Review
APA Reference	Hartman, S., & Norton, J. (2002). Interexaminer reliability and cranial osteopathy. <i>Scientific Review Of Alternative Medicine</i> , 6(1), 23-34.
Abstract	We assess the mechanism purported to underlie the health treatment regime labeled 'cranial osteopathy' or 'craniosacral therapy.' We then summarize all published reports on interexaminer reliability associated with this modality, reanalyze some previously published data, and critique Upledger's often-cited study. Our own and previously published findings suggest that the proposed mechanism for cranial osteopathy is invalid and that interexaminer (and, therefore, diagnostic) reliability is approximately zero. Since no properly randomized, blinded, and placebo-controlled outcome studies have been published, we conclude that cranial osteopathy should be removed from curricula of colleges of osteopathic medicine and from osteopathic licensing examinations.
Author	S. Hartman, PhD. Professor, Department of Anatomy University of New England Numerous articles published in Academic Journals since 1979. Many refuting cranial osteopathy
Publication	Peer-reviewed journal Published by Center for Inquiry
Date and Citation history	Winter, 2002 Google scholar cited by: 104
Stated Purpose or Research Question	Is the primary anatomical mechanism proposed by cranial osteopathy valid? Is there interexaminer reliability in the practice of cranial osteopathy?
Author's Conclusion	The proposed mechanism is invalid. Interexaminer reliability is nonexistent. Cranial osteopathy should not be taught.
Overall Relevance to PICO	Addresses the intervention, but not the specific population. It does predict a lack of outcome.
Overall Quality	Good. The journal is peer reviewed. The author is widely published in credible journals and has made many studies of cranial osteopathy.

Type of Article	Review Systematic Review
APA Reference	Baranek, G. (2002). Efficacy of sensory and motor interventions for children with autism. <i>Journal Of Autism & Developmental Disorders</i> , 32(5), 397-422.
Abstract	Idiosyncratic responses to sensory stimuli and unusual motor patterns have been reported clinically in young children with autism . The etiology of these behavioral features is the subject of much speculation. Myriad sensory- and motor-based interventions have evolved for use with children with autism to address such issues; however, much controversy exists about the efficacy of such therapies . This review paper summarizes the sensory and motor difficulties often manifested in autism , and evaluates the scientific basis of various sensory and motor interventions used with this population. Implications for education and further research are described.
Author	Grace T Baranek PhD. OTR/L FAOTA: Associate Chair for Research; Professor, Division of Occupational Science and Occupational Therapy, University of North Carolina at Chapel Hill.
Publication	The <i>Journal of Autism and Developmental Disorders</i> is the leading peer-reviewed, scholarly periodical focusing on all aspects of autism spectrum disorders and related developmental disabilities. Published by Springer
Date and Citation history	2002 Google scholar cited by: 519
Stated Purpose or Research Question	Summarize sensory and motor challenges of autism and evaluate various sensory motor interventions for efficacy.
Author's Conclusion	Volume of studies is low. Results are mixed. Many are not generalizable due to weaknesses in methodology.
Overall Relevance to PICO	Correct population. No mention of CST.
Overall Quality	Good: Reputable author and journal

Initial Appraisal: Primary Research Studies.

Type of article	Overall Type: Primary Research Study Specific Type: Case Study
APA Reference	Gillespie, B. R. (2009). Case study in attention-deficit/hyperactivity disorder: The corrective aspect of craniosacral fascial therapy. <i>Explore: The Journal of Science and Healing</i> , 5(5), 296-298. doi:10.1016/j.explore.2009.06.003
Abstract	Introduction (no abstract present) Attention-deficit/hyperactivity disorder (ADHD) describes a range of pediatric behavioral disorders, including such symptoms as poor concentration, hyperactivity, and impulsivity. Approximately 1.6 million, or 7% of American children from ages six to 11, have been diagnosed with ADHD. ¹ The prevalence of ADHD is three times more in boys than in girls. ¹ Conventional treatment consists of behavioral interventions and the use of stimulants such as methylphenidate. Although these treatments can be very effective, recently concern has arisen over potential adverse cardiac side effects. ² An alternative method of care includes the evaluation and treatment of the child's craniosacral fascial system as a contributing factor to the underlying neurological dysfunction. This system is an integration of the craniosacral and fascial or connective tissue components.
Author	Credentials: Barry R. Gillespie, DMD, MSD, MT1# Position and Institution: Works with CranioSacral Fascial Therapy with King of Prussia Publication History in Peer-Reviewed Journals: few (less than 10)
Publication	Type of publication: Scholarly Publisher: Elsevier publications Other: "addresses the scientific principles behind, and applications of, evidence-based healing practices from a wide variety of sources"
Date and Citation History	Date of publication: 2009 Cited By: 10
Stated Purpose or Research Question	"Conventional treatment consists of behavioral interventions and the use of stimulants such as methylphenidate. Although these treatments can be very effective, recently concern has arisen over potential adverse cardiac side effects. ² An alternative method of care includes the evaluation and treatment of the child's craniosacral fascial system as a contributing factor to the underlying neurological dysfunction." (p. 296)
Author's Conclusion	"Given the rising incidence of ADHD, the reports of successful treatment using craniosacral fascial manipulation and other body-based approaches, and the growing concerns about adverse effects of long-term treatment with medic" (p. 298)
Overall Relevance to PICO	Overall Relevance to PICO: Moderate Rationale: This article directly relates to the sensory manipulation therapy CranioSacral Therapy and its effectiveness; however, it does not reference children with ASD but those with ADHD.
Overall Quality of Article	Overall Quality of Article: Moderate Rationale: Published within the last 10 years. Author has not published much.

Type of article	Overall Type: Primary Research Study Specific Type: A Randomized Sham-controlled Trial
APA Reference	Haller, H., Lauche, R., Cramer, H., Rampp, T., Saha, F. J., Ostermann, T., & Dobos, G. (2016). Craniosacral therapy for the treatment of chronic neck pain: A randomized sham-controlled trial. <i>The Clinical Journal of Pain</i> , 32(5), 441–449. http://doi.org/10.1097/AJP.0000000000000290
Abstract	<p>Objectives: With growing evidence for the effectiveness of craniosacral therapy (CST) for pain management, the efficacy of CST remains unclear. This study therefore aimed at investigating CST in comparison with sham treatment in chronic nonspecific neck pain patients.</p> <p>Materials and Methods: A total of 54 blinded patients were randomized into either 8 weekly units of CST or light-touch sham treatment. Outcomes were assessed before and after treatment (week 8) and again 3 months later (week 20). The primary outcome was the pain intensity on a visual analog scale at week 8; secondary outcomes included pain on movement, pressure pain sensitivity, functional disability, health-related quality of life, well-being, anxiety, depression, stress perception, pain acceptance, body awareness, patients’ global impression of improvement, and safety.</p> <p>Results: In comparison with sham, CST patients reported significant and clinically relevant effects on pain intensity at week 8 (–21 mm group difference; 95% confidence interval, –32.6 to –9.4; P=0.001; d=1.02) and at week 20 (–16.8 mm group difference; 95% confidence interval, –27.5 to –6.1; P=0.003; d=0.88). Minimal clinically important differences in pain intensity at week 20 were reported by 78% within the CST group, whereas 48% even had substantial clinical benefit. Significant between-group differences at week 20 were also found for pain on movement, functional disability, physical quality of life, anxiety and patients’ global improvement. Pressure pain sensitivity and body awareness were significantly improved only at week 8. No serious adverse events were reported.</p> <p>Discussion: CST was both specifically effective and safe in reducing neck pain intensity and may improve functional disability and the quality of life up to 3 months after intervention.</p>
Author	<p>Credentials: Haller, H, MSc Position and Institution: Research Assistant, Department of Internal and Integrative Medicine, University of Duisburg Publication History in Peer-Reviewed Journals: multiple (around 30)</p>
Publication	<p>Type of publication: scholarly peer-reviewed Publisher: Wolters Kluwer Health Other: “The Clinical Journal of Pain explores all aspects of pain and its effective treatment, bringing readers the insights of leading anesthesiologists, surgeons, internists, neurologists, orthopedists, psychiatrists and psychologists, clinical pharmacologists, and rehabilitation medicine specialists.”</p>
Date and Citation History	<p>Date of publication: 2016 Cited By: 8</p>
Stated Purpose or Research Question	<p>“With growing evidence for the effectiveness of craniosacral therapy (CST) for pain management, the efficacy of CST remains unclear. This study therefore aimed at investigating CST in comparison with sham treatment in chronic nonspecific neck pain patients.” (n.p.)</p>
Author’s Conclusion	<p>Identify one to two sentences in direct quotes and cite page number that summarizes the author’s conclusion “CST was both specifically effective and safe in reducing neck pain intensity and may improve functional disability and the quality of life up to 3 months after intervention.” (n.p.)</p>

<p>Overall Relevance to PICO</p>	<p>Overall Relevance to PICO: Moderate Rationale: This article directly relates to the sensory manipulation therapy CranioSacral Therapy and its effectiveness; however, it does not reference children or ASD.</p>
<p>Overall Quality of Article</p>	<p>Overall Quality of Article: Moderate, Rationale: The article was published recently, however the first listed author does not have outstanding credentials. Published in a credible journal.</p>

Type of article	Overall Type: Primary Research Study Specific Type: Descriptive Outcome Study
APA Reference	Harrison, R. E., & Page, J. S. (2011). Multipractitioner upledger craniosacral therapy: Descriptive outcome study 2007–2008. <i>The Journal of Alternative and Complementary Medicine</i> , 17(1), 13-17. doi:10.1089/acm.2009.0644
Abstract	<p>OBJECTIVES: This study describes patients presenting for CranioSacral treatment, the conditions they present with, and the impact of treatment on both their symptoms and lives.</p> <p>DESIGN: The records of 157 patients treated with Upledger CranioSacral Therapy (UCST) were reviewed. Seventy-three (73) patients had been treated by 10 different practitioners working independently and 84 patients were treated by a single practitioner working within the National Health Service.</p> <p>RESULTS: Patients' ages ranged from neonates to 68 years. Seventy-four percent (74%) of patients reported a valuable improvement in their presenting problem. Sixty-seven percent (67%) also reported a valuable improvement in their general well-being and/or a second health problem. Outcome by diagnostic groups suggested that UCST is particularly effective for patients with headaches and migraine, neck and back pain, anxiety and depression, and unsettled babies. Seventy percent (70%) of patients on medication decreased or discontinued it, and patients' average general practitioner consultation rate fell by 60% in the 6 months following treatment.</p> <p>CONCLUSIONS: The study suggests that further research into UCST as a treatment modality would be valuable for the abovementioned problems in particular.</p>
Author	<p>Credentials: Harrison, R. E., MBChB, MRCP, MFHom, CST,1</p> <p>Position and Institution: General Practice, National Health Service, Edinburgh, UK and Rose Garden Medical Center, Edinburgh, UK.</p> <p>Publication History in Peer-Reviewed Journals: multiple</p>
Publication	<p>Type of publication: Scholarly</p> <p>Publisher: The Journal Of Alternative And Complementary Medicine</p> <p>Other: The Official Journal of the Society for Acupuncture Research and the International Society for Complementary Medicine Research</p>
Date and Citation History	<p>Date of publication: 2011</p> <p>Cited By: 26</p>
Stated Purpose or Research Question	“This study describes patients presenting for CranioSacral treatment, the conditions they present with, and the impact of treatment on both their symptoms and lives.” (p. 13)
Author’s Conclusion	“The study suggests that further research into UCST as a treatment modality would be valuable for the abovementioned problems in particular.” (p. 13)
Overall Relevance to PICO	<p>Overall Relevance to PICO: Moderate</p> <p>Rationale: This article directly relates to the sensory manipulation therapy CranioSacral Therapy and its effectiveness; however, it does not reference children or ASD.</p>
Overall Quality of Article	<p>Overall Quality of Article: Moderate</p> <p>Rationale: Published in the last 5 years. Published in a scholarly Journal. Both of the authors work as CranioSacral Therapists and this may cause bias.</p>

Type of article	Overall Type: Primary Research Article Specific Type: experimental, double-blind longitudinal clinical trial design
APA Reference	Matarán-Peñarrocha, G. A., Castro-Sánchez, A. M., García, G. C., Moreno-Lorenzo, C., Carreño, T. P., & Zafra, M. D. O. (2011). Influence of craniosacral therapy on anxiety, depression and quality of life in patients with fibromyalgia. <i>Evidence-Based Complementary and Alternative Medicine : eCAM</i> , 2011, 178769. http://doi.org/10.1093/ecam/nep125
Abstract	Fibromyalgia is considered as a combination of physical, psychological and social disabilities. The causes of pathologic mechanism underlying fibromyalgia are unknown, but fibromyalgia may lead to reduced quality of life. The objective of this study was to analyze the repercussions of craniosacral therapy on depression, anxiety and quality of life in fibromyalgia patients with painful symptoms. An experimental, double-blind longitudinal clinical trial design was undertaken. Eighty-four patients diagnosed with fibromyalgia were randomly assigned to an intervention group (craniosacral therapy) or placebo group (simulated treatment with disconnected ultrasound). The treatment period was 25 weeks. Anxiety, pain, sleep quality, depression and quality of life were determined at baseline and at 10 minutes, 6 months and 1-year post-treatment. State anxiety and trait anxiety, pain, quality of life and Pittsburgh sleep quality index were significantly higher in the intervention versus placebo group after the treatment period and at the 6-month follow-up. However, at the 1-year follow-up, the groups only differed in the Pittsburgh sleep quality index. Approaching fibromyalgia by means of craniosacral therapy contributes to improving anxiety and quality of life levels in these patients.
Author	Credentials: MD, PhD Position and Institution: La Vega Sanitary District (Andalusian Health Public Service), Department of Physical Therapy, University of Granada, Spain Publication History in Peer-Reviewed Journals: <i>extensive (around 30)</i>
Publication	Type of publication: Scholarly, peer-reviewed Publisher: Hindawi Publishing Corporation
Date and Citation History	Date of publication: 2011 Cited By: 31
Stated Purpose or Research Question	“The objective of this study was to analyze the repercussions of craniosacral therapy on depression, anxiety and quality of life in fibromyalgia patients with painful symptoms.” (n.p.)
Author’s Conclusion	“Approaching fibromyalgia by means of craniosacral therapy contributes to improving anxiety and quality of life levels in these patients.” (n.p.)
Overall Relevance to PICO	Overall Relevance to PICO: Limited Rationale: This article directly relates to the sensory manipulation therapy CranioSacral Therapy and its effectiveness; however, it does not reference children or ASD specifically and is focused on symptoms and conditions irrelevant to the PICO question.
Overall Quality of Article	Overall Quality of Article: Good Rationale: Published by a peer-reviewed journal in the last five years. Also, it has been cited over 30 times and was written by an experienced author.

Type of article	Overall Type: Primary Research Study Specific Type: randomized controlled pilot-trial
APA Reference	Raith, W., Marschik, P., Sommer, C., Maurer-Fellbaum, U., Amhofer, C., Avian, A., . . . Urlesberger, B. (2016). General movements in preterm infants undergoing craniosacral therapy: A randomized controlled pilot-trial. <i>Bmc Complementary and Alternative Medicine</i> , 16, 12. doi:10.1186/s12906-016-0984-5
Abstract	<p>BACKGROUND: The objective of this study was to investigate neurological short-term effects of craniosacral therapy as an ideal form of osteopathic manipulative treatment (OMT) due to the soft kinesthetic stimulation.</p> <p>METHODS: Included were 30 preterm infants, with a gestational age between 25 and 33 weeks, who were admitted to the neonatal intensive care unit of the University Hospital of Graz, Austria. The infants were randomized either into the intervention group (IG) which received standardized craniosacral therapy, or the control group (CG) which received standard care. To guarantee that only preterm infants with subsequent normal neurodevelopment were included, follow up was done regularly at the corrected age (= actual age in weeks minus weeks premature) of 12 and 24 months. After 2 years 5 infants had to be excluded (IG; n = 12; CG: n = 13). General Movements (GMs) are part of the spontaneous movement repertoire and are present from early fetal life onwards until the end of the first half year of life. To evaluate the immediate result of such an intervention, we selected the General Movement Assessment (GMA) as an appropriate tool. Besides the global GMA (primary outcome) we used as detailed GMA, the General Movement Optimality Score (GMOS- secondary outcome), based on Prechtl's optimality concept. To analyse GMOS (secondary outcome) a linear mixed model with fixed effects for session, time point (time point refers to the comparisons of the measurements before vs. after each session) and intervention (IG vs. CG), random effect for individual children and a first order autoregressive covariance structure was used for calculation of significant differences between groups and interactions. Following interaction terms were included in the model: session*time point, session*intervention, time point*intervention and session*time point*intervention. Exploratory post hoc analyses (interaction: session*time point*intervention) were performed to determine group differences for all twelve measurement (before and after all 6 sessions) separately.</p> <p>RESULTS: Between groups no difference in the global GMA (primary outcome) could be observed. The GMOS (secondary outcome) did not change from session to session (main effect session: $p = 0.262$) in the IG or the CG. Furthermore no differences between IG and CG (main effect group: $p = 0.361$) and no interaction of time*session could be observed ($p = 0.658$). Post hoc analysis showed a trend toward higher values before ($p = 0.085$) and after ($p = 0.075$) the first session in CG compared to IG. At all other time points GMOS were not significantly different between groups.</p> <p>CONCLUSION: We were able to indicate that a group of "healthy" preterm infants undergoing an intervention with craniosacral therapy (IG) showed no significant changes in GMs compared to preterm infants without intervention (CG). In view of the fact that the global GMA (primary outcome) showed no difference between groups and the GMOS (detailed GMA-secondary outcome) did not deteriorate in the IG, craniosacral therapy seems to be safe in preterm infants.</p> <p>TRIAL REGISTRATION: German Clinical Trials Register DRKS00004258.</p>
Author	<p>Credentials: Emergency Medicine, Pediatrics M.D. Position and Institution: 1Division of Neonatology, Department of Pediatrics and Adolescent Medicine, Medical University of Graz, Auenbruggerplatz 34/2, Graz 8036, Austria Publication History in Peer-Reviewed Journals: extensive</p>
Publication	<p>Type of publication: scholarly, peer-reviewed Publisher: BioMed Central</p>

	Other: BMC Complementary and Alternative Medicine is affiliated with ISCMR, the international society for complementary medicine research.
Date and Citation History	Date of publication: 2016 Cited By: 3
Stated Purpose or Research Question	“The objective of this study was to investigate neurological short-term effects of craniosacral therapy as an ideal form of osteopathic manipulative treatment (OMT) due to the soft kinesthetic stimulation.” (p. 1)
Author’s Conclusion	“We were able to indicate that a group of “ healthy” preterm infants undergoing an intervention with craniosacral therapy (IG) showed no significant changes in GMs compared to preterm infants without intervention (CG). In view of the fact that the global GMA (primary outcome) showed no difference between groups and the GMOS (detailed GMA-secondary outcome) did not deteriorate in the IG, craniosacral therapy seems to be safe in preterm infants.” (p. 2)
Overall Relevance to PICO	Overall Relevance to PICO: Moderate Rationale: This article directly relates the effectiveness of CranioSacral Therapy in children; however, it does not touch on Autism Spectrum disorders which are a part of the PICO question.
Overall Quality of Article	Overall Quality of Article: Moderate Rationale: Published by a reputable publisher in the last five years; however, it has only been cited 3 times.

Type of article	Overall Type: Primary Research Study Specific Type: interviews with parents whose children use CAM
APA Reference	Huang, A., Seshadri, K., Matthews, T. A., & Ostfeld, B. M. (2013). Parental perspectives on use, benefits, and physician knowledge of complementary and alternative medicine in children with autistic disorder and attention-deficit/hyperactivity disorder. <i>The Journal of Alternative and Complementary Medicine, 19</i> (9), 746-750. doi:10.1089/acm.2012.0640
Abstract	Complementary and alternative medicine (CAM) use appears to be increasing in children with developmental disorders. However, it is not clear whether parents perceive their healthcare providers as resources who are knowledgeable about CAM therapies and are interested in further developing their knowledge. Objectives: (1) To establish and compare use of, and perceived satisfaction with, traditional medicine and CAM in children with attention-deficit/hyperactivity disorder (ADHD) and autism spectrum disorders (ASDs) and (2) to assess parental perceptions of physician knowledge of CAM and physician interest in continuing education about CAM for the two groups of parents. Methods: Families of children with a diagnosis of ADHD or ASD were surveyed regarding the frequency of use of traditional treatment and CAM, parental perceptions of the helpfulness of each therapy, parental perceptions regarding physicians' knowledge level about CAM, and physician interest in continuing education. Results: Thirty-six percent (n = 135) of 378 surveys were returned: 41 contained a diagnosis of ADHD and 22 of ASD. Traditional therapies were used by 98% of children with ADHD and 100% of those with ASD. Perceived helpfulness of medication was 92% for children with ADHD and 60% for children with ASD (p < 0.05). CAM was used for 19.5% of children with ADHD and 82% of children with ASD. Perceived satisfaction for any form of CAM in the children with ADHD was at an individual patient level. Satisfaction for two of the most commonly used CAM treatments in children with ASD ranged from 50% to 78%. In children with ASD (the diagnostic group with the highest use of and satisfaction with CAM), physician's perceived knowledge of CAM was lower (14% versus 38%; p < 0.05), as was perceptions of the physician's interest in learning more (p < 0.05). Conclusion: CAM use is significant, especially in children with ASD. Physicians are not perceived as a knowledgeable resource. (PsycINFO Database Record (c) 2016 APA, all rights reserved)(journal abstract)
Author	Credentials: MD Position and Institution: Pediatrician, Texas Tech University Health Publication History in Peer-Reviewed Journals: extensive publications on medical topics, pediatrics, etc.
Publication	Type of publication: scholarly Publisher: Mary Ann Liebert, Inc Other info: official journal of the Society for Acupuncture Research
Date and Citation History	Date of publication: 2013 Cited By: 11
Stated Purpose or Research Question	"To establish and compare use of, and perceived satisfaction with, traditional medicine and CAM in children with attention-deficit/hyperactivity disorder (ADHD) and autism spectrum disorders (ASDs) and to assess parental perceptions of physician knowledge of CAM and physician interest in continuing education about CAM for the two groups of parents." (p. 746)
Author's Conclusion	"CAM use is significant, especially in children with ASD. Physicians are not perceived as a knowledgeable resource." (p. 746)
Overall Relevance to PICO	Overall Relevance to PICO: Moderate Rationale: It makes connection between ASD and alternative therapies, but does not relate directly to Craniosacral Therapy and does not show actual research as to the effectiveness of the therapies, simply the perceptions of parents.
Overall Quality of Article	Overall Quality of Article: Good Rationale: Fairly recent article, seems fairly unbiased, and credible authors

Type of article	Overall Type: Primary Research Study Specific Type: Web-based surveys
APA Reference	Owen-Smith, A., Bent, S., Lynch, F. L., Coleman, K. J., Yau, V. M., Pearson, K. A., . . . Croen, L. A. (2015). Prevalence and predictors of complementary and alternative medicine use in a large insured sample of children with autism spectrum disorders. <i>Research in Autism Spectrum Disorders, 17</i> , 40-51. doi:10.1016/j.rasd.2015.05.002
Abstract	The purpose of the present study was to examine the prevalence and predictors of complementary and alternative medicine (CAM) use as well as parental perceptions of CAM efficacy in a large, geographically diverse sample of children with Autism Spectrum Disorders (ASD). Methodology: Data were obtained from a web-based survey administered to parents of children with ASD at four sites participating in the Mental Health Research Network (MHRN). The web survey obtained information about services and treatments received by children with ASD as well as the caregivers' experiences with having a child with ASD. Results: Approximately 88% of the sample had either used CAM in the past or had recently used some type of CAM. The following characteristics were associated with CAM use: greater parental education, younger child age, a mix of regular and special classroom settings and prescription drug use in the past three months. Conclusions: The use of CAM was very prevalent in this large, geographically diverse sample of children with ASD. It is critical that providers be prepared to discuss the advantages and potential side effects with families to help them make well-informed health care decisions and prevent possible CAM-drug interactions. (PsycINFO Database Record (c) 2016 APA, all rights reserved)(journal abstract)
Author	Credentials: PhD Position and Institution: Georgia State University – School of Public Health Publication History in Peer-Reviewed Journals: limited (5 or so) publications on alternative therapies and other medical topics
Publication	Type of publication: scholarly Publisher: Elsevier
Date and Citation History	Date of publication: 2015 Cited By: 5
Stated Purpose or Research Question	“The purpose of the present study was to examine the prevalence and predictors of complementary and alternative medicine (CAM) use as well as parental perceptions of CAM efficacy in a large, geographically diverse sample of children with Autism Spectrum Disorders (ASD).” (p. 40)
Author’s Conclusion	“The use of CAM was very prevalent in this large, geographically diverse sample of children with ASD. It is critical that providers be prepared to discuss the advantages and potential side effects with families to help them make well-informed health care decisions and prevent possible CAM-drug interactions.”
Overall Relevance to PICO	Overall Relevance to PICO: Moderate Rationale: same target population, doesn’t provide actual research on the effectiveness of the actual interventions, only the prevalence of CAM and the attitudes towards it.
Overall Quality of Article	Overall Quality of Article: Moderate Rationale: Methods were good, fairly credible authors but only cited a few times and not many publications, etc

Type of Article	Primary research: Quantitative anatomical study
APA Reference	Kostopoulos, D. C., & Keramidas, G. (1992). Changes in elongation of falx cerebri during craniocervical therapy techniques applied on the skull of an embalmed cadaver. <i>CRANIO®</i> , 10(1), 9-12.
Abstract	CranioSacral therapy supports that light forces applied to the skull may be transmitted to the dura membrane having a therapeutic effect to the cranial system. This study examines the changes in elongation of falx cerebri during the application of some of the craniocervical therapy techniques to the skull of an embalmed cadaver. The study demonstrates that the relative elongation of the falx cerebri changes as follows: for the frontal lift, 1.44 mm; for the parietal lift, 1.08 mm; for the sphenobasilar compression, -0.33 mm; for the sphenobasilar decompression, 0.28 mm; and for the ear pull, inconclusive results. The present study offers validation for the scientific basis of craniocervical therapy and the contention for cranial suture mobility.
Author	Dimitrios Kostopoulos, P.T., M.D., Ph.D., D.Sc., ECS co-founded Hands-On Care Physical Therapy, Hands-On EMG Testing, PhysioCare PT and Hands-On Seminars. At time of publication, he was a practicing PT in New York City performing CranioSacral Therapy and other manual techniques for both adults and children Dr. Kostopoulos received a Doctorate (PhD) and Master's degrees from New York University and a second Doctorate of Science (DSc) degree from Rocky Mountain University. He is also graduated from UHSA School of Medicine.
Publication	Name changed to: CRANIO: The Journal of Craniomandibular & Sleep Practice Published quarterly by Chroma Inc. Published by Taylor & Francis Online Peer Reviewed
Date and Citation history	1992 Google scholar cited by: 29
Stated Purpose or Research Question	To measure the effect of CranioSacral techniques on the Falx cerebri, a fold of the dura mater that extends down the longitudinal fissure between the cerebral hemispheres.
Author's Conclusion	“The present study offers validation for the scientific basis of craniocervical therapy and the contention for cranial suture mobility.” (p.12)
Overall Relevance to PICO	Relates to the mechanism of the intervention. No mention of relevance to ASD.
Overall Quality	Good - Well credentialed author - though not widely published. Peer-Reviewed journal

Type of Article	Primary research study Qualitative self-report
APA Reference	Senel, H. (2010). Parents' views and experiences about complementary and alternative medicine treatments for their children with autistic spectrum disorder. <i>Journal Of Autism & Developmental Disorders</i> , 40(4), 494-503. doi:10.1007/s10803-009-0891-4
Abstract	Use of complementary and alternative medicine (CAM) treatments have been increasing for children with autistic spectrum disorder (ASD). In this study, 38 Turkish parents of children with ASD were surveyed related with their use of CAM treatments, experiences, and views for each treatment. They mentioned 'Vitamins and minerals', 'Special Diet', 'Sensory Integration', 'Other Dietary Supplements', and 'Chelation' as five frequently used CAM treatments. Communication, learning, health, and behavior were the main four areas rated as 'improved' after five CAM treatments. Negative sides of treatments were listed as being expensive, difficult to apply, or harmful. The parents' views on some treatments have varied from great improvement to worse. Reported improvements were considerably higher than the negative sides of the treatments.
Author	Hatice Senel of Maltepe University, Istanbul, Turkey Faculty of Educational Sciences, Ankara UniversityAnkaraTurkey
Publication	peer-reviewed. Published by Springer
Date and Citation history	2010 Google scholar cited by: 40
Stated Purpose or Research Question	Research parents' opinions regarding alternative treatments for ASD
Author's Conclusion	Most parents felt the benefits of CAM outweighed the side effects
Overall Relevance to PICO	Relates to the population and their caregivers. Relates only marginally to the intervention.
Overall Quality	Moderate: Reputable journal. Difficult to find info about the author.

Type of Article	Primary Research: Quantitative study
APA Reference	Hallahan, B., Daly, E., McAlonan, G., Loth, E., Toal, F., O'Brien, F., & ... Murphy, D. (2009). Brain morphometry volume in autistic spectrum disorder: a magnetic resonance imaging study of adults. <i>Psychological Medicine</i> , 39(2), 337-346. doi:10.1017/S0033291708003383
Abstract	<p>BACKGROUND: Several prior reports have found that some young children with autism spectrum disorder [ASD; including autism and Asperger's syndrome and pervasive developmental disorder - not otherwise specified (PDD-NOS)] have a significant increase in head size and brain weight. However, the findings from older children and adults with ASD are inconsistent. This may reflect the relatively small sample sizes that were studied, clinical heterogeneity, or age-related brain differences.</p> <p>METHOD: Hence, we measured head size (intracranial volume), and the bulk volume of ventricular and peripheral cerebrospinal fluid (CSF), lobar brain, and cerebellum in 114 people with ASD and 60 controls aged between 18 and 58 years. The ASD sample included 80 people with Asperger's syndrome, 28 with autism and six with PDD-NOS. RESULTS: There was no significant between-group difference in head and/or lobar brain matter volume. However, compared with controls, each ASD subgroup had a significantly smaller cerebellar volume, and a significantly larger volume of peripheral CSF. CONCLUSIONS: Within ASD adults, the bulk volume of cerebellum is reduced irrespective of diagnostic subcategory. Also the significant increase in peripheral CSF may reflect differences in cortical maturation and/or ageing.</p>
Author	B. Hallahan – senior lecturer, Department of Psychiatry, National University of Ireland Galway, frequently published in peer reviewed journals
Publication	Published by Cambridge University Press
Date and Citation history	2009 Google scholar cited by: 60
Stated Purpose or Research Question	Measure head size, cerebellar volume, and CSF volume in people with ASD to check for significant differences from those without ASD.
Author's Conclusion	“compared with controls, each ASD subgroup had a significantly smaller cerebellar volume, and a significantly larger volume of peripheral CSF. CONCLUSIONS: Within ASD adults, the bulk volume of cerebellum is reduced irrespective of diagnostic subcategory. Also the significant increase in peripheral CSF may reflect differences in cortical maturation and/or ageing.” (p. 337)
Overall Relevance to PICO	Speaks to the population. Speaks peripherally to the mechanism of the intervention, but not to the intervention itself.
Overall Quality	Good: journal from reputable academic source. Prolific author.

Initial Appraisal: Conceptual or Theoretical Articles.

Type of article	Overall Type: Conceptual Specific Type: brief overview of various alternative therapies for children with special needs.
APA Reference	Gasalberti, D. (2006). Alternative therapies for children and youth with special health care needs. <i>Journal of Pediatric Health Care, 20</i> (2), 133-136. doi:10.1016/j.pedhc.2005.12.015
Abstract	Aside from the well-known interventions, there are many other therapies Children and youth with special health care needs (CYSHCN) can be helped with. Animals have been used with success in therapies such as animal-assisted psychotherapy, in which animals such as dogs, cats, and birds are used to help those with psychological problems. Positive interaction with animals, even if it is just one's physical presence with them or an empathetic feeling toward them, seems to benefit children. Hippotherapy uses the unique movement of a horse to achieve a child's health care goals. Children receive a therapeutic benefit simply by sitting on the horse. As they work to maintain balance, they receive numerous additional therapeutic benefits--physical, developmental and social. Music therapy uses music as a tool to induce positive behavioral changes. It is particularly useful with autistic children in the area of speech remediation. There is much in the scientific literature to illustrate the positive effects of music. The goal of most massage therapy is relaxation. Massage therapy has been shown to benefit children with a wide variety of disorders. Craniosacral massage corrects and restore the flow of cerebrospinal fluid through the head and spine and lymphatic massage improves the flow of lymph. Light therapy has for many years been used to treat newborn jaundice and seasonal affective disorder. Color therapy uses human sensitivity to color to identify imbalances in energy patterns. Color is believed to have specific physical, emotional, and spiritual effects on human beings. (PsycINFO Database Record (c) 2016 APA, all rights reserved)
Author	Credentials: PhD, RN Position and Institution: Seton Hall University, College of Nursing Publication History in Peer-Reviewed Journals: do a brief search for other publications
Publication	Type of publication: scholarly, peer-reviewed Publisher: Mosby, Inc
Date and Citation History	Date of publication: 2006 Cited By: 21
Stated Purpose or Research Question	“Children and youth with special health care needs (CYSHCN) are often involved in numerous traditional therapies such as physical, speech, occupational, and respiratory therapy. Most health care professionals regularly incorporate these proven, recognized therapies into the patient’s plan of care with helpful results. Yet, there are less-familiar therapies available to CYSHCN that are often overlooked by healthcare professionals and unknown to parents.” (p. 133)
Author’s Conclusion	“While some of the therapies discussed are well researched, more peer-reviewed research studies are necessary for better understanding of the effectiveness of all of these therapies. Parents should be made aware of these therapies and encouraged to discuss these options with their healthcare providers.” (p. 136)
Overall Relevance to PICO	Overall Relevance to PICO: Strong Rationale: same target population, discusses several alternative therapy options, including Craniosacral Therapy.
Overall Quality of Article	Overall Quality of Article: Moderate Rationale: This article is good for getting a basic overview of some alternative therapy options, but it does not actually provide the research behind the interventions.

Type of article	Overall Type: Theoretical Specific Type: philosophy of craniosacral therapy and explanation of the process (the whole book is described as “a comprehensive source for nontraditional therapies essential for physicians; neuropsychologists; psychiatrists; rehabilitation specialists; hospital directors, administrators, and TBI professionals.”)
APA Reference	Wedel, A. (2006). Craniosacral therapy for traumatic brain injury clients with neurobehavioral disorders. <i>Alternate therapies in the treatment of brain injury and neurobehavioral disorders: A practical guide</i> . (pp. 149-180) Haworth Press, New York, NY.
Abstract	Craniosacral therapy is a gentle, nonintrusive, hands-on healing technique utilized by experienced therapists to help the physical body release restricted tissues and restore optimal physical, emotional, behavioral, and cognitive functions (Burget, 2002). It is an alternative medicine technique that is readily able to work with and enhance the effects of traditional allopathic treatments. It can be a very effective means of helping people work through and release chronic pain. Basically, it is a transformational manual therapy technique used to help people suffering from orthopedic and neurological problems to function at a higher level (Reuben, 1987; Smoley, 1991; Upledger, 1996). This chapter examines the philosophy of craniosacral therapy, the craniosacral therapeutic process, and the use of craniosacral therapy in a hospital-based TBI rehabilitation program. (PsycINFO Database Record (c) 2016 APA, all rights reserved)
Author	Credentials: Could not find Position and Institution: Could not find Publication History in Peer-Reviewed Journals: Could not find
Publication	Type of publication: scholarly Publisher: Haworth Press, NY Other: book
Date and Citation History	Date of publication: 2016 Cited By: NA
Stated Purpose or Research Question	“This chapter examines the philosophy of craniosacral therapy, the craniosacral therapeutic process, and the use of craniosacral therapy in a hospital-based TBI rehabilitation program.” (p. 149)
Author’s Conclusion	NA – no conclusion d/t the nature of the article
Overall Relevance to PICO	Overall Relevance to PICO: Moderate Rationale: It discusses in depth the process of Craniosacral therapy, but not in the context of ASD.
Overall Quality of Article	Overall Quality of Article: Moderate Rationale: Seems relatively biased (sited Upledger, the creator of the therapy and person that sells the intervention materials), does not show original research of the effectiveness of craniosacral therapy but rather is a practical guide to giving the therapy in the setting of a TBI.

Type of Article	Theoretical/Conceptual
APA Reference	Levy, S., & Hyman, S. (2002). Alternative/complementary approaches to treatment of children with autistic spectrum disorders. <i>Infants & Young Children: An Interdisciplinary Journal Of Early Childhood Intervention</i> , 14(3), 33-42.
Abstract	Early diagnosis of autistic spectrum disorders (ASD) allows for early referral for treatment and remediation of core deficits in communication, socialization, and behavior. The cornerstone of treatment is a comprehensive, intensive program of educational, developmental, and behavioral strategies. Since the etiology for most cases is not well defined, progress may be slow, and treatment may be intense, interest in alternative theories of causation and novel treatments is high. Families may pursue complementary and alternative medicine (CAM) therapies in addition to the standard treatments. There are two types of CAM: biologic and nonbiologic. Some of the treatments have been examined using standard research techniques, while others have not yet undergone such scrutiny. Families should be supported in their quest for effective treatments and assisted in learning about potential benefits and harm of each CAM.
Author	Susan E. Levy, MD Director of Regional Autism Center at Children’s Hospital of Philadelphia; Published several articles about ASD in pediatrics
Publication	Peer-reviewed Published by Wolters Kluwer
Date and Citation history	2002 Google scholar cited by: 40
Stated Purpose or Research Question	To help parents make informed treatment decisions
Author’s Conclusion	For CST - No scientific treatment data are available to confirm proposed benefits.
Overall Relevance to PICO	Correct Population. CST directly referenced.
Overall Quality	Good; peer reviewed journal Reputable and prolific author.

Type of Article	Conceptual Editorial
APA Reference	Fowles, K. (2004). What is the evidence for the effectiveness of craniosacral therapy?. <i>International Journal of Therapy and Rehabilitation</i> , 11(3), 98-98.
Abstract	Craniosacral therapy (CST) is a complementary therapy widely used by a variety of practitioners including physiotherapists, osteopaths and chiropractors. It is a gentle manual therapy, reported to give clinical improvements in conditions that include musculoskeletal and neurological disorders, stress and emotionally-derived problems and autism. It is described as being holistic in its activation of inherent self-healing mechanisms, resolving dysfunctions together with any associated physical or emotional issues (Hollenbury and Dennis, 1994).
Author	Kate Fowles: this is her only article on ebsco.
Publication	peer-reviewed Published by Mark Allen Group
Date and Citation history	2004 Google scholar cited by: 5
Stated Purpose or Research Question	Does evidence support the efficacy of CST?
Author's Conclusion	CST is promising, but clinical research is needed to show its effectiveness and the existence of the theoretical physiological rhythm at its core - pulsation of the CSF. Evidence supports the mechanism of CST - does affect brain tissue.
Overall Relevance to PICO	Directly relates to CST. Passing mention of the ASD population.
Overall Quality	Poor: minimal publication from this author. 1 page article that cites 2 case studies that rely on subjective report. Journal is peer reviewed, but this is an editorial.

Type of Article	Conceptual
APA Reference	Smith, T. (2008). Empirically supported and unsupported treatments for autism spectrum disorders. <i>Scientific Review of Mental Health Practice, 6</i> (1).
Abstract	While evidence-based interventions for individuals with autism spectrum disorder (ASD) are available, unvalidated interventions abound. These interventions include bonding therapies, sensorimotor treatments, and a variety of complementary and alternative medicine approaches. Both single-case experiments and between-group studies can be useful in evaluating such interventions. However, unvalidated interventions are likely to remain prevalent for many years, and interventionists in general-practice settings can expect to encounter them. An appendix summarizes many of these interventions and the status of research on them.
Author	Tristram Smith, Ph.D., is an associate professor of pediatrics at the University of Rochester Medical Center (URMC). Many published articles related to ASD in pediatrics. Behavior specialist in the Community Consultation Program in the Strong Center for Developmental Disabilities
Publication	Peer Reviewed: Published by Center for Inquiry
Date and Citation history	2008 Google scholar cited by: 20
Stated Purpose or Research Question	How can caregivers and practitioners judge an intervention and how do professionals address them?
Author's Conclusion	“Unvalidated interventions for ASD have taken on a life of their own, multiplying at the same time that investigators have identified evidence-based interventions (particularly ABA and, in some cases, psychopharmacological treatments). While there is no easy solution to this problem, there is evidence that research to understand the nature of ASD and to test particular interventions can be beneficial. “ (n.p.)
Overall Relevance to PICO	Speaks to ASD Does not specifically mention CST
Overall Quality	Good: Highly credentialed and published author: Peer reviewed journal

Type of Article	Conceptual
APA Reference	Ravindran, N., & Myers, B. J. (2012). Cultural influences on perceptions of health, illness, and disability: A review and focus on autism. <i>Journal of Child and Family Studies</i> , 21(2), 311-319.
Abstract	This conceptual paper considers the role of culture in shaping family, professional, and community understanding of developmental disabilities and their treatments. The meanings of health, illness, and disability vary greatly across cultures and across time. We use Bronfenbrenner’s ecological model to provide a theoretical framework for examining disability, with special attention to autism spectrum disorders. Cultural beliefs about the cause of a disorder influence families’ decision-making about what treatments to use and what outcomes to expect. Autism provides an example that is especially challenging, as there is no agreed-upon cause. Also, an overwhelming array of treatments is available in the West for autism, including behavioral, cognitive, pharmaceutical, sensory, relational, vitamin, and diet therapies. Other cultures contribute additional views on cause (e.g., <i>Karma</i> , Allah’s will) and treatments (e.g., acupuncture, herbal medicines, <i>Ayurveda</i>). We suggest how a broad cultural view can help us understand treatments and the treatment delivery system of a nation and a culture. For the best course of care, professionals need to understand and respect families’ views of autism and work toward mutually agreeable treatments that may involve a combination of biomedical and cultural practices. Although a family-focused, open teamwork model that aims to acknowledge the context of the child, take into consideration the strengths and limitations of the child and the family, and introduce appropriate, sustainable, and sensitive interventions is regarded as best practice in the United States, it will take sensitive work to find out whether it will suit other cultural groups across the world.
Author	Neeraja Ravindran, PhD, LCP Many articles published in a wide array of pediatric studies Practicing at Children’s Hospital of Richmond, VA
Publication	Published by Springer Science and Business Media Peer reviewed.
Date and Citation history	2012 Google scholar cited by: 58
Stated Purpose or Research Question	How do cultural concepts influence health and treatment of children with ASD?
Author’s Conclusion	“For children with disabilities to achieve the best outcomes, treatments and life opportunities must acknowledge both the biological and potentially universal aspects of disability and the cultural perspectives that are important to families and societies.” (p. 319)
Overall Relevance to PICO	Speaks to the importance of individual contexts of persons with ASD and caregivers.
Overall Quality	Good. Widely published author. Journal is peer reviewed.

Other

Type of Article	Advertorial
APA Reference	Gilchrist, R., (2016). Biodynamic Craniosacral Therapy. (2016). <i>Journal of the Australian Traditional-Medicine Society</i> , 22(3), 181.
Abstract	An “advertorial” in a peer reviewed journal about CranioSacral Therapy as “energy medicine.”
Author	Roger Gilchrist, MA, RPP, RCST® the founder of The Wellness Institute, an international school for energy medicine, training offered includes biodynamic CranioSacral Therapy
Publication	Paid advertisement sponsored by The Wellness Institute. Placed in peer-reviewed journal published by Australian Traditional-Medicine Society
Date and Citation history	Google scholar cited by: 0
Stated Purpose or Research Question	What is the history and theory behind Biodynamic CranioSacral Therapy? How does one become a practitioner?
Author’s Conclusion	Biodynamic CranioSacral Therapy (BCST) helps the client’s physical systems achieve neutral balance which is more healthful. Dr. Gilchrist is offering a new series of training beginning in January in Sydney, Australia. Full training usually takes about three years.
Overall Relevance to PICO	Poor. No mention is made of ASD.
Overall Quality	Poor. Paid advertisement in reputable journal.

Critical Appraisals.

Harrison, R. E., & Page, J. S. (2011). Multipractitioner Upledger CranioSacral Therapy:

Descriptive outcome study 2007–2008. *The Journal of Alternative and Complementary Medicine*, 17(1), 13-17. doi:10.1089/acm.2009.0644

Jakel, A., & von Hauenschild, P. (2012). A systematic review to evaluate the clinical benefits of craniosacral therapy. *Complementary Therapies in Medicine*, 20(6), 456-465.

doi:10.1016/j.ctim.2012.07.009

Hartman, S., & Norton, J. (2002). Interexaminer reliability and cranial osteopathy. *Scientific*

Review Of Alternative Medicine, 6(1), 23-34.