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## **Reflex Based Interventions For Children with Autism and Developmental Disabilities: An Evidence-Based Practice Project**

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**Reflex Based Interventions**  
**For Children with Autism and Developmental Disabilities:**  
**An Evidence-Based Practice Project**

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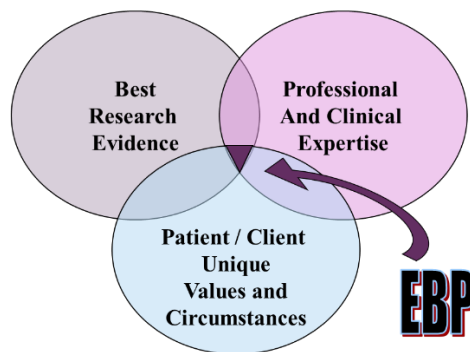
## EBP Summary

### 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*

<b>General Category</b>	<b>Specific Interventions</b>
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/>.

**EBP PICO Question**

Are reflex-based interventions effective for improving occupational performance when treating children with autism and developmental disabilities?

	Keywords	More Broad and Narrow Keywords	Synonyms, abbreviations, spelling variants
<b>P</b> (Patient/Population/Problem)	Children with developmental disabilities	Autism Spectrum Disorder Dyslexia Attention Deficit Disorder/Attention Deficit Hyperactivity Disorder Cerebral Palsy	ASD ADD/ADHD CP
<b>I</b> (Assessment/Intervention)	Occupational Therapy Reflex integration Primitive reflexes	Quantum Reflex Integration Rhythmic Movement Training Masgutova Method Posture	QRI RMT MNRI
<b>C</b> (Comparison)	ABA Developmental groups		
<b>O</b> (Outcome)	Occupational Performance, Participation	Processing skills Functional independence Social skills Motor Planning, Academic Performance, Communication	ADL

## The Masgutova Neurosensorimotor Reflex Integration (MNRI Method)

### Executive Summary

#### Final EBP question and PICO.

Are reflex based interventions effective for improving occupational performance when treating children with autism and developmental disabilities?

	Keywords	More Broad and Narrow Keywords	Synonyms, abbreviations, spelling variants
<b>P</b> (Patient/Population/Problem)	Children with developmental disabilities	Autism Spectrum Disorder Dyslexia Attention Deficit Disorder/Attention Deficit Hyperactivity Disorder Cerebral Palsy	ASD ADD/ADHD CP
<b>I</b> (Assessment/Intervention)	Occupational Therapy Reflex integration Primitive reflexes	Quantum Reflex Integration Rhythmic Movement Training Masgutova Method Posture	QRI RMT MNRI
<b>C</b> (Comparison)	ABA Developmental groups		
<b>O</b> (Outcome)	Occupational Performance, Participation	Processing skills Functional independence Social skills Motor Planning, Academic Performance, Communication	ADL

**Themes.*****Description of the intervention.***

The Masgutova Neurosensorimotor Reflex Integration (MNRI) claims to integrate and re-pattern primitive reflexes to improve neurologic function and open new pathways for cognitive, behavioral and physical development (Masgutova Foundation (MF), 2016a). Recommended duration and frequency are not clearly stated and seems to be a decision made between the MNRI practitioner and patient. Dr. Masgutova states MNRI is able to improve a wide array of ailments in children and adults ranging from physical to mental illnesses, however the targeted populations seem to be children with developmental disorders (Svetlana Masgutova Educational Institute for Neuro-Sensory-Motor and Reflex Integration (SMEI), 2016a). Since MNRI is advertised to treat many types of disorders and afflictions, the duration, frequency, and outcomes will depend on what the client is being seen for (SMEI, 2016b). Parents interviewed report improvements with motor skills, process skills, and social interactions (MF, 2016b). Costs for MNRI are currently not covered by insurance and is therefore up to the discretion of the private practices who offer MNRI therapy to decide how much to charge per session (SMEI, 2016c). Official MNRI camps are regularly scheduled throughout the year where an eight day camp is about \$9,450.00 per child under 18 years of age and \$10,350.00 for participants 19 years of age or older (SMEI, 2016d). There are approximately 13 core classes and 9 advanced subject classes offered for the average price of about \$675.00 per class which are open to anyone interested in learning more or for professionals who want to become certified in order for them to offer MNRI therapy at their private practice clinic (SMEI, 2016e).

***Developers/proponents, researchers, and organization/company.***

One year after receiving her PhD in developmental and educational psychology, Svetlana Masgutova created the Masgutova Neuro-Sensory-Motor and Reflex Integration (MNRI) Method in 1989 (Svetlana Masgutova Educational Institute (SMEI), 2016f). With limited publication in scholarly peer reviewed journals, Dr. Masgutova is a lecturer on early intervention at Wroclaw Medical Academy and directs the International Dr. Svetlana Masgutova Institute for Movement Development and Reflex Integration. The Svetlana Masgutova Educational Institute disseminates, directs, and advertises the MNRI method and any materials required for its delivery and training. A few key researchers for the MNRI method include Masgutova herself and fellow colleagues, Witold Pilecki (Wroclaw Medical University, n.d.) and Dr. Nelly Akhmatova (ResearchGate, 2016). Every article published on the MNRI method contains Masgutova as an author. Even though publications of the MNRI method are limited, many therapy settings utilize the method to treat clients, and conferences are held around the world to certify MNRI core specialists (SMEI, 2016g). For example, when doing a basic google search of the MNRI method, clinics like the Pathways Treatment Center (n.d.) and the Brainchild Institute (2016) feature the MNRI method on their webpages, promoting it as a viable treatment option.

***Description of the quality and quantity of available evidence.***

After conducting a thorough search, it was found that there is limited, poor quality research on the Masgutova method. Although many articles were published in peer-reviewed journals further investigation, using scholarlyoa.com, showed that four of the six were not reliable: the International Journal of Neurorehabilitation (Akhmatova et al., 2015; Masgutova, Akmatova, & Ludwika, 2016b), the Journal of Traumatic Stress Disorders & Treatment (Masgutova, 2016), the Journal of Neurology and Psychology (Masgutova, Akhmatova, Sadowska, Shackelford, & Akhmatov, 2016a), and the Journal of Neurology and Neuroscience (Magutova et al, 2015). Additionally, all of the research studies found on MNRI was completed

by Dr. Masgutova and her team, with Dr. Masgutova as the first author in many of the articles (see appraisal of evidence p...). Most of the studies on MNRI are primary research with similar methods used in each, and level II (non-randomized controlled design). A few studies were published in non-peer-reviewed journals, and many were published on her website alone. Of the expert review groups investigated, only one addresses MNRI. It states that there is no evidence behind MNRI and there needs to be more research (see table 1). Overall, the research that has been found is limited, poor quality, biased, and only provides a small base of research for MNRI.

*Summary of the current evidence and reviews of evidence.*

Masgutova et al, (2016a) studied the effects of the MNRI method for children with autism spectrum disorder (ASD). With one treatment group of children with ASD receiving the MNRI method and two control groups who did not receive any treatment, one with ASD and one with no developmental delays, the researchers found statistically significant improvements in reflexes for the treatment group and no statistical differences for the control groups (Masgutova et al., 2016a). Although there was no mention of limitations in the study in the discussion section, the study design, sample size, and biases all skew the claims the researchers made (Masgutova et al., 2016a).

Masgutova et al, (2016b) studied the effects of the MNRI method for children with Down syndrome. There were three groups, a study group that received MRNI at a training conference for 11 days, a control group that did not receive MNRI and a second control group that did not have Down syndrome, but instead had neurotypical development and did not receive MNRI (Masgutova et al., 2016b). The researchers found that the study group was statistically significant at  $p < .001$ , but the control groups were not significant (Masgutova et al., 2016b). Although there

was no mention of limitations in the study in the discussion section, the study design, sample size, and biases all skew the claims the researchers made (Masgutova et al., 2016b).

Pilecki, Masgutova, Kowalewska, Masgutov, Akhmatova, Poreba, Sobieszczanska, Koleda, Pilecka, and Kalka (2012a) were interested to see if MNRI could improve conductivity in the auditory nerve using Brainstem Auditory Evoked Potentials (BAEP) by obtaining Interpeak Latency I-V (IPL I-V) values in children with cerebral palsy (cp). The design included 17 children (9 girls and 8 boys) of ages 1.3 to 5.9 years (mean = 3.8 years). Two children dropped out which made the n=15. The first BAEP was given, followed by six MNRI exercises repeated six times, and then a follow up BAEP examination. Results were compared against a control group of 30 healthy children. Statistical analysis used was the Student's t-test and Wilcoxon test. Results of the study stated significant improvement in speed of transmission, in milliseconds (ms) where the p-value was 0.001 and 0.004 for the Student's t-test and Wilcoxon respectively. The authors stated their reasoning to conduct this study because of a possibility that improving the auditory pathway might have a direct relationship to improving mobility (Pilecki et al., 2012b). Dr. Masgutova who created MNRI is listed as the second author of this study. The authors did not provide a critique of limitations in their study despite concluding significant results of what looks to be a pilot study. More research needs to be conducted by unbiased researchers to determine the benefits of the MNRI method on occupational performance in the populations the method currently claims to help.



**Expert review table.**

Table 1

*Summary of Evidence and Recommendations by Expert Review Groups for Masgutova Method*

Review Organization	Summary and Recommendations	Citation and Source
Wisconsin Treatment Intervention Advisory Committee	In sum, it is the decision of the committee that for ASD and/or other developmental disabilities, MNRI receives an efficacy rating of Level 4 - Insufficient evidence (Experimental Treatment) that reflects not the volumes of non-experimental and quasi-experimental reports, but rather the lack of methodological rigor, the lack of proven clinical significance, and alternative explanations that can be given for the data-comparative studies were entirely lacking so MNRI's superiority to other approaches was never covered.	Wisconsin Department of Health Services Autism and Other Developmental Disabilities Treatment Intervention Advisory Committee (2016). <a href="https://tiac.wisconsin.gov/summary-determinations-regarding-level-evidence.htm">https://tiac.wisconsin.gov/summary-determinations-regarding-level-evidence.htm</a>
Evidence-Based Practices for Children, Youth, and Young Adults with Autism Spectrum Disorder	Not Reviewed as of December 5, 2016	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. <a href="http://autismpdc.fpg.unc.edu/sites/autismpdc.fpg.unc.edu/files/2014-EBP-Report.pdf">http://autismpdc.fpg.unc.edu/sites/autismpdc.fpg.unc.edu/files/2014-EBP-Report.pdf</a>
Association for Science in Autism Treatment (ASAT)	Not Reviewed as of December 5, 2016	Association for Science in Autism Treatment (n.d.) Treatments in alphabetical order. ( <a href="http://www.asatonline.org/for-parents/learn-more-about-">http://www.asatonline.org/for-parents/learn-more-about-</a>

Cochrane Collaboration	Not Reviewed as of December 5, 2016	specific-treatments/treatments-in-alphabetical-order/ Cochrane Collaboration (2016). <a href="http://www.cochrane.org/">http://www.cochrane.org/</a>
U.S. Department of Health and Human Services, Centers for Medicare & Medicaid Services.	Not Reviewed as of December 5, 2016	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 <a href="http://www.impaqint.com/sites/default/files/files/Autism_Spectrum_Disorders.pdf">http://www.impaqint.com/sites/default/files/files/Autism_Spectrum_Disorders.pdf</a>
National Autism Center	Not Reviewed as of December 5, 2016	National Autism Center (2015). National Standards Project, Phase 2. Retrieved from <a href="http://www.nationalautismcenter.org/national-standards-project/phase-2/">http://www.nationalautismcenter.org/national-standards-project/phase-2/</a>
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. <a href="http://pediatrics.aappublications.org/content/pediatrics/120/5/1162.full.pdf">http://pediatrics.aappublications.org/content/pediatrics/120/5/1162.full.pdf</a>

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### *Summary.*

After a careful analysis of the literature surrounding the Masgutova Neurosensorimotor Reflex Integration Method, there is minimal evidence to support the claims the Svetlana Masgutova Educational Institute makes for the use in therapeutic practices. The lack of research coupled with the amount of training needed and the cost of becoming certified ought to be carefully considered before deciding if this is a viable therapy method. The main research articles evaluating the MNRI method include limitations in sample size, study design, lack of self-critique, and significant research bias. The creator of the MNRI method, Masgutova, is a co-author in every research article specifically examining the effects of the method. Following the

Treatment Intervention Advisory Committee of Wisconsin level 4 rating of the MNRI method, we determined that more comparative research is needed to assert the claims that are currently being made.

Based on the current body of literature, there is insufficient evidence to support the use of reflex based interventions in therapy settings. All of the interventions reviewed target populations of individuals with retained primitive reflexes. Proponents of these interventions claim that the integration of reflexes leads to improved occupational performance. Some of the claims included improved academic performance, mental health, immune system function, sensory processing, speech and language performance, and emotional management. Insufficient research exists on these three interventions, and of the research that was found, minimal were considered scholarly. While evidence does not suggest these interventions are harmful, quality research is needed to determine the legitimacy of the benefits.

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## Background Learning and Evidence Searches

### Table of resources.

Table 2

#### *References and Documents that Address MNRI*

Title/Name	Brief Description	Source
The Impact of Rehabilitation Carried out Using the Masgutova Neurosensorimotor Reflex Integration Method in Children with Cerebral Palsy on the Results of Brain Stem Auditory Potential Examinations	<ul style="list-style-type: none"> <li>-Tested the improvements in Brainstem Auditory Evoked Potentials (BAEP) when using MNRI on children with cerebral palsy.</li> <li>-Measured using the Interpeak Latency I-V assessment tool that calculates the speed of the brain wave activity from the auditory nerve to the CNS.</li> <li>-Found conclusive results that indicate effectiveness of MNRI for BAEP.</li> <li>-Focused on BAEP</li> <li>-Free full-text</li> </ul>	<p>Pilecki, W. et al. (2012). The impact of rehabilitation carried out using the masgutova neurosensorimotor reflex integration method in children with cerebral palsy on the results of brain stem auditory potential examinations. <i>Advances in Clinical and Experimental Medicine</i>, 21(3), 363-371. Retrieved from <a href="https://www.researchgate.net/profile/Piotr_Koleda2/publication/233872368_The_Impact_of_Rehabilitation_Carried_out_Using_the_Masgutova_Neurosensorimotor_Reflex_Integration_Method_in_Children_with_Cerebral_Palsy_on_the_R">https://www.researchgate.net/profile/Piotr_Koleda2/publication/233872368_The_Impact_of_Rehabilitation_Carried_out_Using_the_Masgutova_Neurosensorimotor_Reflex_Integration_Method_in_Children_with_Cerebral_Palsy_on_the_R</a></p>

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Treatment Intervention Advisory Committee Review and Determination	<ul style="list-style-type: none"> <li>-Discounted the research article on BEAP</li> <li>-Classified the Masgutova study as insufficient evidence.</li> <li>-Stated that not 1 high quality study was done, the ones that were done were by the creator, the study was not published in a peer-reviewed journal, and the <i>N</i> was not clearly defined.</li> </ul>	<p>esults_of_Brain_Stem_Auditory_Potential_Examinations/links/00b7d516d52081f671000000.pdf</p> <p>Collet-Klingenberg, L. (2015). Treatment intervention advisory committee review and determination. <i>Wisconsin Department of Health Services Autism and other Developmental Disabilities Treatment Intervention Advisory Committee</i>. Retrieved from <a href="https://www.dhs.wisconsin.gov/tiac/ait.pdf">https://www.dhs.wisconsin.gov/tiac/ait.pdf</a></p>
The Masgutova Method of Neuro-Sensory-Motor and Reflex Integration: Key to Health, Development and Learning	<ul style="list-style-type: none"> <li>-Summarizes why reflexes in infants is important</li> <li>-Mentions the effects of trauma in reflexive integration due to the dynamics of autonomic responses</li> <li>-Describes positive and negative protection</li> <li>-Describes the three-part circuit of reflexes</li> </ul>	<p>Rentschler, M. (2008). <i>The masgutova method of neuro-sensory-motor and reflex integration: Key to health, development and learning</i>. Retrieved from <a href="http://ekldata.com/bAsITI2Fy9Zarlub6yDSm1Oj4M8/article_Masgutova_Method.pdf">http://ekldata.com/bAsITI2Fy9Zarlub6yDSm1Oj4M8/article_Masgutova_Method.pdf</a></p>
The Masgutova Method of Neurosensorimotor Reflex Integration (MNRI)	<ul style="list-style-type: none"> <li>-Summarizes reflex integration and tactile integration.</li> <li>-Describes who can benefit from MNRI.</li> <li>-Provides definitions of different reflexive integrations.</li> <li>-Highlights on-going research.</li> </ul>	<p>A Total Approach. (2015). <i>Reflex integration</i>. Retrieved from <a href="http://www.atotalapproach.com/index.php/programs/10-programs/42-masgutova-reflex-integration">http://www.atotalapproach.com/index.php/programs/10-programs/42-masgutova-reflex-integration</a></p>
Immunological Effects of Masgutova Neurosensorimotor Reflex integration in Children with Recurrent	<ul style="list-style-type: none"> <li>-Examined the improvement of respiratory function when using standard drug treatment and MNRI.</li> <li>-Tested 4 different groups: a healthy group, a baseline group, a group treated with standard drug treatment, and a</li> </ul>	<p>Akhmatova, N. K. et al. (2015). Immunological effects of masgutova neurosensorimotor reflex integration in children with recurrent obstructive bronchitis. <i>International</i></p>

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Obstructive  
Bronchitis

group treated with standard drug  
treatment and MNRI.

-Found conclusive results that MNRI  
improved respiratory immune function.

-Free full text

*Journal of Rehabilitation*,  
2(3), 166. doi:10.4172/2376-  
0281.1000166  
[http://www.omicsgroup.org/jo  
urnals/immunological-effects-  
of-masgutova--  
neurosensorimotor-reflex-  
integration-in-children-with-  
recurrent-obstructive-  
bronchitis-2376-0281-  
1000166.php?aid=55801](http://www.omicsgroup.org/journals/immunological-effects-of-masgutova--neurosensorimotor-reflex-integration-in-children-with-recurrent-obstructive-bronchitis-2376-0281-1000166.php?aid=55801)

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**Background learning paper one.**

This research will focus on reflex based interventions, specifically The Masgutova Neurosensorimotor Reflex Integration Method (MNRI Method). Background learning was completed by searching multiple search engines with combinations of keywords. The background information consisted of who the founder of MNRI is, what MNRI is, how it is done, and why the creator believes it works.

MNRI was created by Dr. Svetlana Masgutova. Dr. Masgutova has her Doctorate in Developmental Educational Psychology (Dr. Svetlana Masgutova n.d.). Her doctoral work was geared toward the history of reflexes (Dr. Svetlana Masgutova n.d.; Rentschler, 2008). The background information she used came from the work of researchers such as Vygotsky and Piaget (Dr. Svetlana Masgutova n.d.; Rentschler, 2008). She also participated in work with post-traumatic stress disorder (PTSD) which eventually became the groundwork for MRNI (Dr. Svetlana Masgutova n.d.). She now works with individuals with multiple disorders and leads the MNRI International Team (Dr. Svetlana Masgutova n.d.).

MNRI is something that can be hard for someone to understand when they first encounter it. It started being used in Russia and Europe in 1989 (Akhmatova et al., 2015). “The primary focus of the MNRI Method is to support the integration process of primary motor reflex patterns regardless of a person’s condition or age,” (The MNRI Method, n.d.). In other words, MNRI Method is used for someone with a reflex pattern problem to attempt to properly integrate reflexes. If one’s reflexes are not working properly, their development could be affected which is why Dr. Masgutova believes that MNRI is important (Rentschler, 2008;).

It is hard for one to find how MRNI is done online. When MNRI is used for a client, an initial assessment of their reflexes needs to be done (Akhmatova et al., 2015; How MNRI Works,

n.d.). After the assessment is done it is used to create a treatment plan (Akhmatova et al., 2015; How MNRI Works, n.d.). The treatment plan usually consists of the reflexes that the client is having troubles with (Akhmatova et al., 2015; How MNRI Works, n.d.). The trouble can be due to multiple things such as the intensity, pattern, direction, symmetrical, or dynamic pattern of their reflexes (Akhmatova et al., 2015; How MNRI Works, n.d.; Rentschler, 2008). The plan starts with finding the appropriate pattern for a given reflex (Akhmatova et al., 2015; How MNRI Works, n.d.). Then the pattern is used to work on the basic motion of the reflex, it is then repeated up to three times in a session, which is referred to as “re-patterning” (Akhmatova et al., 2015; How MNRI Works, n.d.). There is also a reassessment that is done during the assessment to see if the reflex state has changed at all (Akhmatova et al., 2015; How MNRI Works, n.d.). Although this does not cover all the things done during an MNRI treatment session, it is the basic steps taken.

Researchers were unable to find scientific evidence to back it up, but the supporters of MNRI, as well as Dr. Masgutova, have a reasoning behind why they believe it works even though there is no evidence to back it up. Akhamatova, et al., (2015) stated that they believe that MNRI, “furthers neurodevelopment in impaired individuals and enables them to integrate primary movements, reflexes, coordination systems, and skills that enable optimal functioning, development and learning. The stimulation of those reflexes revives traces of genetic motor memory and activates the innate defense mechanisms of the body-brain system,” (p. 2). In other words, they believe that the repetitive movements elicit a revival of reflexes that are awoken from the clients’ motor memory. Rentschler (2008) also added that the movement of the limbs, “opens communication among the muscles, tendons and ligaments, and adjust the receptors of

deep touch and pressure,” (p. 6). Which means that they think that repetitive movements of MNRI allow for the body to work together again and then become part of the motor memory.

Although the MNRI Method is used throughout the world, it is hard to find information on it. Most of the information that was found for this paper came from Dr. Masgutova’s MNRI website. Additional information used was found from therapy websites that only cited the MNRI website and in articles that Dr. Masgutova was a co-author for. This is a potential issue because there is information that supports the MNRI Method, but none that was found thus far is unbiased. As researchers, we agree that we need to continue our research on the Masgutova Method to decide whether it is a reliable and effective method.

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**Background learning paper two.**

In the year 1989, Svetlana Masgutova, a developmental and educational psychologist, created a therapy for reflex integration known as the Masgutova Neuro-Sensory-Motor and Reflex Integration (MNRI) Method (Svetlana Masgutova Educational Institute (SMEI), 2016a). The MNRI Method developed as a result of her experience working with traumatic incident survivors diagnosed with post-traumatic stress disorder (SMEI, 2016a). Masgutova proposed that a stress state impacts reflexive responses (SMEI, 2015). In the case of PTSD, sympathetic nervous system response to stress is believed to “trigger [previously integrated] reflex patterns to re-surface.” (SMEI, 2015, p. 59). At infancy when humans are most vulnerable, “automatic involuntary unconscious responses to stress and danger... serve as protective or survival mechanisms,” and as one develops, these reflexes no longer present themselves (Rentschler, 2008, n.p.). However, it is claimed that trauma and disease can lead to reflex integration problems and cause people to seek out treatment, such as MNRI. Because MNRI is commonly practiced in therapy settings today, it is timely to review the treatment for current evidence.

At its foundation, MNRI proposes to evaluate and work on either integrating reflexes that may not have integrated at the appropriate developmental stage or reintegrate those that have resurfaced (SMEI, 2016b). Once a reflex issue has been identified, treatment is tailored to fit the client’s situation (SMEI, 2016b). The method considers pattern, direction, timing and dynamics, intensity and symmetry to develop a customized treatment (SMEI, 2016b). The treatment itself incorporates sensory-motor planning, reflex integrating exercises, repetition, and reassessment (SMEI, 2016b). Masgutova’s method claims to benefit a variety of individuals, including those with cerebral palsy and autism (A Total Approach, 2015). Certification in MNRI is recommended to ensure proper dissemination of the treatment (SMEI, 2016b).

Cost and characteristics of the curriculum should be considered when evaluating any therapy method. To become certified in MNRI, one has to take a series of 11 courses covering different reflexive integration material (SMEI, 2016c). There are various levels of certification, but after the completion of “all required course work and IPET trainings, and testing, you become an MNRI® Core Specialist.” (SMEI, 2016c). Every two years, a MNRI Core Specialist must recertify. This involves, attending conferences, retaking 32 hours of courses and basic exams, and the submission of one case study (SMEI, 2016c). The cost to attend an MNRI training conferences is approximately \$410 which covers only part of the required material (SMEI, 2016d). Workshops, courses, and clinical conferences are all offered for MRNI.

Though limited in its breadth, research does exist surrounding the MNRI therapy method. According to the Pilecki et al. (2012) study that tested the improvements in Brainstem Auditory Evoked Potentials (BAEP) when using MNRI on children with cerebral palsy, the researchers claimed that MNRI significantly increased BAEP for the participants as opposed to the participants who did not receive BAEP. Akhmatova et al. (2015) examined the improvement of respiratory function when using standard drug treatment and MNRI. By testing four different groups, the researchers concluded that respiratory function improved significantly for those who received MNRI (Akhmatova et al., 2015).

Conversely, the Masgutova method lends itself to criticism. Many have emphasized reasons why there is not enough research to support its viability. A review of the Pilecki et al. (2012) study classified the research as insufficient to support the conclusions that the MNRI Method worked because it was not peer-reviewed, there was bias, and the sample size was not clearly defined (Collet-Klingenberg, 2015). Both of the studies mentioned limitations in their discussion sections but made no mention of any form of bias. In each study, one of the main

authors is Masgutova herself. On her website, she publicizes these studies as well (SMEI, 2016e). Biases like this are important to highlight when an author can profit off study results.

Although narrow research exists on the Masgutova Method, many clinicians promote and utilize this therapy in practice. The Pathways Treatment Center (n.d.) advertises the various types of diagnoses it can help with but references the Masgutova website as their sole source. Similarly, other websites make statements on their page claiming that MNRI is “highly specialized and recognized world-wide.” (Brainchild Institute, 2016). The Masgutova website also claims to have the support of the AOTA (SMEI, 2016f), yet there is no mention of MNRI on the AOTA website.

As healthcare workers, clients come to us with the expectation that the care we provide is trustworthy and tested. Based on the current body of literature, it is clear that the Masgutova Method must be investigated further to appropriately assess its validity and reliability in the field of occupational therapy.

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[\\_of\\_Rehabilitation\\_Carried\\_out\\_Using\\_the\\_Masgutova\\_Neurosensorimotor\\_Reflex\\_Integration\\_Method\\_in\\_Children\\_with\\_Cerebral\\_Palsy\\_on\\_the\\_Results\\_of\\_Brain\\_Stem\\_Au](https://www.researchgate.net/profile/Piotr_Koleda2/publication/233872368_The_Impact_of_Rehabilitation_Carried_out_Using_the_Masgutova_Neurosensorimotor_Reflex_Integration_Method_in_Children_with_Cerebral_Palsy_on_the_Results_of_Brain_Stem_Auditory_Potential_Examinations/links/00b7d516d52081f671000000.pdf)

[ditory\\_Potential\\_Examinations/links/00b7d516d52081f671000000.pdf](https://www.researchgate.net/profile/Piotr_Koleda2/publication/233872368_The_Impact_of_Rehabilitation_Carried_out_Using_the_Masgutova_Neurosensorimotor_Reflex_Integration_Method_in_Children_with_Cerebral_Palsy_on_the_Results_of_Brain_Stem_Auditory_Potential_Examinations/links/00b7d516d52081f671000000.pdf)

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**Background learning paper three.**

This EBP project will focus on the Masgutova Method® intervention for Autism Spectrum Disorder (ASD), as well as a wide array of other developmental and psychological disorders the Masgutova Method® claims it is capable of treating. Background learning on this topic explored defining what the Method is, for the target populations, and its acceptance in the scientific community as an effective intervention.

The Masgutova Method® is also called the Masgutova Neurosensorimotor Reflex Integration® (MNRI) Method. It was founded by Dr. Svetlana Masgutova. Dr. Masgutova has a Doctorate in Developmental and Educational Psychology, a post-graduate degree in Clinical Neuro-Speech Development from the Medical Academy in Poland, and is an Associate Professor at Wroclaw Medical University in Russia. Her main website states she also spent three years studying paramedics and massage therapy. MNRI is an intervention aimed for a broad array of psychological, physical, and developmental disorders.

MNRI claims to work on a wide variety of disorders through the therapeutic stimulation and integration of primitive reflexes of infants. Children with autism spectrum disorder, cerebral palsy (CP), brain injury, and allergies are listed as treatable conditions through MNRI. MNRI proposes reflexes have become unorganized in these conditions, and MNRI can be used to restore and reintegrate the primitive reflexes that support more complex movements (Leah Light, Au.D. 2016).

Quality research on MNRI is limited and thus, the intervention has limited applications in therapy. Searches using different combinations of key words related to MNRI and Masgutova were performed on various library health search engines. One study, performed by Dr. Masgutova herself, did come up in a search. However the Wisconsin Department of Health

Services Autism and other Developmental Disabilities Treatment Intervention Advisory Committee reviewed her article for the third time in 2016 and classified MNRI as “Level 4 – Insufficient Evidence (Experimental Treatment)” on grounds that it was performed by the creator of MNRI, the study was not peer reviewed, and the participants (N) were not clearly defined (Wisconsin Department of Health Services, 2016).

In a 2014 court case in California, the parents of a 14 year old boy with autism spectrum disorder (ASD) asked the Eastern Los Angeles Regional Center (ELARC) to acknowledge and pay for MNRI treatments. The parents had spent almost \$10,000 dollars on MNRI sessions and treatments which, at the beginning, were partially funded by ELARC and a scholarship program (Andrew v. ELARC, 2014, p.2). The judge ultimately ruled that “ELARC’s decision to deny funding for the Masgutova Method is confirmed, based on the lack of scientific evidence of the efficacy of the Masgutova Method generally, and the lack of objective evidence that it is a necessary service for Claimant,” (Andrew v. ELARC, 2014, p.6).

Despite listing affiliation and with the American Occupational Therapy Association (AOTA), the American Physical Therapy Association (APTA), and the American Speech-Language-Hearing Association (ASHA) on the Masgutova website, searches performed for everything related to MNRI on these professional websites did not yield any results or state partnership with Dr. Masgutova. As of now, MNRI has not yet had a published study with intervention outcomes that are relevant to occupational therapy.

This background study of MNRI has shown that the Masgutova Method is developmentally still in the preliminary stages of experimentation. Despite the denial of payment by a California court along with the Wisconsin Department of Health Services determination, the intervention is currently used for a wide-ranging spectrum of ailments. It is unknown if MNRI is

effective in terms of its stated claims. More research is needed before it should be recommended as an intervention in occupational therapy.

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### Evidence searches.

#### Name of Library and Online Databases:

*Name of Database and Database Provider/System:* Pubmed

#### *Preparing for Search Process*

- Primitive reflex is not in the MeSH headings. I tried reflexes and found that there are multiple primitive reflexes underneath the MeSH heading. Reflex is the MeSH heading that matched my topic best.
- There are two MeSH terms for occupational therapy. The general one seemed to be most appropriate for my search.
- Developmental disabilities is a MeSH term, but a broader term of neurodevelopmental disorders seemed to fit my topic best because ASD, cerebral palsy, and many other childhood disorders fall under it.
  - Subject Headings or Indexing Terms of the Database:
    - Therapeutics>Rehabilitation>Occupational Therapy
    - Diagnosis>Diagnostic Techniques and Procedures>Neurologic Examination>Reflex
    - Psychiatry and Psychology Category>Mental Disorders>Neurodevelopmental Disorders>Developmental Disabilities
  - Final Concept or Term List for the Database:
    - “Occupational Therapy” [MeSH], “Reflex” [MeSH], “Neurodevelopmental Disorders” [MeSH], Masgutova Method, MNRI
  - Database Filters to be tried:
    - I will try no filters
  - Boolean Logic Terms to be tried:
    - Since I want to do an exhaustive search for the Masgutova Method I will use a combination of ‘AND’ and ‘OR’.

#### *Summarizing a Strategic Search Process*

Filters/Years	Keywords	Total Yield / Relevant Hits	Date
None Years: Unlimited	"Occupational therapy" [Mesh] AND "reflex" [Mesh] AND "neurodevelopmental disorders" [Mesh]	3/-	Nov, 11, 2016
None Years: Unlimited	"Occupational therapy" [Mesh] AND MNRI OR Masgutova Method)	4/1 <b>Pilecki et al., 2012</b>	Nov, 11, 2016
None Years: Unlimited	MNRI OR Masgutova Method	10/1 <b>Pilecki et al., 2012</b>	Nov, 14, 2016
None Years: Unlimited	MNRI OR Masgutova Method AND "reflex" [Mesh]	1/1 <b>Pilecki et al., 2012</b>	Nov, 14, 2016

None Years: Unlimited	"occupational therapy" [Mesh] AND "neurodevelopmental disorders" [Mesh] AND MNRI OR Masgutova Method	4/1 <b>Pilecki et al., 2012</b>	Nov, 14, 2016
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### *Summary of 5 BEST Research Articles*

Pilecki, W., Masgutova, S, Kowalewska, J., Masgutov, D., Akhmatova, N., Poreba, M., ...

Kalka, D. (2012). The impact of rehabilitation carried out using the Masgutova neurosensorimotor reflex integration method in children with cerebral palsy on the results of brain stem auditory potential examinations. *Advances in Clinical and Experimental Medicine*, 21(3), 363-371.

**Abstract Background.** Rehabilitation therapy in children with neuromotor development disorders can be carried out with the use of various methods. **Objectives.** The aim of this study was to determine the efficiency of rehabilitation carried out with the use of the new therapeutic method MNRI® (Masgutova Neurosensorimotor Reflex Integration) in children with cerebral palsy (CP) by objective measurements with a Brainstem Auditory Evoked Potentials (BAEP) examination. **Material and Methods.** Besides the known parameters, Interpeak Latency I-V (IPL I-V) in BAEP, an original parameter proposed by Pilecki was introduced, called a relative IPL I-V value. The study involved a group of 17 children (9 girls and 8 boys) aged from 1.3 to 5.9 years (mean = 3.8 years, SD = 1.3) with cerebral palsy. Due to difficulty in co-operation, analysis of only 15 children could be finished. **Results.** Analysis of the absolute IPL I-V values showed that after rehabilitation the percentage of the results with slowed transmission, i.e. those in which the IPL I-V value was prolonged, decreased from more than 88% to 60%. The assessment of the relative IPL I-V values showed that the results obtained after rehabilitation are more advantageous. **Conclusions.** As a result of rehabilitation carried out by the MNRI® method in children with CP, a significant improvement in the transmission in the brain stem section of the auditory pathway was observed based on the absolute and relative IPL I-V values. However, the change obtained in children was various

**Other Evidence Resources:**

*Name of Evidence Resource(s):* Google Scholar

***Preparing for Search Process***

- For my search I will use keywords: Masgutova method, MNRI, reflex integration, and neurodevelopmental disorders
- Boolean Logic Terms to be tried:
  - Since I want to do an exhaustive search for the Masgutova Method I will use a combination of 'AND' and 'OR'.
- There will be no limitations put in place.

***Summarizing Strategic Process***

Filters/Years	Keywords	Total Yield / Relevant Hits	Date
None Years: Unlimited	Masgutova Method OR MNRI	88/8 <b>Pilecki et al., 2012</b> <b>Masgutova, Wenber, &amp; Retschler, 2008</b> <b>Masgutova &amp; Masgutov, n.d.</b> <b>Masgutova et al., 2015</b> <b>Masgutova, Akhmatova, &amp; Ludwika, 2016</b> <b>Sadowska et al., n.d.</b> <b>Masgutova n.d.</b> <b>Akhmatova et al., 2015</b>	Nov, 15, 2016
None Years: Unlimited	Masgutova Method OR MNRI AND reflex integration	60/8 <b>Pilecki et al., 2012</b> <b>Masgutova, Wenber, &amp; Retschler, 2008</b> <b>Masgutova &amp; Masgutov, n.d.</b> <b>Masgutova et al., 2015</b> <b>Masgutova, Akhmatova, &amp; Ludwika, 2016</b> <b>Sadowska et al., n.d.</b> <b>Masgutova n.d.</b> <b>Akhmatova et al., 2015</b>	Nov, 15, 2016

None Years: Unlimited	Masgutova Method OR MNRI AND reflex integration AND neurodevelopmental disorders	23/8 <b>Pilecki et al., 2012</b> <b>Masgutova, Wenber, &amp; Retschler, 2008</b> <b>Masgutova &amp; Masgutov, n.d.</b> <b>Masgutova et al., 2015</b> <b>Masgutova, Akhmatova, &amp; Ludwika, 2016</b> <b>Sadowska et al., n.d.</b> <b>Masgutova n.d.</b> <b>Akhmatova et al., 2015</b>	Nov, 16, 2016
None Years: Unlimited	Masgutova Method OR MNRI OR Neurosensorimotor reflex integration	65/8 <b>Pilecki et al., 2012</b> <b>Masgutova, Wenber, &amp; Retschler, 2008</b> <b>Masgutova &amp; Masgutov, n.d.</b> <b>Masgutova et al., 2015</b> <b>Masgutova, Akhmatova, &amp; Ludwika, 2016</b> <b>Sadowska et al., n.d.</b> <b>Masgutova n.d.</b> <b>Akhmatova et al., 2015</b>	Nov, 16, 2016
None Years: Unlimited	Neurosensorimotor reflex integration AND neurodevelopmental disorders	37/8 <b>Pilecki et al., 2012</b> <b>Masgutova, Wenber, &amp; Retschler, 2008</b> <b>Masgutova &amp; Masgutov, n.d.</b> <b>Masgutova et al., 2015</b> <b>Masgutova, Akhmatova, &amp; Ludwika, 2016</b> <b>Sadowska et al., n.d.</b> <b>Masgutova n.d.</b>	Nov, 16, 2016



		<b>Akhmatova et al., 2015</b>	
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***Summary of 5 BEST Research Articles or Credible Resources***

a. Abstracts

Pilecki, W., Masgutova, S., Kowalewska, J., Masgutov, D., Akhmatova, N., Poreba, M., ...

Kalka, D. (2012). The impact of rehabilitation carried out using the masgutova neurosensorimotor reflex integration method in children with cerebral palsy on the results of brain stem auditory potential examinations. *Advances in Clinical and Experimental Medicine*, 21(3), 363-371.

**Abstract Background.** Rehabilitation therapy in children with neuromotor development disorders can be carried out with the use of various methods. **Objectives.** The aim of this study was to determine the efficiency of rehabilitation carried out with the use of the new therapeutic method MNRI® (Masgutova Neurosensorimotor Reflex Integration) in children with cerebral palsy (CP) by objective measurements with a Brainstem Auditory Evoked Potentials (BAEP) examination. **Material and Methods.** Besides the known parameters, Interpeak Latency I-V (IPL I-V) in BAEP, an original parameter proposed by Pilecki was introduced, called a relative IPL I-V value. The study involved a group of 17 children (9 girls and 8 boys) aged from 1.3 to 5.9 years (mean = 3.8 years, SD = 1.3) with cerebral palsy. Due to difficulty in co-operation, analysis of only 15 children could be finished. **Results.** Analysis of the absolute IPL I-V values showed that after rehabilitation the percentage of the results with slowed transmission, i.e. those in which the IPL I-V value was prolonged, decreased from more than 88% to 60%. The assessment of the relative IPL I-V values showed that the results obtained after rehabilitation are more advantageous. **Conclusions.** As a result of rehabilitation carried out by the MNRI® method in children with CP, a significant improvement in the transmission in the brain stem section of the auditory pathway was observed based on the absolute and relative IPL I-V values. However, the change obtained in children was various

Masgutova, S., Wenber, S., & Retschler, M. (2008). Mastgutova method of reflex integration for children with cerebral palsy. Unpublished manuscript, Swetlana Masgutova Educational Institute for Neuro-Sensory-Motor and Reflex Integration.

There is no abstract for this article because it is not a research article however, it does talk about MNRI being used with children with CP.

Masgutova, S., & Masgutov, D. (n.d.) Reflex integration disorder as a new treatment paradigm for children with autism. Unpublished manuscript, Swetlana Masgutova Educational Institute for Neuro-Sensory-Motor and Reflex Integration.

Introduction to this Study he MNRI® program is based on clinical observations and research on assessed reflex delays found in children and adults, especially those with neurodeficits. Many individuals with Autism Spectrum Disorder (ASD) are lacking in skills related to early motor milestones. The MNRI® program supports maturation in the neuro-sensory-motor system through specific strategies and techniques that access the innate and natural resources of reflex patterns. (Masgutova, 2011; Masgutova, Akhmatova, 2008, 2012). The goal of this article is to introduce the basic principles of the MNRI® program and its application to the ASD population, particularly:

- Assessment of reflex patterns to evaluate the level of reflex maturation and functionality in children diagnosed with ASD (see MNRI® Assessment for Determining the Level of Reflex Development in this book)
- Reflex development profiles as a guide for use with each child to measure increased performance (at cognitive, physical, emotional, and behavioral levels)
- The effectiveness of MNRI® for increasing neurosensorimotor integration and restoring reflex pattern expression in a child with ASD.

The MNRI® program is based on knowledge and experience of neurodevelopment through the use of reflex patterns to develop physical and cognitive skills as well as behavioral and emotional regulation. Reflexes are genetically determined motor-behavioral patterns that must be integrated by every child into consciously controlled sensory-motor abilities and skills (Sechenov, 1995; Sherrington, 1947; Vygotsky, 1986; Myles, Huggins, Rome-Lake, et al., 2003; Masgutova, 2011). They provide an individual with the neurological foundation to process sensory input, program and control motor and behavioral actions, enhance memory and learning, and develop appropriate language and communication skills. Statistical analysis has allowed us to calculate the number of reflex patterns that were dysfunctional/pathological or in the norm in large numbers of subjects. We have concluded that when 35% or more of reflexes were dysfunctional, we were dealing with a phenomenon of ‘Reflex Integration Disorder’ (RID; S. Masgutova, 2011). Analysis of reflex profiles of 3,700 children with ASD revealed that RID was typical for children with autism as 86.7% of their reflex patterns were assessed to be dysfunctional. Knowledge of the state of a person’s reflex functioning can be key in choosing an effective strategy of intervention.

Masgutova, S., Sadowska, L., Kowalewska, J., Masgutov, D., Akhmatova, N., & Filipowski, H. (2015). Use of neurosensorimotor reflex integration program to improve reflex patterns of children with down syndrome. *Journal of Neurology and Neuroscience*, 6(4), 1-8.

A novel and non-invasive method for evaluating and improving neurodevelopmental delays in children with Down syndrome was evaluated. Changes in the reflex patterns of children (6 months to 18 years old) (n=54) with Down syndrome were used as objective measures for comparing before and after participation in a Neurosensorimotor Reflex Integration exercise program. Majority number of reflex patterns showed substantial improvement after children’s completion of the exercise program, although not to the level of development comparable to that

of children with typical development. This success indicates that the neurodevelopment and overall functioning of Down syndrome children is not static and can be improved with this novel Masgutova Neurosensorimotor Reflex Integration (MNRI®) exercise program. This research also shows the fact that the changes in reflex patterns happen in children with mild, moderate and severe disabilities on significant level.

Masgutova, S., Akhmatova, N., & Ludwika, S. (2016). Reflex profile of children with down syndrome improvement of neurosensorimotor development using the MNRI reflex integration program. *International Journal of Neurorehabilitation*, 3(1), 197, doi:10.4172/2376-0281.1000197

A reflex profile of children with Down Syndrome (n=48) has been created based on an Assessment of their reflex patterns. This profile and its analysis demonstrate that dysfunctional patterns intrude upon the neurodevelopment of children in this group significantly, and cause more delays in their neurosensorimotor integration, motor coordination, and other areas. The MNRI® (Masgutova Neurosensorimotor Reflex Integration) therapy modality which comprises of techniques and exercises of repatterning, was used for children participating in this research. It has proved its optimizing effect on sensory (tactile, visual-auditory) perception, motor programming and control, and proprioceptive awareness. The MNRI® concept of reflex integration differs from other traditional theories of reflex inhibition/extinction of retained reflexes. The MNRI® approach with immature or dysfunctional reflex circuits is based on activating the sensory-motor patterns encoded in a human nervous system on the genetic level. Non-invasive exercises and techniques in the MNRI® Program are aimed at the development of proper connectivity between sensory and motor neurons in neurophysiological circuits, and at strengthening and coordinating the links between different reflex patterns. The MNRI® process proposes exercises that remind the body-brain system of reflex patterns in a delicate and safe way, sometimes through the use of games and play. These techniques can be easily used by parents, caregivers, and specialists working with Down syndrome children. Statistical analysis of five parameters of a reflex pattern: sensory-motor coordination, direction of a response, intensity (muscle tone regulation), latency/dynamics, and symmetry before and after the MNRI® therapy process (based on synthesized Z function; A. Krefft algorithm) allowed for an objective scientific approach of the effectiveness of the MNRI® processes. The therapy program and evaluations were conducted during 11 day therapy-rehabilitation camps with 48 children from different countries (Poland, USA, Canada, and Russia). The feedback reports by parents and specialists on the motor and cognitive function changes in children with Down syndrome after the MNRI® program show certain improvements.

Sadowska, L., Masgutova, S., Kowalewska, J., Masgutov, D., Warsaw, W. (n.d.) Reflex integration of children with down syndrome: MNRI assessment and therapy results.

Unpublished manuscript, Swetlana Masgutova Educational Institute for Neuro-Sensory-Motor and Reflex Integration.

The objective of this article is to offer an appropriate support tool for new solutions based on the ‘reason and cause’ of the problems concerning the deficits and challenges of motor development in individuals with Down syndrome. Also, to document statistical research to verify that the functions of children with Down syndrome are improved and better facilitated by the use of the Masgutova Method® program, MNRI® processes. This article presents the results of MNRI® with 38 individuals with Down syndrome.

Masgutova, S. (n.d.) MNRI for children with cerebral palsy. Unpublished manuscript, Swetlana Masgutova Educational Institute for Neuro-Sensory-Motor and Reflex Integration.

There is no abstract for this article because it is not a research article, but it is about how MNRI is used for children with CP.

Akhmatova, N. K., Masgutova, S. K., Shubina, I. Z., Akhmatov, E. A., Khomenkov, V. V., Sorokina, E. V., ... Kostinov, M. P. (2015). Immunological effects of masgutova neurosensorimotor reflex integration in children with recurrent obstructive bronchitis. *International Journal of Neurorehabilitation*, 2, 166, doi:10.4172/2376-0281.1000166

Damage to the mechanisms of immune system regulation contributes to the development and recurrence of chronic inflammatory respiratory diseases in millions of children worldwide. Treatment for those diseases has been primarily pharmacological to date, although some dietary, nutritional, and supplemental therapies have been used. We investigated the effects of a combination of standard drug treatment and therapy using the Masgutova neurosensorimotor reflex integration program, which is based on the activation of the primary motor system, compared with the effects of drug treatment alone in children with recurrent obstructive bronchitis. Our results revealed that combining MNRI with standard drug treatment normalized the number of T lymphocytes (CD3, CD4, CD8) and natural killer cells, the metabolic function of leukocytes, and the levels of regulatory and anti-inflammatory cytokines more effectively than standard drug treatment alone. We also found that the combination of MNRI and standard drug treatment was more effective than drug treatment alone in stimulating immune system function and strengthening the polarization of the immune response, both of which decrease the incidence of respiratory system diseases and prolong the intervals between recurrences.

**Library Database:** CINAHL, ScienceDirect***Preparing for Search Process***

- When I first began my search through the databases, I started with CINAHL. This is a well-known EBSCO Host platform that searches thousands of medical journals for topics that could be found in the Cumulative Index of Nursing and Allied Health Literature (CINAHL). I read through their online tutorials and watched their tutorial videos to familiarize myself with the database.
- The “Suggested Subject Terms” box allows one to view the MeSH headings related to the original search and narrow down the original search to more relevant topics (EBSCO Help, n.d.).
- MeSH headings used for my search included:
  - Method (MT)- The note box stated that it would look for “Used with techniques, procedures, and programs for methods.”
  - Reflex, stretch, acoustic, abnormal- The note box said that Reflex, Acoustic was “Contraction of the middle ear muscles in response to sound.” I decided to check this box due to the background information I previously found on the Masgutova website highlighting BAEP from Pilecki et al. (2012). I also checked reflex, abnormal. When I clicked on it, it expanded my search to other reflexes to which included the stretch reflex, stated as “Reflex contraction of a muscle in response to passive stretching.”
  - Autism Spectrum Disorder
  - Sensory Motor Integration
  - Rehabilitation (RH)
  - Occupational Therapy
- From the background research I had previously done, I did not want to limit my search by date because the MNRI method was founded in 1989. Because my initial searches through the CINAHL database were not yielding many results, I kept my filters to Boolean/Phrases and Years: Unlimited.

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***Summarizing a Strategic Search Process***

Filters/Years	Keywords	Total Yield/ Relevant Hits	Date
Boolean/Phrases Years: Unlimited	"masgutova"	0 When I typed this in to the search box with the “Suggested Terms Box” checked, everything in the terms list was unrelated to Masgutova.	November 13, 2016
Boolean/Phrases Years: Unlimited	"Neurosensorimotor Reflex Integration" OR (MH "Reflex, Abnormal/MT/RH") OR (MH "Reflex, Acoustic/MT") OR (MH "Reflex, Stretch/MT")	4 hits but none were relevant to the Masgutova Method.	November 13, 2016

Boolean/Phrases Years: Unlimited	"MNRI"	0	November 14, 2016
Boolean/Phrases Years: Unlimited	"reflex integration methods" OR (MH "Sensory Motor Integration/MT") OR (MH "Rehabilitation") OR (MH "Occupational Therapy")	30,382 Need to narrow the focus	November 14, 2016
Boolean/Phrases Years: Unlimited	"reflex integration method" OR (MH "Sensory Motor Integration/MT")	54 hits that all had more to do with sensory integration than reflex integration. Nothing was related to MNRI.	November 14, 2016
Boolean/Phrases Years: Unlimited	"reflex integration AND autism spectrum disorders"	946 Need to narrow the focus	November 14, 2016
	"reflex integration therapy AND autism" using smart text searching	1 unrelated article found	November 14, 2016
Boolean/Phrases Years: Unlimited	"Neurosensorimotor Reflex Integration" using SmartText Searching	1/58 hits that were somewhat related to my topic: Patel (2005)	November 14, 2016

### ***Summary of Best Research Article***

After an exhaustive search using key words and terms directly and indirectly related to the MNRI method, I found several articles, but none of them related specifically to the MNRI method of interest for this project. I did find one article that might generally relate to our topic. Patel (2005) is about the therapy interventions for Cerebral palsy. From what I can tell, there is no mention of MNRI within the article, but since the Masgutova websites state that MNRI can be used to treat CP symptoms, this article could be a good comparison to the MNRI intervention.

Patel, D. (2005). Therapeutic interventions in cerebral palsy. *Indian Journal of Pediatrics*,

72(11), 979-983. <https://doi.org/10.1007/bf02731676>

**Abstract:** Various therapeutic interventions have been used in the management of children with cerebral palsy. Traditional physiotherapy and occupational therapy are widely used interventions and have been shown to be of benefit in the treatment of cerebral palsy. Evidence in support of the effectiveness of the neurodevelopmental treatment is equivocal at best. There is evidence to support the use and effectiveness of neuromuscular electrical stimulation in children with cerebral palsy. The effectiveness of many other interventions used in the treatment of cerebral palsy has not been clearly established based on well-controlled trials. These include: sensory integration, body-weight support treadmill training, conductive education, constraint-induced therapy, hyperbaric oxygen therapy, and the Vojta method. This article provides an overview of salient aspects of popular interventions used in the management of children with cerebral palsy.

***Preparing for Search Process***

- With little success in CINAHL, I decided to search through ScienceDirect. I followed a similar process as with CINAHL by looking through the ScienceDirect help guides to begin.

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**Library Database: ScienceDirect**

Filters/Years	Keywords	Total Yield/ Relevant Hits	Date
All Fields Years: All Years	“Masgutova”	4 results and 1 relevant Pilecki et al. (2013)	November 14, 2016
All Fields Years: All Years	“MNRI Method and Reflex integration”	1 result and 1 relevant Pilecki et al. (2013)	November 14, 2016
All Fields Years: All Years	Reflex integration and therapy	7,811 results Need to narrow focus	November 14, 2016
All Fields Years: All Years	Neurosensorimotor Reflex Integration method	3 results 1 relevant Pilecki et al. (2013)	November 14, 2016
All Fields Years: All Years	Search results: (reflex integration MeSH Terms) and (cerebral palsy )	105 results, 0 relevant	November 14, 2016
All Fields Years: All Years	(reflex integration MeSH Terms) and autism	51 results, 0 relevant	November 14, 2016
All Fields Years: All Years	Search results: 1 results found for (MNRI Method) and Masgutova	1 result and 1 relevant Pilecki et al. (2013)	November 14, 2016

***Summary of Best Research Article***

Pilecki, W., Kipinski, L., Szawrowicz-Pelka, T., Kalka D., & Masgutova, S. (2013). Spectral

brain mapping in children with cerebral palsy treated by the masgutova

neurosensorimotor reflex integration method. *Journal of the Neurological Sciences*,

333(1), e550. <http://dx.doi.org/10.1016/j.jns.2013.07.1932>

Background: Rehabilitation in children with neuromotor impairment disorders can be carried out with the use of effective therapeutic methods. The new one is the Masgutova Neurosensorimotor Reflex Integration (MNRI®) method. Objectives: The aim of this study was to determine the efficiency of rehabilitation carried out with the use of MNRI® in children with cerebral palsy using objective electrophysiological tools. Patients and methods: The study involved a group of 15 children with cerebral palsy treated by MNRI®. We measured their brain activity by multichannel EEG and analyzed the obtained signals with use of the spectral brain mapping. Results: By analysis of the spectral maps we documented the changes in electric brain activity as

an effect of neurorehabilitation. Conclusion: The rehabilitation carried out by the MNRI® method in children with cerebral palsy causes the reorganization of the electrical activity of central nervous system network. It may be responsible for positive treatment effect of this therapeutic method.



**Evidence Resource(s): Credible and Not Credible Websites*****Preparing for Search Process***

- Since I had limited success in finding articles in the CINAHL database and ScienceDirect, I decided to examine more broadly what other general resources existed mentioning the MNRI method. In order to prepare for this search process, I utilized Google Search to examine the credible and non-credible websites. When I typed in “Masgutova”, the Masgutova website was my first result. Within the Masgutova website I found a page that contains research on the MNRI method. The one article I did find in ScienceDirect was listed within the website and I was curious to see what other websites featured this article along with others the Masgutova website mentions.
- My main goals for this type of search were to:
  - Goal 1: Investigate the types of information the average user would get when looking up the MNRI method.
  - Goal 2: Investigate where else the articles mentioned in the Masgutova Website are listed.

***Documenting the Search Process*****Goal 1:**

- Search term: “masgutova method training”
  - This search yielded 4,560 results, many of which were the Masgutova method, but others included blog posts, YouTube videos, and other therapy practices’ websites that promote the MNRI method.
- Search terms: “masgutova method reviews” and “Masgutova articles”
  - When I searched both of these search terms separately, “Masgutova method reviews” yielded 6,310 results. The “Masgutova method articles” search yielded 9,930 results. Both of these search terms brought up mainly blog posts and non-credible sources. However, the credible sources the searches had in common were:
    - Pilecki et al. (2013) study.
    - Collet-Klingenberg (2015) review.
    - The *Claimant v. Eastern Los Angeles Regional Center* (2015) court case on the Masgutova Method.
- Search Term: “parents’ guide to mnri”
  - This search yielded 823 results, many of which linked to the actual book, *Parent’s Guide to MNRI*.

Goal 2: The Masgutova website has a page for research articles that claim to be peer reviewed (Svetlana Masgutova Educational Institute, 2016). I sought to investigate where else some of these article titles appear when searched online.

- Search Term: “Sense of a neurosensorimotor reflex integration program to improve reflex patterns of children with down syndrome”
  - 298 results- The first page had the most relevant sources with the actual article. The 3 main open access websites I found were the *Journal of Neurology and Neuroscience* website, *OMICS International*, and *ResearchGate.net*. The *ResearchGate.net* led me to find the Masgutova, Akhmatova, and Ludwika (2016) article.
- Search Term: “Post-trauma recovery in children of newtown, CT using MNRI reflex integration”

- 48 results-The Masgutova website, other Masgutova supported websites, and blogposts resulted. In addition, the Resiliency Center of Newtown, Connecticut highlighted this method on their website.
- Search Term: “Immunological effects of masgutova neurosensorimotor reflex integration in children with recurrent obstructive bronchitis”
  - 75 results- *Frontiersin.org*, *OMICS International*, and *ResearchGate.net* all had open access to this article.
- Search term: “Progress with neurosensorimotor reflex integration for children with autism spectrum disorder”
  - 360 results- This search contained blog posts and much irrelevant information, but it also brought up the Collet-Klingenberg (2015) review.
- Search Term: “The impact of rehabilitation carried out using the Masgutova neurosensorimotor reflex integration method in children with cerebral palsy on the results of brain stem auditory potential examinations”
  - 253 results- *PubMed*, *ResearchGate.net*, *Pubpdf.com*, *Cerebral Palsy Alliance Research Foundation*, and *OMICS International* featured this article.

### ***Summary of 7 Best Research Articles***

Masgutova, S., Sadowska, L., Kowalewska, J., Masgutov, D. Akhmatova, N., & Filipowski, H.

(2015). Use of a neurosensorimotor reflex integration program to improve reflex patterns of children with down syndrome. *Journal of Neurology and Neuroscience*, 6(4), 1-8.

Retrieved from

[http://masgutovamethod.com/\\_uploads/articles/\\_source/Use\\_of\\_a\\_Neurosensorimotor\\_Reflex\\_Integration\\_Program\\_to\\_Improve\\_Reflex\\_Patterns\\_of\\_Children\\_w\\_Downs\\_Syndrome.pdf](http://masgutovamethod.com/_uploads/articles/_source/Use_of_a_Neurosensorimotor_Reflex_Integration_Program_to_Improve_Reflex_Patterns_of_Children_w_Downs_Syndrome.pdf)

A novel and non-invasive method for evaluating and improving neurodevelopmental delays in children with Down syndrome was evaluated. Changes in the reflex patterns of children (6 months to 18 years old) (n=54) with Down syndrome were used as objective measures for comparing before and after participation in a Neurosensorimotor Reflex Integration exercise program. Majority number of reflex patterns showed substantial improvement after children’s completion of the exercise program, although not to the level of development comparable to that of children with typical development. This success indicates that the neurodevelopment and overall functioning of Down syndrome children is not static and can be improved with this novel Neurosensorimotor Reflex Integra on (NRI) exercise program. This research also show the fact that the changes in reflex patterns happen in children with mild, moderate and severe disabilities on significant level.

Masgutova, S. (2016). Post-trauma recovery in children of newtown, CT using MNRI reflex integration. *Journal of Traumatic Stress Disorders & Treatment*, 5(5), 1-12. doi: 10.4172/2324-8947.1000163

Trauma recovery is an extremely urgent concern in today's world as highly stressful events appear to be on the rise and corresponding professional support for individuals experiencing traumatic stress, especially children, is lacking. The experience of survival of traumatic events – natural disasters or human made catastrophes, physical, emotional and sexual abuse, and violence, witnessing a mass shooting, terrorism and wars can be anchored to memories, causing negative protection, fear, and worry. The efficacy and validity of various therapy modalities has been established in other contexts: psychotherapy, psychiatry, pharmacology, and alternative interventions. However, these current primary treatments are not adequate for many, especially children. They do not address the neurosensorimotor integration needs of those with post-traumatic stress and PTSD, and they may not orient a client toward new perspectives and well-being. These methods are sometimes seen by parents of child trauma survivors as a metaphysical imitation of treatments designed for adults and not reflective of the specific recovery needs of children. The MNRI® Program proposes a unique therapy modality based on work with neurosensorimotor integration mechanisms, using re ex patterns as 'ready-made' neural schemes that aid in survival and the development of the nervous system. These re ex integration techniques provide support for the extrapyramidal and subcortical brain structures that become dominant in stress, resulting in over-reactivity (excess activation of freezing and/or fight-or-flight mechanisms) and limited ability to make rational decisions. Detailed MNRI® assessment data on the re ex function of children who experienced the Sandy Hook School tragedy in Newtown, CT in 2012 (n=134; Study Group 1) were analyzed and compared with assessment data on child survivors of other catastrophes (n=340; Control Group 1) and typically developing children with no history of traumatic stress (n=730; Control Group 2). This comparative analysis demonstrated positive changes in re ex pattern function for the Newtown children who received the MNRI® Trauma Recovery protocol, and responses to detailed questionnaires on stress resilience and the dynamics of change in their abilities also demonstrated improvement in overall stress level, emotional and behavioral regulation, and cognitive function.

Akhmatova, N., et al. (2015). Immunological effects of masgutova neurosensorimotor reflex integration in children with recurrent obstructive bronchitis. *International Journal of Neurorehabilitation*, 2(3), 1-9. <http://dx.doi.org/10.4172/2376-0281.1000166>

Damage to the mechanisms of immune system regulation contributes to the development and recurrence of chronic inflammatory respiratory diseases in millions of children worldwide. Treatment for those diseases has been primarily pharmacological to date, although some dietary, nutritional, and supplemental therapies have been used. We investigated the effects of a combination of standard drug treatment and therapy using the Masgutova neurosensorimotor re ex integration program, which is based on the activation of the primary motor system, compared with the effects of drug treatment alone in children with recurrent obstructive bronchitis. Our results revealed that combining MNRI with standard drug treatment normalized the number of T

lymphocytes (CD3, CD4, CD8) and natural killer cells, the metabolic function of leukocytes, and the levels of regulatory and anti-inflammatory cytokines more effectively than standard drug treatment alone. We also found that the combination of MNRI and standard drug treatment was more effective than drug treatment alone in stimulating immune system function and strengthening the polarization of the immune response, both of which decrease the incidence of respiratory system diseases and prolong the intervals between recurrences.

Pilecki, W. et al. (2012). The impact of rehabilitation carried out using the Masgutova

neurosensorimotor reflex integration method in children with cerebral palsy on the results

of brain stem auditory potential examinations. *Adv Clin Exp Med*, 21(3), 363-371.

Retrieved

from [http://masgutovamethod.com/\\_uploads/articles/\\_source/Impact\\_of\\_Rehabilitation\\_Carried\\_out\\_Using\\_the\\_Masgutova\\_Neurosensorimotor\\_Reflex\\_Integration\\_Method\\_in\\_Children\\_with\\_Cerebral\\_Palsy\\_on\\_the\\_Results\\_of\\_Brain\\_Stem\\_Auditory\\_Potential\\_Examinations.pdf](http://masgutovamethod.com/_uploads/articles/_source/Impact_of_Rehabilitation_Carried_out_Using_the_Masgutova_Neurosensorimotor_Reflex_Integration_Method_in_Children_with_Cerebral_Palsy_on_the_Results_of_Brain_Stem_Auditory_Potential_Examinations.pdf)

**Background.** Rehabilitation therapy in children with neuromotor development disorders can be carried out with the use of various methods.

**Objectives.** The aim of this study was to determine the efficiency of rehabilitation carried out with the use of the new therapeutic method MNRI (Masgutova Neurosensorimotor Reflex Integration) in children with cerebral palsy (CP) by objective measurements with a Brainstem Auditory Evoked Potentials (BAEP) examination.

**Material and Methods.** Besides the known parameters, Interpeak Latency I-V (IPL I-V) in BAEP, an original parameter proposed by Pilecki was introduced, called a relative IPL I-V value. The study involved a group of 17 children (9 girls and 8 boys) aged from 1.3 to 5.9 years (mean = 3.8 years, SD = 1.3) with cerebral palsy. Due to difficulty in co-operation, analysis of only 15 children could be finished.

**Results.** Analysis of the absolute IPL I-V values showed that after rehabilitation the percentage of the results with slowed transmission, i.e. those in which the IPL I-V value was prolonged, decreased from more than 88% to 60%. The assessment of the relative IPL I-V values showed that the results obtained after rehabilitation are more advantageous.

**Conclusions.** As a result of rehabilitation carried out by the MNRI method in children with CP, a significant improvement in the transmission in the brain stem section of the auditory pathway was observed based on the absolute and relative IPL I-V values. However, the change obtained in children was various (*Adv Clin Exp Med* 2012, 21, 3, 363–371).

Masgutova, S., Akhmatova, N., Sadowska, L., Shackleford, P., & Akhmatov, E. (2016).

Progress with neurosensorimotor reflex integration for children with autism spectrum disorder. *Journal of Neurology and Psychology*, 4(2), 1-14. Retrieved from [http://masgutovamethod.com/\\_uploads/articles/\\_source/Jnl\\_Neurology\\_\\_Psychology\\_-\\_Oct\\_2016-2.pdf](http://masgutovamethod.com/_uploads/articles/_source/Jnl_Neurology__Psychology_-_Oct_2016-2.pdf)

The MNRI therapy was chosen for facilitation of neurodevelopment in children with ASD. The MNRI program is aimed at supporting the neuro-sensory-motor system as a marker of the maturity of extrapyramidal and subcortical brain functions. Children with ASD show obvious asynchronicity and delays in these functions along with poor skills related to early motor milestones. In Reflex Assessments given to children with ASD prior to the MNRI® therapy it was found that 83.33% reflex patterns (25 out of 30) were dysfunctional compared to their neurotypical peers. After completion of MNRI® intervention, the number of dysfunctional reflex patterns of these children improved in 63.33% of reflex patterns. The study also shows a correlation between significant improvement in levels of reflex patterns and the children's cognitive abilities, particularly in such areas as sensory-motor integration, behavioral and emotional regulation, self-awareness, sociability and interaction, stress resilience, physical health, speech and language, cognitive processing, learning, and motivation.

Collet-Klingenberg, L. (2015). Treatment intervention advisory committee review and determination. *Wisconsin Department of Health Services Autism and other Developmental Disabilities Treatment Intervention Advisory Committee*. Retrieved from <https://www.dhs.wisconsin.gov/tiac/ait.pdf>

In the case of the Masgutova Method or Masgutova Neurosensorymotor Reflex Integration, please refer to the attached reference listing that details the reviewed research. The committee's conclusions regarding this therapy include:

The materials found related to the Masgutova Method did not include any experimental studies. While the founder of the practice claims to have helped thousands of individuals with the therapy, no data or research were provided, only "inspirational stories." A review of Ebscohost and other academic search engines found no research or other articles pertaining to the Masgutova Method. For the first review an internet search found two resources (both by the creator of the treatment) and a website promoting the practice. The website identified research that supports the theory behind the approach as well as a number of testimonials, but no applied research. For this review, one research article was found. This research had several major design flaws. Furthermore, it did not measure clinical or behavioral outcomes. Instead, it included a measure of brain wave activity.

In sum, it is the decision of the committee that the Masgutova Method or Masgutova Neurosensorymotor Reflex Integration remains a level 5, untested treatment, as there are no

experimental studies that have tested its effectiveness. There is no evidence to suggest that it is harmful.

Masgutova, S., Akhmatova, N, & Ludwika, S. (2016). Reflex profile of children with down syndrome improvement of Neurosensorimotor development using the MNRI reflex integration program. *International Journal of Neurorehabilitation*, 3(1), 2-9.  
<http://dx.doi.org/10.4172/2376-0281.1000197>

A reflex profile of children with Down Syndrome (n=48) has been created based on an Assessment of their reflex patterns. This profile and its analysis demonstrate that dysfunctional patterns intrude upon the neurodevelopment of children in this group significantly, and cause more delays in their neurosensorimotor integration, motor coordination, and other areas. The MNRI® (Masgutova Neurosensorimotor Reflex Integration) therapy modality which comprises of techniques and exercises of reprogramming, was used for children participating in this research. It has proved its optimizing effect on sensory (tactile, visual-auditory) perception, motor programming and control, and proprioceptive awareness. The MNRI® concept of reflex integration differs from other traditional theories of reflex inhibition/extinction of retained reflexes. The MNRI® approach with immature or dysfunctional reflex circuits is based on activating the sensory-motor patterns encoded in a human nervous system on the genetic level. Non-invasive exercises and techniques in the MNRI® Program are aimed at the development of proper connectivity between sensory and motor neurons in neurophysiological circuits, and at strengthening and coordinating the links between different reflex patterns. The MNRI® process proposes exercises that remind the body-brain system of reflex patterns in a delicate and safe way, sometimes through the use of games and play. These techniques can be easily used by parents, caregivers, and specialists working with Down syndrome children. Statistic analysis of five parameters of a reflex pattern: sensory-motor coordination, direction of a response, intensity (muscle tone regulation), latency/dynamics, and symmetry before and after the MNRI® therapy process (based on synthesized Z function; A. Krefft algorithm) allowed for an objective scientific approach of the effectiveness of the MNRI® processes. The therapy program and evaluations were conducted during 11 day therapy-rehabilitation camps with 48 children from different countries (Poland, USA, Canada, and Russia). The feedback reports by parents and specialists on the motor and cognitive function changes in children with Down syndrome after the MNRI® program show certain improvements.

#### Other References

- EBSCO Help. (n.d.). *Using CINAHL/MeSH headings*. Retrieved from [https://help.ebsco.com/interfaces/CINAHL\\_MEDLINE\\_Databases/CINAHL\\_and\\_MEDLINE\\_FAQs/Using\\_CINAHL\\_MeSH\\_Headings](https://help.ebsco.com/interfaces/CINAHL_MEDLINE_Databases/CINAHL_and_MEDLINE_FAQs/Using_CINAHL_MeSH_Headings)
- Claimant v. Eastern Los Angeles Regional Center*. (2015). Retrieved from [https://www.documents.dgs.ca.gov/OAH/DDS\\_Decisions/2015080538.084.pdf](https://www.documents.dgs.ca.gov/OAH/DDS_Decisions/2015080538.084.pdf)
- Svetlana Masgutova Educational Institute (2016). *Articles*. Retrieved from <http://masgutovamethod.com/learn-more/articles>

**Library Database:** OT Search. OT Search also searches AJOT in AOTA and AOTF.

### *Preparing for Search Process*

- “Reflexotherapy” was a MeSH term used in OT Search
- “Masgutova” “MNRI” (Neurosensory AND Motor AND Reflex AND integration” “reflex therapy” were not part of the OT Thesaurus within the OT Search Database, but used in the search.
- “Reflex integration” and “Primitive Reflex” yielded results within OT Search, which also draws from the AJOT and AOTF databases. Primitive AND Reflex only yielded two extra results, which were not relevant.
- Having to integrate key terms like “occupational therapy” “rehabilitation” and “therapeutics” were not necessary since searches were conducted in OT themed databases.
- Search was conducted with and without Boolean terms “AND”
- No filters were used at all.
- Masgutova and MNRI did not yield any results from OT Search, AOTA, AOTF, or WFOT.

### *Summarizing a Strategic Search Process.*

Filters/Years	Keywords	Total Yield/ Relevant Hits	Date
None	"Reflex Integration"	9/1	Nov-16
Years: Unlimited		Rylander, PB 1977	
.	"Reflex AND Integration"	22/1	Nov-16
.		Rylander, PB 1977	
.	"Primitive Reflex"	42/3	Nov-16
.		Pimentel, D 1996	
.		Zemke, R 1985	
.		Zemke, R 1980	

### **Summary of Best Research Articles**

Pimentel, E. (1996). *The Disappearing Reflex: Physical & Occupational Therapy in*

*Pediatrics*, 16(4), 19-42. doi:10.1300/j006v16n04\_02

“The objectives of this article are to examine theoretical views regarding the appearance and disappearance of primitive reflexes, and to discuss their implications for therapeutic intervention. According to the traditional view, primitive reflexes are inhibited or integrated by higher central nervous system centers. After central nervous system (CNS) damage, these primitive reflexes are released from inhibition by higher centers. This view implies a model of CNS organization for motor control that is hierarchically organized. Alternatively, according to the more contemporary systems view, the development of reflexive and volitional behavior is the result of an interaction of central and external environmental influences. Research on primitive stepping indicates that such factors as decreased body mass and practice can contribute to the prolonged retention of this reflex. The systems view implies a distributed control model of CNS motor control in which peripheral and CNS factors participate in the control of movement. If

environmental demands can alter reflexive as well as volitional movement, then the traditional view of the relationship between primitive and pathologic reflexes is challenged. The systems view and implied distributed control model of the CNS should lead therapists to reassess their treatment rationales,” Pimentel (1996)

Zemke, R. (1985). Application of an ATNR Rating Scale to Normal Preschool Children. *American Journal of Occupational Therapy*, 39(3), 178-180.

doi:10.5014/ajot.39.3.178

“An Asymmetrical Tonic Neck Reflex Rating Scale was applied to data from 40 normal 3- and 5-year-old children. Raw scores representing degrees of elbow flexion in response to passive head rotation were converted using a four-point scale, and the results of eight trials in quadrupedal posture were summed. These results reinforce those of previous studies: the mean inhibition scores increased with age, whereas the variance decreased. Results also support further development of normative data for clinical use of the scale,” Zemke, R (1985)

Zemke, R. (1981). Incidence of ATNR Response in Normal Preschool Children. *Physical & Occupational Therapy In Pediatrics*.

“The effect of age, sex, and test posture on the incidence of the asymmetrical tonic neck reflex (ATNR) in normal preschoolers was investigated. Head rotation and elbow flexion were measured by electro goniometry over eight trails in the supine posture and eight trails in quadrupedal posture. The number of trails elbows flexion greater than zero degrees for the starting position become the incidence score. The mean incidence response was seven out of eight trails across age groups, sexes, and test postures. The results support the hypothesis that the presence of the ATNR response is normal in preschool children and suggest other clinical measures of ATNR abnormality be considered,” Zemke, R (1981)



## Other Evidence Resources

Evidence Resource(s): Google Scholar

### *Preparing for Search Process*

- One of my group members mentioned an article during class that is very relevant to our EBP project and subgroup topic concerning the Masgutova Method. It was published, reviewed, and accepted into the Journal of Neurology and Neuroscience in December of 2015. I decided to look this article up in Google Scholar to check what the search brought forth along with any other articles by Masgutova as well.
  - Masgutova, S., Sadowska, L., Kowalewska, J., Masgutov, D. Akhmatova, N., & Flilipowski, H. (2015). Use of a neurosensorimotor reflex integration program to improve reflex patterns of children with down syndrome. *Journal of Neurology and Neuroscience*, 6(4), 1-8.
  - This particular article is by Masgutova herself and was found on the Journal of Neurology and Neuroscience website.
- **Goal 1: Has this article been reviewed by others?**
  - According to the website that hosts this Masgutova paper, the Journal of Neurology and Neuroscience states that “it is an international circulating peer-reviewed Open Access journal presenting original research contributions and scientific advances in the field of Neurology and Neuroscience... Journal of Neurology & Neurosciences accepts original research articles, reviews, mini reviews, case reports and rapid communication covering all aspects of neurology & Neurosciences,”
  - Regarding the Journal of Neurology and Neuroscience, a separate google search concerning the legitimacy of the journal yielded a watchdog source (<https://scholarlyoa.com/>) which suggests the company who reviews and accepts publications (Austin Publishing Group) in their journal as “peer reviewed” is predatory and questionable.
  - The administrator who runs scholarlyopenaccess.com is a librarian and tenured associate professor at the University of Colorado Denver, in Denver Colorado.
- **Goal 2: Are there related articles or has this article been cited in other research studies?**
  - There are results in google scholar that yield about 144 results when searching for “Masgutova AND MNRI”. Most are cited zero times with a few cited once.
  - Google Scholar seems to yield the most results on Masgutova and MNRI among our shared databases within my subgroup compared to OT Seeker which yielded no results at all.
  - Google Scholar seems to yield any and all results one searches for. One may need to exercise caution when selecting sources from google scholar. Someone looking for information may have good intentions but could possibly find weak sources.

### *Documenting the Search Process*

- **Goal 1: Has this article been reviewed by others?** I am unsure at this point, according to my source referenced earlier from scholarlyopenaccess.com, it is possible for one to have an article readily accepted and posted in the Journal of Neurology and Neuroscience

for a fee. The fact there are conflicting sources about the legitimacy of this Journal should be noted.

- **Goal 2: Are there related articles or has this article been cited in other research studies?** No. Google Scholar mentions this particular article published twice. One in the Journal for Neurology and Neuroscience and the other in Insight Medical Publishing (IMedPub). IMedPub is not part of Austin Publishing Group, yet is also flagged by scholarlyoa.com for operating unethically and also under many other journal names.

### References

- Beall, J. (n.d.). Scholarly Open Access. Retrieved November 27, 2016, from <https://scholarlyoa.com/>  
<https://scholarlyoa.com/2016/03/03/a-true-predator-austin-publishing-group/>  
<https://scholarlyoa.com/2015/12/29/watch-out-for-insight-medical-publishing-imedpub-www-imedpub-com/#more-6465>
- Masgutova, S., Sadowska, L., Kowalewska, J., Masgutov, D. Akhmatova, N., & Filipowski, H. (2015). Use of a neurosensorimotor reflex integration program to improve reflex patterns of children with down syndrome. *Journal of Neurology and Neuroscience*, 6(4), 1-8.

## Appraisal of Evidence

### Initial Appraisal: Primary Research Studies.

Type of article	Overall Type: Primary Research Study
APA Reference	Zemke, R. (1981). Incidence of ATNR Response in Normal Preschool Children. <i>Physical &amp; Occupational Therapy In Pediatrics</i> . MNE 169695773
Abstract	“The effects of age, sex, and test posture on the incidence of the asymmetrical tonic neck reflex (ATNR) in normal preschoolers was investigated. Head rotation and elbow flexion were measured by electrogoniometry over eight trials in the supine posture and eight trials in quadrupedal posture. The number of trials with elbow flexion greater than zero degrees from the starting position became the incidence score. The mean incidence response was seven out of eight trials across both age groups, sexes, and test postures. The results support the hypothesis that the presence of the ATNR response is normal in preschool children and suggest other clinical measures of ATNR abnormality be considered.”
Author	Credentials: PhD, OTR, Assistant Professor in Department of Health Sciences, School of Allied Health Professions, University of Wisconsin-Milwaukee.
Publication	Physical & Occupational Therapy in Pediatrics, The Haworth Press
Date and Citation History	Date of Publication: 1980; Citation History: Google Scholar Cited By 9
Stated Purpose or Research Question	“This study was undertaken to offer support for the assessment of the magnitude of the ATNR response rather than its presence or absence. Current emphasis on early screening for learning disabled children and other children with sensori-integrative or developmental deficits. suggests preschool-aged children (3-5 years) are likely to be labeled abnormal due to misreading ATNR presence in their motor performance. This study's purpose was to clearly demonstrate the normality of the presence of the ATNR response in preschool children. To achieve this purpose improved measurement through electrogoni-ometry, repeated trials with lead rotation toward both the left and right, and two different test' postures were used to produce more accurate information than has been available. If the ATNR was clearly demonstrated with a high incidence under these conditions, the need for assessment-of magnitude of the response rather than its presence would be obvious,” (p. 32)

Author's Conclusion	“Thus, the-clinical tradition of labeling the presence of ihe ATNR response abnormal in young children appears inappropriate. The results of this study support the need for more precise examination of the ATNR response to determine what aspect best differentiates between normal and abnormal response in young children. Perhaps the magnitude of the response would be a better factor for clinical differentiation. Future studies should focus on determination of appropriate differentiators between normal and abnormal ATNR response in young children,” (p. 36)
Overall Relevance to PICO	Relevance: Strong; PICO: According to Zemke's research, the primitive reflex of ATNR can be measured in children after infancy to assess and address occupational performance in children with developmental issues.
Overall Quality	Good Quality although it is an old article (1980).

Type of article	Overall Type: Primary Research Study
APA Reference	Masgutova, S., Sadowska, L., Kowalewska, J., Masgutov, D. Akhmatova, N., & Flilipowski, H. (2015). Use of a neurosensorimotor reflex integration program to improve reflex patterns of children with down syndrome. <i>Journal of Neurology and Neuroscience</i> , 6(4), 1-8. Retrieved from <a href="http://masgutovamethod.com/_uploads/articles/_source/Use_of_a_Neurosensorimotor_Reflex_Integration_Program_to_Improve_Reflex_Patterns_of_Children_w_Downs_Syndrome.pdf">http://masgutovamethod.com/_uploads/articles/_source/Use_of_a_Neurosensorimotor_Reflex_Integration_Program_to_Improve_Reflex_Patterns_of_Children_w_Downs_Syndrome.pdf</a>
Abstract	A novel and non-invasive method for evaluating and improving neurodevelopmental delays in children with Down syndrome was evaluated. Changes in the reflex patterns of children (6 months to 18 years old) (n=54) with Down syndrome were used as objective measures for comparing before and after participation in a Neurosensorimotor Reflex Integration exercise program. Majority number of reflex patterns showed substantial improvement after children's completion of the exercise program, although not to the level of development comparable to that of children with typical development. This success indicates that the neurodevelopment and overall functioning of Down syndrome children is not static and can be improved with this novel Masgutova Neurosensorimotor Reflex Integration (MNRI®) exercise program. This research also show the fact that the changes in reflex patterns happen in children with mild, moderate and severe disabilities on significant level.
Author	Credentials: PhD Position and Institution: Lecturer on the Early Intervention Faculty of the Wroclaw Medical Academy, Director of the International Dr. Svetlana Masgutova Institute for Movement Development and Reflex Integration Publication History in Peer-Reviewed Journals: limited (most are research articles from her website)
Publication	Type: Scholarly Peer-reviewed journal Publisher: Insight Medical Publishing
Date and Citation History	Date of Publication: 2015 Citation History: Google Scholar Cited By 0
Stated Purpose or Research Question	"This study evaluates the efficacy of MNRI for improving the functions of the sensory-motor sphere of children with developmental deficiencies," (p. 2).
Author's Conclusion	"The MNRI program significantly improves the reflex functions of children with Down syndrome (6 months to 18 years old) (n = 54) by improving their sensory-motor integration," (p. 6).

Overall Relevance to PICO	Relevance: Strong PICO: This article directly relates to all parts of our PICO question.
Overall Quality of Article	Moderate Quality Reputable journal. Publication within the last 10 years. Not cited by any other article

Type of article	Overall Type: Primary Research Study
APA Reference	Masgutova, S., Akhmatova, N., & Ludwika, S. (2016). Reflex profile of children with down syndrome improvement of neurosensorimotor development using the MNRI reflex integration program. <i>International Journal of Neurorehabilitaiton</i> , 3(1), 1-9, doi:10.4172/2376-0281.1000197
Abstract	<p>A reflex profile of children with Down Syndrome (n=48) has been created based on an Assessment of their reflex patterns. This profile and its analysis demonstrate that dysfunctional patterns intrude upon the neurodevelopment of children in this group significantly, and cause more delays in their neurosensorimotor integration, motor coordination, and other areas. The MNRI® (Masgutova Neurosensorimotor Reflex Integration) therapy modality which comprises of techniques and exercises of repatterning, was used for children participating in this research. It has proved its optimizing effect on sensory (tactile, visual-auditory) perception, motor programming and control, and proprioceptive awareness. The MNRI® concept of reflex integration differs from other traditional theories of reflex inhibition/extinction of retained reflexes. The MNRI® approach with immature or dysfunctional reflex circuits is based on activating the sensory-motor patterns encoded in a human nervous system on the genetic level. Non-invasive exercises and techniques in the MNRI® Program are aimed at the development of proper connectivity between sensory and motor neurons in neurophysiological circuits, and at strengthening and coordinating the links between different reflex patterns. The MNRI® process proposes exercises that remind the body-brain system of reflex patterns in a delicate and safe way, sometimes through the use of games and play. These techniques can be easily used by parents, caregivers, and specialists working with Down syndrome children. Statistic analysis of five paramers of a reflex pattern: sensory-motor coordination, direction of a response, intensity (muscle tone regulation), latency/dynamics, and symmetry before and after the MNRI® therapy process (based on synthesized Z function; A. Krefft algorythm) allowed for an objective scientific approach of the effectiveness of the MNRI® processes. The therapy program and evaluations were conducted during 11 day therapy-rehabilitation camps with 48 children from different countries (Poland, USA, Canada, and Russia). The feedback reports by parents and specialists on the motor and cognitive function changes in children with Down syndrome after the MNRI® program show certain improvements.</p>
Author	<p>Credentials: PhD  Position and Institution: Lecturer on the Early Intervention Faculty of the Wroclaw Medical Academy, Director of the International Dr. Svetlana Masgutova Institute for Movement Development and Reflex Integration  Publication History in Peer-Reviewed Journals: limited (most are research articles from her website)</p>

Publication	Type: scholarly peer-reviewed journal; Publisher: OMICS International
Date and Citation	Date of Publication: 2016; Citation History: Google Scholar Cited By 1
Stated Purpose or Research Question	“The objective of this article is to: 1) Offer a support tool as a new solution based on the ‘reason and cause’ of problems resulting in sensory-motor and neurodevelopment deficits and challenges in Down syndrome children and 2) To document statistical research which verifies that functions in children with Down syndrome can be improved by the use of the MNRI® program,” (p. 1).
Author’s Conclusion	“Intensive work using the MNRI® during 11 days at rehabilitation camps/clinics is highly subjective according to the opinion of parents and specialists. Hey point out the positive influence of integration of sensorimotor reflexes directly on the development of the performance of skills and also intellectual processes – control of attention span, memory, and thinking,” (p. 8).
Overall Relevance to PICO	Relevance: Strong; PICO: This article directly relates to all parts of our PICO question.
Overall Quality of Article	Moderate Quality; Unestablished Author. Reputable Journal. Publication within the last 10 years



Type of article	Overall Type: Primary Research Study
APA Reference	Akhmatova, N. K., Masgutova, S. K., Shubina, I. Z., Akhmatov, E. A., Khomenkov, V. V., Sorokina, E. V., ... Kostinov, M. P. (2015). Immunological effects of masgutova neurosensorimotor reflex integration in children with recurrent obstructive bronchitis. <i>International Journal of Neurorehabilitation</i> , 2(3), 166, doi:10.4172/2376-0281.1000166.
Abstract	Damage to the mechanisms of immune system regulation contributes to the development and recurrence of chronic inflammatory respiratory diseases in millions of children worldwide. Treatment for those diseases has been primarily pharmacological to date, although some dietary, nutritional, and supplemental therapies have been used. We investigated the effects of a combination of standard drug treatment and therapy using the Masgutova neurosensorimotor reflex integration program, which is based on the activation of the primary motor system, compared with the effects of drug treatment alone in children with recurrent obstructive bronchitis. Our results revealed that combining MNRI with standard drug treatment normalized the number of T lymphocytes (CD3, CD4, CD8) and natural killer cells, the metabolic function of leukocytes, and the levels of regulatory and anti-inflammatory cytokines more effectively than standard drug treatment alone. We also found that the combination of MNRI and standard drug treatment was more effective than drug treatment alone in stimulating immune system function and strengthening the polarization of the immune response, both of which decrease the incidence of respiratory system diseases and prolong the intervals between recurrences.
Author	Credentials: MD & PhD Position and Institution: Head of lab of immunity regulation mechanisms, Mechnikov Research Institute for Vaccines and Sera Publication History in Peer-Reviewed Journals: 9
Publication	Type: scholarly peer-reviewed journal; Publisher: OMICS International
Date and Citation History	Date of Publication: 2015 Citation History: Google Scholar Cited By 0
Stated Purpose or Research Question	“We investigated the hypothesis that MNRI can also enhance immune system function in children with a chronic respiratory disease such as ROB,” (p. 2).
Author’s Conclusion	“We suggest that adding MNRI to the treatment of children with ROB can correct impaired immune system mechanisms, contribute to the resolution of chronic respiratory disease, and enable a longer remission from recurrent

	disease. However, additional studies of the effects of MNRI therapy on mechanisms regulating immune, endocrine, and nervous system function in children with ROB are required,” (p. 8).
Overall Relevance to PICO	Relevance: Limited PICO: Partially related to the I (reflex based interventions).
Overall Quality of Article	Moderate Quality Reputable Journal. Publication within the last 10 years.

Type of article	Overall Type: Primary Research Study
APA Reference	Masgutova, S., Akhmatova, N., Sadowska, L., Shackleford, P., & Akhmatov, E. (2016). Progress with neurosensorimotor reflex integration for children with autism spectrum disorder. <i>Journal of Neurology and Psychology</i> , 4(2), 1-14. Retrieved from <a href="http://masgutovamethod.com/_uploads/articles/_source/Jnl_Neurology__Psychology_-_Oct_2016-2.pdf">http://masgutovamethod.com/_uploads/articles/_source/Jnl_Neurology__Psychology_-_Oct_2016-2.pdf</a>
Abstract	The MNRI® therapy was chosen for facilitation of neurodevelopment in children with ASD. The MNRI® program is aimed at supporting the neuro-sensory-motor system as a marker of the maturity of extrapyramidal and subcortical brain functions. Children with ASD show obvious asynchronicity and delays in these functions along with poor skills related to early motor milestones. In Reflex Assessments given to children with ASD prior to the MNRI® therapy it was found that 83.33% reflex patterns (25 out of 30) were dysfunctional compared to their neurotypical peers. After completion of MNRI® intervention, the number of dysfunctional reflex patterns of these children improved in 63.33% of reflex patterns. The study also shows a correlation between significant improvement in levels of reflex patterns and the children's cognitive abilities, particularly in such areas as sensory-motor integration, behavioral and emotional regulation, self-awareness, sociability and interaction, stress resilience, physical health, speech and language, cognitive processing, learning, and motivation.
Author	Credentials: PhD Position and Institution: Lecturer on the Early Intervention Faculty of the Wroclaw Medical Academy, Director of the International Dr. Svetlana Masgutova Institute for Movement Development and Reflex Integration Publication History in Peer-Reviewed Journals: limited (most are research articles from her website)
Publication	Type: Scholarly Open Access peer reviewed journal; Journal: Journal of Neurology and Psychology; Publisher: AVENS Publishing Group
Date and Citation History	Date of Publication: September 2016 Citation History: 0
Stated Purpose or Research Question	“This study describes the efficacy of the MNRI program in improving the overall and specific neurodevelopment of children with ASD through targeting individually specific reflex patterns that develop and improve physical and cognitive skills as well as improve behavioral and emotional regulation.” (p. 3).

Author's Conclusion	“Thus, the MNRI program for children with ASD opens up the possibility of regaining their neurosensory motor reflex integration, improvement in emotional and behavior regulation, increasing self-awareness, learning, and development of their own unique personalities.” (p. 12).
Overall Relevance to PICO	Relevance: Strong PICO: This directly relates both to our PICO population of interest, Autism, occupational performance, and the reflex integration of MNRI.
Overall Quality of Article	Poor Quality ;This article was published by a reputable journal and within the last 10 years. However, the study has a significant amount of bias since one of the authors is the person also profiting off of the results. It also is not cited anywhere on google scholar.

Type of article	Overall Type: Primary Research Study
APA Reference	Masgutova, S. (2016). Post-trauma recovery in children of newtown, CT using MNRI reflex integration. <i>Journal of Traumatic Stress Disorders &amp; Treatment</i> , 5(5), 1-12. doi: 10.4172/2324-8947.1000163
Abstract	<p>Trauma recovery is an extremely urgent concern in today's world as highly stressful events appear to be on the rise and corresponding professional support for individuals experiencing traumatic stress, especially children, is lacking. The experience of survival of traumatic events – natural disasters or human made catastrophes, physical, emotional and sexual abuse, and violence, witnessing a mass shooting, terrorism and wars can be anchored to memories, causing negative protection, fear, and worry. The efficacy and validity of various therapy modalities has been established in other contexts: psychotherapy, psychiatry, pharmacology, and alternative interventions. However, these current primary treatments are not adequate for many, especially children. They do not address the neurosensorimotor integration needs of those with post-traumatic stress and PTSD, and they may not orient a client toward new perspectives and well-being. These methods are sometimes seen by parents of child trauma survivors as a metaphysical imitation of treatments designed for adults and not reflective of the specific recovery needs of children. The MNRI® Program proposes a unique therapy modality based on work with neurosensorimotor integration mechanisms, using re ex patterns as 'ready-made' neural schemes that aid in survival and the development of the nervous system. These re ex integration techniques provide support for the extrapyramidal and subcortical brain structures that become dominant in stress, resulting in over-reactivity (excess activation of freezing and/or fight-or-flight mechanisms) and limited ability to make rational decisions. Detailed MNRI® assessment data on the re ex function of children who experienced the Sandy Hook School tragedy in Newtown, CT in 2012 (n=134; Study Group 1) were analyzed and compared with assessment data on child survivors of other catastrophes (n=340; Control Group 1) and typically developing children with no history of traumatic stress (n=730; Control Group 2). This comparative analysis demonstrated positive changes in re ex pattern function for the Newtown children who received the MNRI® Trauma Recovery protocol, and responses to detailed questionnaires on stress resilience and the dynamics of change in their abilities also demonstrated improvement in overall stress level, emotional and behavioral regulation, and cognitive function.</p>
Author	<p>Credentials: PhD  Position and Institution: Lecturer on the Early Intervention Faculty of the Wroclaw Medical Academy, Director of the International Dr. Svetlana Masgutova Institute for Movement Development and Reflex Integration  Publication History in Peer-Reviewed Journals: limited (most are research articles from her website)</p>

Publication	Type: Scholarly peer reviewed journal Publisher: International Publisher of Science, Technology and Medicine
Date and Citation History	Date of Publication: 2016; Citation History: Google Scholar Cited By 0
Stated Purpose or Research Question	“Reflexes are automatic and reactive responses that govern our actions, behavior, emotions, and thoughts in traumatic stress; thus, it is crucial for practitioners to understand that the re ex integration concept is a key for transition from the shock state, with its negative anchors of trauma, to a state of positive protection that supports not only survival, but the ability to thrive as well, enabling further development of self-regulation mechanisms and neural networks. This paper reports the results of assessment and initial MNRI therapy work done on a voluntary basis with 134 children directly or indirectly involved in the tragic Sandy Hook School shooting in Newtown, CT on December 14, 2012.” (p. 2).
Author’s Conclusion	“The MNRI Trauma Recovery Protocol brought about significant changes in the Newtown children’s reflex patterns as noted in periodic testing (in every 1.5 months) with corresponding changes in their school skills and daily performance in other areas (tested before the MNRI Program and after 9 months). Improvement in reflex pattern function progressed quickly with MNRI treatment, assuring significant and stable improvement in the children’s everyday lives.” (p. 11).
Overall Relevance to PICO	Relevance: Moderate; PICO: This article talks about the MNRI reflex integration intervention but does not talk about children with developmental disabilities but rather PTSD. It does talk about occupational performance.
Overall Quality of Article	Poor quality. There is a significant amount of bias in the article because Masgutova invented this method and authored the research. Although this article was published within the last year, it is not cited anywhere in google scholar.

Type of article	Overall Type: Primary Research Study
APA Reference	Pilecki, W., Kipinski, L., Szawrowicz-Pelka, T., Kalka D., & Masgutova, S. (2013). Spectral brain mapping in children with cerebral palsy treated by the masgutova neurosensorimotor reflex integration method. <i>Journal of the Neurological Sciences</i> , 333(1), e550. <a href="http://dx.doi.org/10.1016/j.jns.2013.07.1932">http://dx.doi.org/10.1016/j.jns.2013.07.1932</a>
Abstract	Background: Rehabilitation in children with neuromotor impairment disorders can be carried out with the use of effective therapeutic methods. The new one is the Masgutova Neurosensorimotor Reflex Integration (MNRI®) method.Objectives: The aim of this study was to determine the efficiency of rehabilitation carried out with the use of MNRI® in children with cerebral palsy using objective electrophysiological tools. Patients and methods: The study involved a group of 15 children with cerebral palsy treated by MNRI®. We measured their brain activity by multichannel EEG and analysed the obtained signals with use of the spectral brain mapping. Results: By analysis of the spectral maps we documented the changes in electric brain activity as an effect of neurorehabilitation. Conclusion: The rehabilitation carried out by the MNRI® method in children with cerebral palsy causes the reorganisation of the electrical activity of central nervous system network. It may be responsible for positive treatment effect of this therapeutic method.
Author	Credentials: unable to locate Position and Institution: Department of Pathophysiology, Wroclaw Medical University, Wroclaw, Poland
Publication	Type: Scholarly peer reviewed journal ; Publisher: Journal of the Neurological Sciences Other: Official Journal of the World Federation of Neurology
Date and Citation History	Date of Publication: October 15, 2013 Citation History: Google Scholar Cited By 0
Stated Purpose or Research Question	This article is only an abstract. I cannot find the original study. “The aim of this study was to determine the efficiency of rehabilitation carried out with the use of MNRI® in children with cerebral palsy using objective electrophysiological tools.” (p. e550).
Author’s Conclusion	This article is only an abstract. I cannot find the original study. “The rehabilitation carried out by the MNRI® method in children with cerebral palsy causes the reorganisation of the electrical activity of central nervous system network. It may be responsible for positive treatment effect of this therapeutic method.” (p. e550).

Overall Relevance to PICO	Relevance: Relevant PICO: This study examines brain images of children with cerebral palsy being given the Masgutova method. The population and reflex integration method of interest are both mentioned, but there is not mention of occupational performance.
Overall Quality of Article	Poor quality. It has not been cited anywhere else. The original research article not found.



Type of article	Overall Type: Primary Research Study
APA Reference	Pilecki, W., Masgutova, S, Kowalewska, J., Masgutov, D., Akhmatova, N., Poreba, M., ... Kalka, D. (2012). The impact of rehabilitation carried out using the masgutova neurosensorimotor reflex integration method in children with cerebral palsy on the results of brain stem auditory potential examinations. <i>Advances in Clinical and Experimental Medicine</i> , 21(3), 363-371. Retrieved from <a href="http://masgutovamethod.com/_uploads/articles/_source/Impact_of_Rehabilitation_Carried_out_Using_the_Masgutova_Neurosensorimotor_Reflex_Integration_Method_in_Children_with_Cerebral_Palsy__on_the_Results_of_Brain_Stem_Auditory_Potential_Examinations.pdf">http://masgutovamethod.com/_uploads/articles/_source/Impact_of_Rehabilitation_Carried_out_Using_the_Masgutova_Neurosensorimotor_Reflex_Integration_Method_in_Children_with_Cerebral_Palsy__on_the_Results_of_Brain_Stem_Auditory_Potential_Examinations.pdf</a>
Abstract	<p>Background. Rehabilitation therapy in children with neuromotor development disorders can be carried out with the use of various methods. Objectives. The aim of this study was to determine the efficiency of rehabilitation carried out with the use of the new therapeutic method MNRI® (Masgutova Neurosensorimotor Reflex Integration) in children with cerebral palsy (CP) by objective measurements with a Brainstem Auditory Evoked Potentials (BAEP) examination. Material and Methods. Besides the known parameters, Interpeak Latency I-V (IPL I-V) in BAEP, an original parameter proposed by Pilecki was introduced, called a relative IPL I-V value. The study involved a group of 17 children (9 girls and 8 boys) aged from 1.3 to 5.9 years (mean = 3.8 years, SD = 1.3) with cerebral palsy. Due to difficulty in co-operation, analysis of only 15 children could be finished. Results. Analysis of the absolute IPL I-V values showed that after rehabilitation the percentage of the results with slowed transmission, i.e. those in which the IPL I-V value was prolonged, decreased from more than 88% to 60%. The assessment of the relative IPL I-V values showed that the results obtained after rehabilitation are more advantageous. Conclusions. As a result of rehabilitation carried out by the MNRI method in children with CP, a significant improvement in the transmission in the brain stem section of the auditory pathway was observed based on the absolute and relative IPL I-V values. However, the change obtained in children was various (<i>Adv Clin Exp Med</i> 2012, 21, 3, 363–371).</p>
Author	Credentials: Unable to locate Position and Institution: Department of Pathophysiology, Wroclaw Medical University, Poland
Publication	Type: Scholarly Peer Reviewed journal ; Journal: <i>Advances in Clinical and Experimental Medicine</i> Publisher: Wroclaw Medical University
Date and Citation History	Date of Publication: 2012; Citation History: Google Scholar Cited by 6

Stated Purpose or Research Question	“The aim of this study was to determine the efficacy of rehabilitation carried out with the use of the MNRI® method in children with cerebral palsy using objective measurements taken using the BAEP examination.” (p. 365).
Author’s Conclusion	“The authors have concluded that, as a result of the rehabilitation carried out using the MNRI® method in children with CP (cerebral palsy), a significant improvement has occurred in the transmission in the brain stem section of the auditory pathway observed based on the absolute and relative IPL I-V value.” (p. 369).
Overall Relevance to PICO	Relevance: Moderate; PICO: This article relates in the reflex integration method of interest but not the population of interest or occupational performance.
Overall Quality of Article	Moderate Quality; This article was published by a reputable journal and within the last 10 years. However, there is bias and the authors are too conclusive based on the information they found.

**Initial Appraisal: Reviews of Research Studies.**

Type of article	Overall Type: Review of Research Studies
APA Reference	<i>Claimant v. Eastern Los Angeles Regional Center.</i> (2015). Retrieved from <a href="https://www.documents.dgs.ca.gov/OAH/DDS_Decisions/2015080538.084.pdf">https://www.documents.dgs.ca.gov/OAH/DDS_Decisions/2015080538.084.pdf</a>
Abstract	No Abstract
Author	N/A
Publication	Type of Publication: Unpublished/Court Case
Date and Citation History	Date of Publication: 2015 Citation History: Not Reported by Google Scholar
Stated Purpose or Research Question	“The issues in this case are whether the Service Agency should fund for claimant’s parents to attend a conference on the Masgutova Method and whether an exception applies to the prohibition against regional center funding for experimental treatment,” (p. 1).
Author’s Conclusion	“Claimant’s appeal is denied. The Service Agency’s decision to deny funding for the Masgutova Method is affirmed,” (p. 7).
Overall Relevance to PICO	Relevance: Moderate Relevance PICO: This article is directly related to the P (children with developmental disabilities) and I (reflex interventions), but it is indirectly related to O (occupational performance).
Overall Quality of Article	Good quality because this is a court case of people under oath.

Type of article	Overall Type: Review of Research Studies
APA Reference	Collet-Klingenberg, L. (2015). Treatment intervention advisory committee review and determination. <i>Wisconsin Department of Health Services Autism and other Developmental Disabilities Treatment Intervention Advisory Committee</i> . Retrieved from <a href="https://tiac.wisconsin.gov/tiacfiles/pdf/masgutovanri0416.pdf">https://tiac.wisconsin.gov/tiacfiles/pdf/masgutovanri0416.pdf</a>
Abstract	No abstract
Author	Credentials: PhD Position and Institution: Chairperson at Wisconsin Department of Health Services Autism and other Developmental Disabilities Treatment Intervention Advisory Committee Publications in Peer-Reviewed Journals: Extensive
Publication	Type of Publication: Government Publication Publisher: Wisconsin Department of Health Services Autism and other Developmental Disabilities Treatment Intervention Advisory Committee
Date and Citation History	Date of Publication: 2015 Citation History: Not reported on Google Scholar
Stated Purpose or Research Question	“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. (p. 1).
Author’s Conclusion	“Committee Decision on Level of Evidence to Suggest the Proposed Treatment is Proven and Effective: Level 4 - Insufficient Evidence/Experimental Treatment,” (p. 6).
Overall Relevance to PICO	Relevance: Moderate PICO: Directly relates to I and P of our PICO question.
Overall Quality of Article	Good quality because it is an article written for the government. Reputable author.

Type of article	Overall Type: Review of Research Studies
APA Reference	Collet-Klingenberg, L. (2015). Treatment intervention advisory committee review and determination. <i>Wisconsin Department of Health Services Autism and other Developmental Disabilities Treatment Intervention Advisory Committee</i> . Retrieved from <a href="https://www.dhs.wisconsin.gov/tiac/ait.pdf">https://www.dhs.wisconsin.gov/tiac/ait.pdf</a>
Abstract	No Abstract
Author	Credentials: PhD Position and Institution: Chairperson at Wisconsin Department of Health Services Autism and other Developmental Disabilities Treatment Intervention Advisory Committee Publications in Peer-Reviewed Journals: Extensive
Publication	Type of Publication: Government Publication Publisher: Wisconsin Department of Health Services Autism and other Developmental Disabilities Treatment Intervention Advisory Committee
Date and Citation History	Date of Publication: April 24, 2015 Citation History: Not reported on Google Scholar
Stated Purpose or Research Question	“In subsequent sections you will find documentation of our review process including description of the proposed treatment, a synopsis of review findings, the treatment review evidence checklist, and a listing of the literature considered,” (p. 1)
Author’s Conclusion	“Committee Decision on Level of Evidence to Suggest the Proposed Treatment is Proven and Effective: Level 5 - Untested (Experimental) Treatment & Potentially Harmful,” (p. 6).
Overall Relevance to PICO	Relevance: Limited PICO: Indirectly relates to I (reflex integration) in our PICO.
Overall Quality of Article	Good quality because it is an article written for the government. Reputable author.

Type of article	Overall Type: Review of research study Specific Type: Review of a measurement scale
APA Reference	Zemke, R. (1985). Application of an ATNR Rating Scale to Normal Preschool Children. <i>American Journal of Occupational Therapy</i> , 39(3), 178-180. doi:10.5014/ajot.39.3.178
Abstract	“An Asymmetrical Tonic Neck Reflex Rating Scale was applied to data from 40 normal 3- and 5-year-old children. Raw scores representing degrees of elbow flexion in response to passive head rotation were converted using a four-point scale, and the results of eight trials in quadrupedal posture were summed. These results reinforce those of previous studies: the mean inhibition scores increased with age, whereas the variance decreased. Results also support further development of normative data for clinical use of the scale,” Zemke (1985)
Author	Credentials: PhD, OTR Position and Institution: Associate Professor, Occupational Therapy Department, University of Southern California, CA
Publication	Publisher: The American Journal of Occupational Therapy
Date and Citation History	Date of Publication: 1985 Citation History: Google Scholar Cited By 2
Stated Purpose or Research Question	“This paper reports on the reanalysis and application of the ATNR Rating Scale to data on 20 normal 3-year old children and 20 normal 5-year old children's ATNR responses,” (p. 178)
Author's Conclusion	“Neither sample is sufficient to provide normative data; however, the results of the study can serve as pilot works. The clinical potential for such a scale, when based on larger samples and for similar measures of inhibition of other reflexes, is great. Such normative development of a scale for clinical assessment of central nervous system functional maturation level is needed to provide a firm basis for clinical identification of dysfunctional children,” (p. 180)
Overall Relevance to PICO	Relevance: Moderate Relevance, may be outdated (1985) PICO: Study seeks to measure ATNR in children after infancy in order to assess levels of dysfunction in children.
Overall Quality of Article	Good quality but may be outdated. Reputable Author and Journal.

Type of article	Overall Type: Review of Research Studies
APA Reference	Patel, D. (2005). Therapeutic interventions in cerebral palsy. <i>Indian Journal of Pediatrics</i> , 72(11), 979-983. <a href="https://doi.org/10.1007/bf02731676">https://doi.org/10.1007/bf02731676</a>
Abstract	Various therapeutic interventions have been used in the management of children with cerebral palsy. Traditional physiotherapy and occupational therapy are widely used interventions and have been shown to be of benefit in the treatment of cerebral palsy. Evidence in support of the effectiveness of the neurodevelopmental treatment is equivocal at best. There is evidence to support the use and effectiveness of neuromuscular electrical stimulation in children with cerebral palsy. The effectiveness of many other interventions used in the treatment of cerebral palsy has not been clearly established based on well-controlled trials. These include: sensory integration, body-weight support treadmill training, conductive education, constraint-induced therapy, hyperbaric oxygen therapy, and the Vojta method. This article provides an overview of salient aspects of popular interventions used in the management of children with cerebral palsy.
Author	Credentials: MD Position and Institution: Kalamazoo Center for Medical Studies Michigan State University Kalamazoo USA Publication History in Peer-Reviewed Journals: Extensive
Publication	Type: scholarly peer reviewed journal Publisher: Indian Journal Of Pediatrics
Date and Citation History	Date of Publication: November, 2005 Citation History: Google Scholar Cited by 53
Stated Purpose or Research Question	“This article provides an overview of salient aspects of neurodevelopmental treatment, sensory integration, electrical stimulation, body-weight support treadmill training, conductive education, patterning, constraint- induced therapy, hippotherapy, hyperbaric oxygen therapy, acupuncture, and Vojta method.” (p. 979).
Author’s Conclusion	“The efficacy of only a few such interventions has been established by scientific research while many others have no established effectiveness in cerebral palsy management. The clinician involved in the care of children with cerebral palsy should be familiar with various interventions so that he or she can guide the families appropriately.” (p.982).
Overall Relevance to PICO	Relevance: Limited PICO: This article explores different therapy interventions for CP but does not mention the MNRI method as one of them. It does, however, examine a

	population where reflex integration interventions would be used. This article is a comparison to the research in existence in MNRI to show what has been evaluated.
Overall Quality of Article	Good quality but not published within the last 10 years.



**Initial Appraisal: Conceptual or Theoretical Articles.**

Type of article	Overall Type: Conceptual Article Specific Type: Research study
APA Reference	Masgutova, S., & Masgutov, D. (2015). <i>Reflex integration disorder as a new treatment paradigm for children with autism</i> . Unpublished manuscript, Svetlana Masgutova Educational Institute for Neuro-Sensory-Motor and Reflex Integration. Retrieved from <a href="http://masgu.com/wp-content/uploads/2016/02/Autism_by_SM_6-10-2015-SCIENCE.pdf">http://masgu.com/wp-content/uploads/2016/02/Autism_by_SM_6-10-2015-SCIENCE.pdf</a>
Abstract	No Abstract
Author	Credentials: PhD Position and Institution: Lecturer on the Early Intervention Faculty of the Wroclaw Medical Academy, Director of the International Dr. Svetlana Masgutova Institute for Movement Development and Reflex Integration Publication History in Peer-Reviewed Journals: limited (most are research articles from her website)
Publication	Type: Self-published Manuscript from Svetlana Masgutova Educational Institute® for Neuro-Sensory-Motor and Reflex Integration
Date and Citation History	Date of Publication: 2015 Citation History: Google Scholar Cited By 0
Stated Purpose or Research Question	<p>“The goal of this article is to introduce the basic principles of the MNRI® program and its application to the ASD population, particularly:</p> <ul style="list-style-type: none"> <li>• Assessment of reflex patterns to evaluate the level of reflex maturation and functionality in children diagnosed with ASD (see <i>MNRI® Assessment for Determining the Level of Reflex Development</i> in this book)</li> <li>• Reflex development profiles as a guide for use with each child to measure increased performance (at cognitive, physical, emotional, and behavioral levels)</li> <li>• The effectiveness of MNRI® for increasing neurosensorimotor integration and restoring reflex pattern expression in a child with ASD.” (p. 171).</li> </ul>
Author’s Conclusion	“The MNRI® program ‘teaches and retrains’ the brain to improve its own sensory-motor links and functions on the level of primary unconditioned reflex responses.” (p. 179).
Overall Relevance to PICO	Relevance: Strong PICO: This is both relevant to the population of interest, autism, occupational performance and the reflex integration method of interest, MNRI, for our PICO.

Overall Quality of Article	Poor Quality This is a self-published article, cited by no other sources, and contains a significant amount of bias.
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Type of article	Overall Type: Conceptual Article Specific Type: Scientific Research
APA Reference	Masgutova, S. (n.d.) MNRI for children with cerebral palsy. Unpublished manuscript, Svetlana Masgutova Educational Institute for Neuro-Sensory-Motor and Reflex Integration. Retrieved from <a href="https://informedchoicesinhealth.org/wp-content/uploads/2015/08/Cerebral-Palsy-1.pdf">https://informedchoicesinhealth.org/wp-content/uploads/2015/08/Cerebral-Palsy-1.pdf</a>
Abstract	No Abstract
Author	Credentials: PhD Position and Institution: Lecturer on the Early Intervention Faculty of the Wroclaw Medical Academy, Director of the International Dr. Svetlana Masgutova Institute for Movement Development and Reflex Integration Publication History in Peer-Reviewed Journals: limited (most are research articles from her website)
Publication	Type: Unpublished
Date and Citation History	Date of Publication: n.d. Citation History: Google Scholar Cited By 0
Stated Purpose or Research Question	“This comparative analysis offers a profound understanding of the dysfunctional features characteristic of CP and allows us to design therapeutic interventions using developmental techniques that influence the sensory-motor links of the reflex circuit,” (p. 81).
Author’s Conclusion	“The natural, non-invasive MNRI® techniques used clinically by professionals and applied by parents in home programs have brought successful remediation and progress toward functional health to thousands of challenged individuals,” (p. 86).
Overall Relevance to PICO	Relevance: Strong PICO: This article directly relates to all parts of our PICO question.
Overall Quality of Article	Poor Quality Unestablished author. Unpublished article. Not cited anywhere.

Type of article	Overall Type: Conceptual Article Specific Type: Scientific Research
APA Reference	Masgutova, S., Wenber, S., & Retschler, M. (2008). Mastgutova method of reflex integration for children with cerebral palsy. Unpublished manuscript, Svetlana Masgutova Educational Institute for Neuro-Sensory-Motor and Reflex Integration. Retrieved from <a href="http://reflexes.be/article_valerie-cp.pdf">http://reflexes.be/article_valerie-cp.pdf</a>
Abstract	No Abstract
Author	Credentials: PhD Position and Institution: Lecturer on the Early Intervention Faculty of the Wroclaw Medical Academy, Director of the International Dr. Svetlana Masgutova Institute for Movement Development and Reflex Integration Publication History in Peer-Reviewed Journals: limited (most are research articles from her website)
Publication	Type: Unpublished
Date and Citation History	Date of Publication: 2008 Citation History: Google Scholar Cited By 1
Stated Purpose or Research Question	“In our work we identify traditional, well-known 3 reflexes, such as the Moro and the Babinsky. We also choose to identify and name additional reflex patterns, which may be less familiar,” (p. 2).
Author’s Conclusion	“ Our work using the MNRI™ Method with children with CP demonstrates measurable results in reflex pattern expression, with these implications for primary motor system function: improved postural control, stability, and sense of equilibrium. This improvement in sensory motor function provides the neurophysiological support needed for development and learning,” (p. 20).
Overall Relevance to PICO	Relevance: Strong PICO: This article directly relates to all parts of our PICO question.
Overall Quality of Article	Poor Quality Unestablished author. Unpublished article. Only cited once.

Type of article	Overall Type: Conceptual Article Specific Type: Scientific Research
APA Reference	Sadowska, L., Masgutova, S., Kowalewska, J., Masgutov, D., Warsaw, W. (n.d.) Reflex integration of children with down syndrome: MNRI assessment and therapy results. Unpublished manuscript, Swetlana Masgutova Educational Institute for Neuro-Sensory-Motor and Reflex Integration Retrieved from <a href="http://masgutovamethod.com/_uploads/_media_uploads/_source/Down_Syndrome_2-24-2015-DOWN_SYNDROME.pdf">http://masgutovamethod.com/_uploads/_media_uploads/_source/Down_Syndrome_2-24-2015-DOWN_SYNDROME.pdf</a>
Abstract	The objective of this article is to offer an appropriate support tool for new solutions based on the ‘reason and cause’ of the problems concerning the deficits and challenges of motor development in individuals with Down syndrome. Also, to document statistical research to verify that the functions of children with Down syndrome are improved and better facilitated by the use of the Masgutova Method® program, MNRI® processes. This article presents the results of MNRI® with 38 individuals with Down syndrome.
Author	Credentials: MD Position and Institution: unable to locate Publication History in Peer-Reviewed Journals: Limited
Publication	Type: Unpublished
Date and Citation History	Date of Publication: n.d. Citation History: Google Scholar Cited By 0
Stated Purpose or Research Question	“This article presents the study of the assessment and therapy results of 38 children with Down syndrome using MNRI®,” (p. 110).
Author’s Conclusion	“The Masgutova Method® offers a strong support for creation of new developmental possibilities and programs for Down syndrome children that can be applied in conjunction with other therapies. The Masgutova Method® demonstrates the primary importance of addressing reflex patterns to support the development and function of motor and cognitive systems. Statistical analysis has supported the effectiveness of the MNRI® diagnostic protocol and validates the results of the therapeutic part of the program,” (p. 121).
Overall Relevance to PICO	Relevance: Strong PICO: This article directly relates to all parts of our PICO question because it attests to reflex integration, the population of interest, and occupational performance.

Overall Quality of Article	Poor Quality Unestablished author. Unpublished article. Not cited by other articles.
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Type of article	Overall Type: Conceptual Article Specific Type:
APA Reference	Brainchild Institute. (n.d.). Masgutova Method. Retrieved November 20, 2016, from <a href="http://www.brainchildinstitute.com/">http://www.brainchildinstitute.com/</a>
Abstract	None
Author	Dr. Leah Light Credentials: B.S. in Special Education, M.S. in Audiology, Au.D. in Audiology; “completed one year of graduate studies in speech-language pathology”. Position and Institution: Director at Brainchild Institute. Publication History in Peer-Reviewed Journals: Low
Publication	Contributed a chapter: “APD as a Model of a Functional Disconnection Syndrome” in the book - Geffner, D. S., & Ross-Swain, D. (2007). <i>Auditory processing disorders: Assessment, management, and treatment</i> . San Diego: Plural Pub.
Date and Citation History	Date of Publication: 2016 Google Scholar Cited By: 0
Stated Purpose or Research Question	“Dr. Masgutova’s techniques are aimed at addressing “reflexes gone astray” to restore the brain’s foundational structure upon which higher level skills such as attention, language, social finesse, and academic learning are built.”
Author’s Conclusion	“The Brainchild Institute here in Hollywood, Florida is a leader in using the Masgutova Method (MNRI®) for our patients here in South Florida. The organization has also sponsored over 45 family educational conferences and has trained over 8,000 MNRI® students, parents and caregivers in this life-changing method including our own Dr. Leah Light, a leading advocate of MNRI® in South Florida.”
Overall Relevance to PICO	Relevance: Strong Rationale: This site claims strong evidence that MNRI works in treating children with developmental disabilities, thus improving occupational participation.
Overall Quality of Article	Poor Quality This was a website promoting MNRI at Dr. Leah Light’s private practice. Sources for claims made about effectiveness of MNRI were not given. Kaiser Permanente was misspelled “Keiser Presidente Health Care in San Mateo, CA”. Dr. Light is credentialed, and has co-authored “APD as a Model of a Functional Disconnection Syndrome” in the book - Geffner, D. S., & Ross-

	Swain, D. (2007). <i>Auditory processing disorders: Assessment, management, and treatment</i> . San Diego: Plural Pub.
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Type of article	Overall Type: Theoretical Review
APA Reference	Pimentel, E. (1996). The Disappearing Reflex: <i>Physical &amp; Occupational Therapy in Pediatrics</i> , 16(4), 19-42. doi:10.1300/j006v16n04_02
Abstract	<p>“The objectives of this article are to examine theoretical views regarding the appearance and disappearance of primitive reflexes, and to discuss their implications for therapeutic intervention. According to the traditional view, primitive reflexes are inhibited or integrated by higher central nervous system centers. After central nervous system (CNS) damage, these primitive reflexes are released from inhibition by higher centers. This view implies a model of CNS organization for motor control that is hierarchically organized. Alternatively, according to the more contemporary systems view, the development of reflexive and volitional behavior is the result of an interaction of central and external environmental influences. Research on primitive stepping indicates that such factors as decreased body mass and practice can contribute to the prolonged retention of this reflex. The systems view implies a distributed control model of CNS motor control in which peripheral and CNS factors participate in the control of movement. If environmental demands can alter reflexive as well as volitional movement, then the traditional view of the relationship between primitive and pathological reflexes is challenged. The systems view and implied distributed control model of the CNS should lead therapists to reassess their treatment rationales,” Pimentel (1996)</p>
Author	<p>Credentials: MA &amp; PT  Position and Institution: Instructor of Neuroanatomy, College of Physicians and Surgeons, Columbia University, New York, NY.</p>
Publication	<p>Type of publication: Scholarly Article- a Review  Publisher: Physical &amp; Occupational Therapy in Pediatrics by the Haworth Press</p>
Date and Citation History	<p>Date of Publication: 1996  Citation History: Google Scholar Cited By 1</p>
Stated Purpose or Research Question	<p>“The objectives of this article are to examine theoretical views regarding the appearance and disappearance of primitive reflexes, and to discuss their implications for therapeutic intervention,” (p.19)</p>
Author’s Conclusion	<p>“If environmental demands can alter reflexive as well as volitional movement, the traditional view of reflexes is challenged. Therapy based on the distributed control model of CNS motor control, rather than the hierarchical CNS model, allows for a more dynamic explanation of movement behaviors in normal and</p>

	abnormal development. This leads to a reassessment of the rationales for what therapists are actually doing in therapy,” (p. 37)
Overall Relevance to PICO	Relevance: Strong PICO: Offers a review and reevaluation of the primitive reflex in normal and abnormal child development.
Overall Quality of Article	Good Quality Reputable author and journal.

**Critical appraisals.**

Mastgutova, S., Akhmatova, N., & Ludwika, S. (2016). Reflex profile of children with Down syndrome improvement of neurosensorimotor development using the MNRI reflex integration program. *International Journal of Neurorehabilitation*, 3(1), 1-9.

Masgutova, S., Akhmatova, N., Sadowska, L., Shackleford, P., & Akhmatov, E. (2016). Progress with neurosensorimotor reflex integration for children with autism spectrum disorder. *Journal of Neurology and Psychology*, 4(2), 1-14. Retrieved from [http://masgutovamethod.com/uploads/articles/source/Jnl\\_Neurology\\_Psychology\\_-\\_Oct\\_2016-2.pdf](http://masgutovamethod.com/uploads/articles/source/Jnl_Neurology_Psychology_-_Oct_2016-2.pdf)

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## Reflex Integration

### Executive Summary

#### Final EBP question and PICO.

Are reflex-based interventions effective for improving occupational performance when treating children with developmental disabilities?

	Keywords	More Broad and Narrow Keywords	Synonyms, abbreviations, spelling variants
<b>P</b> (Patient/Population/Problem)	Children with developmental disabilities	Autism Spectrum Disorder Dyslexia Attention Deficit Disorder/Attention Deficit Hyperactivity Disorder Cerebral Palsy	ASD ADD/ADHD CP
<b>I</b> (Assessment/Intervention)	Occupational Therapy Reflex integration Primitive reflexes	Quantum Reflex Integration Rhythmic Movement Training Masgutova Method Posture	QRI RMT MNRI
<b>C</b> (Comparison)	ABA Developmental groups		
<b>O</b> (Outcome)	Occupational Performance, Participation	Processing skills Functional independence Social skills Motor Planning, Academic Performance, Communication	ADL

**Themes.*****Description of the intervention.***

Reflex integration is an intervention that uses movement patterns to manipulate neural connections throughout the body. It is proposed that persistence of primitive reflexes is connected with developmental disorders (Blythe & Hyland, 1998; Chinello et al., 2016; Futagi, Tagawa, & Otani, 1992; Institute for Neuro-Physiological Psychology, 2014; Zafieiriou, 2004). Proponents suggest that completion of exercises within this intervention causes primitive reflexes to be exhausted and eventually integrated, causing widespread improvement. The recommended duration and frequency of reflex integration varies by practitioner (Johnson, 2004; Melillo, 2016; Pyramid of Potential, n.d.b). The most commonly stated frequency is 10-15 repetitions of each exercise daily for one year (Blythe, 2005; Jordan-Black, 2005). Claims have been made that target populations for reflex integration include adults and children with the following diagnoses: agoraphobia, attention deficit disorder/attention-deficit hyperactivity disorder, dyscalculia, dyspraxia, anxiety and panic disorders, auditory processing disorder, dysgraphia, Asperger's disorder, cerebral palsy, dyslexia, autism, down syndrome, cerebral palsy, Parkinson's disease, and cerebro-vascular accident (Autism Exchange, 2016; Blythe, 2005; Institute for Neuro-Physiological Psychology [INPP], 2014; Lang et al., 2010; Quantum Reflex Integration Network, n.d.; Therapy Junction, n.d.). Stated outcomes include improved math, reading, and spelling skills; promotion of normative development; improved balance and motor coordination; increased physical stability; improved physical symptoms of autism spectrum disorders; enhanced work performance; and improved neurological functioning (Blythe, 2009; Jordan-Black, 2005; Lang et al., 2010; Melillo, 2016; Move Play Thrive, 2010; Quantum Reflex Integration Network, n.d.). The cost of therapy ranges from \$275 to \$450 per

session, and training costs between \$200 and \$300 for a kit to teach oneself; costs for webinars and training were not listed without first providing personal information (INPP, 2014; Pyramid of Potential, n.d.a; Quantum Reflex Integration Network, n.d.).

***Developers/proponents, researchers, and organization/company.***

Proponents of reflex integration show a range of education and research experience. Robert Melillo, a professor, researcher, author, and television host, developed Brain Gym Centers which use reflex integration (Melillo, n.d.). Peter Blythe founded the Institute for Neuro-Physiological Psychology, located in the United Kingdom, forty years ago (INPP, 2014). Peter and his wife, Sally Goddard Blythe conducted much of their own research; these studies are available for purchase through the INPP website (Blythe, 2005; INPP, 2014). A main source listed on the website was conducted by an education board no longer in existence (Education Authority--North Eastern Region, 2016). Bonnie Brandes, the founder of quantum reflex integration (QRI), has worked with children and adults with learning and physical disabilities and behavioral issues for twenty-eight years. She has worked with different machines and techniques for thirty years to incorporate frequencies into therapy (Quantum Reflex Integration Network, n.d.). McPhillips and Jordan-Black, both researchers from Queen's University of Belfast, independently conducted research on the effectiveness of reflex-based interventions on academic performance (McPhillips, 2000; Jordan-Black, 2005).

***Description of the quality and quantity of available evidence.***

Overall, we found sixteen articles published in peer-reviewed journals and six published in non-peer reviewed sources. Pimentel (1996), Anderson (2008), and Anderson (2009) were conceptual/theoretical articles exploring primitive reflexes and developmental delays. The comparative studies scrutinized groups with developmental delays and persistent primitive

reflexes (Calcott, 2012; Chinello, 2016; Jordan-Black, 2005; Stanton, Peloso, Brown & Rodier, 2007; and Teitelbaum, et. al, 2004). A double blind study was conducted by McPhillips, Hepper, & Mulhern (2000). One regression analysis study was conducted by de Bildt et. al, (2012). Melillo (2016) and Hyatt, Stephenson & Carter (2009) produced meta analyses. The eight systemic review articles primarily researched independent studies, reflexes alone, and meta analyses of primitive reflexes, but none explored the evidence surrounding reflex-based interventions (Blythe, 2005; Futagi & Suzuki, 2010; Hyatt et al., 2009; Melillo, 2016; Ottenbacher, 1982; Teitelbaum, 2002; Zafieriou, 2004; Zwaigenbaun et. al, 2013) The five expert review studies included Endler (1978), Rider (1972), Ottenbacher (1982), Smith (2013) and Mailloux et. al, (2014), all of which were reviewed and published by the American Occupational Therapy Association (AOTA) or the American Psychological Association (APA). The studies published by AOTA primarily analyzed primitive reflexes of individuals with developmental disabilities, reflex delays, and sensory integration skills, but none provide evidence for reflex integration therapy (Endler, 1978; Mailloux, et. al, 2014; Ottenbacher, 1982).

***Summary of the current evidence and reviews of evidence.***

Through the searches, we identified three best evidence reviews (Blythe, 2009; Chinello, Gangli, & Valenza, 2016; Jordan-Black, 2005). Blythe (2009) provided a summary of independent studies that addressed academic performance using INPP test battery and developmental exercise programme, from which Blythe suggested that additional testing in schools could help to identify children with neurological dysfunction. This study relates to our PICO in its proposed use of exercise to address neurological dysfunction in children with developmental disabilities; however, it does not address reflex integration. Jordan-Black (2005) conducted a nonrandomized control study to establish evidence for the effectiveness of reflex-

based interventions in improving academic performance, from which she proposed that Primary Movement decreases persistence of asymmetrical tonic neck reflex and significantly impacts mathematics and reading skills of children who completed the intervention. The relevance of this study to our PICO includes the population (though not children with ASD, the experimental group included some children with developmental disabilities), intervention (reflex-based movement therapy), comparison (with a control-group of children participating in typical academic curriculum), and the outcome (improved academic performance). Chinello et al. (2016) found that infants whose parents exhibited subclinical autistic traits were more likely to have persistent reflexes, suggesting infants who have persistent reflexes and who have parents with subclinical autistic traits may be more susceptible to developing an autism spectrum disorder. The relevance of this study to our PICO include primitive reflexes, persistence of reflexes, developmental disabilities, and potential outcomes of primitive reflexes. The study does not measure the outcome of reflex integration therapy. Overall, these articles demonstrated the best evidence and relevance to our overall theme of reflex integration; however, two of these sources focused on primitive reflexes rather than reflex integration (Blythe, 2009; Chinello et al., 2016), while the other source (Jordan-Black, 2005) did not address children with autism spectrum disorders but instead addressed the general population. Of the three best evidence sources only Chinello et al. (2016) provided recent findings whereas Blythe (2009) and Jordan-Black (2005) presented findings from over five years ago.

### **Expert Review Groups.**

Table 1  
*Summary of Evidence and Recommendations by Expert Review Groups for Reflex Integration*

Review Organization	Summary and Recommendations	Citation and Source
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Wisconsin Treatment Intervention Advisory Committee	Not reviewed (2016).	Wisconsin Department of Health Services Autism and Other Developmental Disabilities Treatment Intervention Advisory Committee (2016). <a href="https://tiac.wisconsin.gov/summary-determinations-regarding-level-evidence.htm">https://tiac.wisconsin.gov/summary-determinations-regarding-level-evidence.htm</a>
Evidence-Based Practices for Children, Youth, and Young Adults with Autism Spectrum Disorder	Not reviewed (2014).	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. <a href="http://autismpdc.fpg.unc.edu/sites/autismpdc.fpg.unc.edu/files/2014-EBP-Report.pdf">http://autismpdc.fpg.unc.edu/sites/autismpdc.fpg.unc.edu/files/2014-EBP-Report.pdf</a>
Association for Science in Autism Treatment (ASAT)	Not reviewed (2016).	Association for Science in Autism Treatment (n.d.) Treatments in alphabetical order. ( <a href="http://www.asatonline.org/for-parents/learn-more-about-specific-treatments/treatments-in-alphabetical-order/">http://www.asatonline.org/for-parents/learn-more-about-specific-treatments/treatments-in-alphabetical-order/</a> )
Cochrane Collaboration	Not reviewed. (2016).	Cochrane Collaboration (2016). <a href="http://www.cochrane.org/">http://www.cochrane.org/</a>
U.S. Department of Health and Human Services, Centers for Medicare & Medicaid Services.	Not reviewed (2016).	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 <a href="http://www.impaqint.com/sites/default/files/files/Autism_Spectrum_Disorders.pdf">http://www.impaqint.com/sites/default/files/files/Autism_Spectrum_Disorders.pdf</a>
National Autism Center	Not reviewed (2016).	National Autism Center (2015). National Standards Project, Phase 2. Retrieved from <a href="http://www.nationalautismcenter.org/national-standards-project/phase-2/">http://www.nationalautismcenter.org/national-standards-project/phase-2/</a>

American Academy of Pediatrics	Not reviewed (2016). 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. <a href="http://pediatrics.aappublications.org/content/pediatrics/120/5/1162.full.pdf">http://pediatrics.aappublications.org/content/pediatrics/120/5/1162.full.pdf</a>
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Blythe (2009) stated that underlying neurological dysfunction in children and their academic performance could be addressed earlier in development if more extensive use of tests for neurological dysfunction within the school system were used. Additional longitudinal studies should be used to assess the long-term effects of change in neurodevelopmental status upon academic achievement (Blythe, 2009). Different settings may produce bias, so it is necessary to consider a variety of settings (Chinello et al., 2009). Also, the time of day must be considered when addressing appearance biases (Chinello et al., 2009). According to Jordan-Black (2005), there is no peer-reviewed published research on the effectiveness of reflex integration. There is ongoing controversy when discussing primitive reflexes and their effects on development (Jordan-Black, 2005). Further research on primitive reflexes and reflex integration is suggested by researchers in the studies described above.

### ***Summary.***

Reflex integration is an intervention proposed to impact academic performance, coordination, and social participation in children and adults with developmental disabilities. According to proponents of reflex integration, completing the exercises will integrate retained primitive reflexes, which will improve occupational performance. Of the 24 studies we explored, 17 were published in peer-reviewed journals. The authors researched populations with persistent primitive reflexes, biomarkers associated with the detection of developmental disabilities, and

academic outcomes, but no articles explicitly studied reflex-based interventions. The proponents of reflex integration conducted most of the research on this intervention. An inspection of expert organizations revealed that none of the organizations reviewed reflex integration. Currently, there is not sufficient evidence to support the use of reflex integration as a comprehensive intervention, but research has not concluded that the intervention is ineffective or harmful. Using the Wisconsin Determination Levels, we assigned reflex integration a Level 4 because it is not peer reviewed, there is no emerging evidence, and proponents authored many of the studies. Further research is needed to more conclusively establish the results of reflex integration as either fruitful, ineffective, or harmful.

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**Background Learning and Evidence Searches****Table of resources.**

Table 2.

*Online Articles that Address Reflex Integration Therapy*

Title/Name	Brief Description	Source
Reflex Integration Exercises	Description of main exercises used in reflex integration <a href="http://drrobertmelillo.com/2016/03/18/5-exercises-inhibit-primitive-reflexes/">http://drrobertmelillo.com/2016/03/18/5-exercises-inhibit-primitive-reflexes/</a>	Brain Balance (2016)
	Exercises developed by Dr. Robert Melillo, university professor, brain researcher, tv host, and published author <a href="http://drrobertmelillo.com/about/">http://drrobertmelillo.com/about/</a>	Health News Blog (2016)
	Business website with links to Dr. Melillo's books, tv show, and radio	
	Supported by Northwest Functional Neurology, Autism Speaks, and Generation Rescue <a href="http://drrobertmelillo.com/supporters/">http://drrobertmelillo.com/supporters/</a>	
Primitive Reflexes	Dr. Curtis Cripe-behavioral medicine and neuro-engineering.	The CrossRoads Institute (2016)
	Institute to treat children with developmental disorders (autism)	
	Discussed the importance of primitive reflexes and the different types of primitive reflexes. <a href="http://www.crossroadsinstitute.org/child-programs/123-grow/inpp-reflexes.html">http://www.crossroadsinstitute.org/child-programs/123-grow/inpp-reflexes.html</a>	
Quantum Reflex Integration (QRI)	Definition of a branch of reflex integration	Quantum Reflex Integration
	Success stories of the intervention <a href="http://reflexintegration.net/success-stories">http://reflexintegration.net/success-stories</a>	Network (n.d.)
	Integration has 30 years of use <a href="http://reflexintegration.net/">http://reflexintegration.net/</a>	

Title/Name	Brief Description	Source
Reflex Integration	<p>Website presenting research from one practitioner, Bonnie Brandes, who has 28 years of experience and a Master's degree in Multicultural Language Development  <a href="http://reflexintegration.net/home-2">http://reflexintegration.net/home-2</a></p> <p>Business website selling books, courses, and materials for completing QRI            Staff with OTR/L, OTDR/L, and M.S. CCC-SLP</p> <p>Gives a definition of reflex integration and what types of conditions benefit from it.</p>	Therapy Junction (n.d.)
Primitive Reflexes and Treatment for Children with Autism	<p><a href="http://therapyjunction.net/ri.html">http://therapyjunction.net/ri.html</a>            Describes primitive reflexes, the purposes, normative development, and signs of developmental deviation. Lists and briefly explains the two most notable methods of reflex integration.</p>	The Autism Exchange (2016)
Institute for Neuro-Physiological Psychology	<p><a href="https://www.theautismexchange.com/therapies/reflex-therapy">https://www.theautismexchange.com/therapies/reflex-therapy</a>            Describes target populations for reflex integration, proposes benefits of the intervention, offers training and assessments.  <a href="http://www.inpp.org.uk/">http://www.inpp.org.uk/</a></p> <p>Provides list of publications about reflex integration, available for purchase.  <a href="http://www.inpp.org.uk/research-publications/published-articles/">http://www.inpp.org.uk/research-publications/published-articles/</a></p> <p>Lists key proponents of reflex integration, Peter and Sally Blythe, who conducted majority of the research.  <a href="http://www.inpp.org.uk/about-us/">http://www.inpp.org.uk/about-us/</a></p>	Institute for Neuro-Physiological Psychology (2014)

**Background learning paper one.**

A brief background analysis demonstrates the importance of evidence-based practice in reflex-based interventions in children with autism. Specifically, this paper will summarize reflex integration therapy (RI). Researching the background of RI revealed themes of the hierarchy of reflexes, the correlation of reflexes and ASD, and the integration of reflexes in intervention. Furthermore, an exploration of current research revealed both the credentials of practitioners promoting RI and several areas of controversy within the intervention.

One key component of reflex integration is neurodevelopment, specifically an infant's development from displaying primitive postural reflexes. Those who use reflex integration therapy propose a hierarchy of reflexes (Futagi, Tagawa, & Otani, 1992). The classifications of reflexes are classified as primitive versus postural remains a controversial subject among scholars (Zafeiriou, 2004). Neuroscientists agree that primitive reflexes are replaced by postural reflexes during the early development of an individual, typically within the first year of life (Blythe, 2005; Zafeiriou, 2004). Examples of primitive reflexes include palmar and plantar grasp, rooting, sucking, placing, Galant, and Moro (Blythe, 2005; Chinello, Gangli, & Valenza, 2016; The Crossroads Institute, n.d.; Zafeiriou, 2004). Proponents of reflex integration therapy believe the failure of primitive reflexes to integrate is correlated to developmental disorders.

The connection between failed reflex integration and impairments is suggested in several studies. Authors believe that failure of primitive reflexes to integrate strongly contributes to the future development of impairments, including those present in ASD (Chinello et al., 2016; Institute for Neuro-Physiological Psychology, 2014; Zafeiriou, 2004). Researchers state that the persistence of primitive reflexes affects later development of both complex motor skills and communication proficiencies (Blythe & Hyland, 1998; Chinello et al., 2016). Authors disagree



about the significance of primitive reflex persistence in adults. Many suggest that their presence indicates damage to the frontal lobe or upper motor neurons (Zafeiriou, 2004). When promoting RI, researchers cite the persistence of primitive reflexes as an indicator of a future disorder.

Through RI, clinicians assert their success in integrating primitive reflexes. They state that this integration improves balance and motor dysfunction (Blythe, 2009). Reflex integration consists of many exercises, each of which reportedly addresses a different primitive reflex (Johnson, 2004; Melillo, 2016). Practitioners claim that by completing these exercises, the neural pathways of the primitive reflex can be broken and new pathways will form (Johnson, 2004). This then is believed to decrease neurological dysfunction (Blythe, 2009). Websites promoting RI list several testimonials from parents, teachers, and clinicians who claim success using this intervention.

The websites and articles focusing on RI describe the credentials and the potential bias of clinicians. These scholars have published limited research regarding reflex integration. The description of the intervention is only found on commercial websites or in articles written by the main contributors to those websites. The credentials of key researchers vary from a master's degree in education to a doctorate in neuroscience (Melillo, n.d.; Pyramid of Potential, n.d.). These sites have conspicuous links to products, talk shows, and seminar tickets available for purchase. Overall, the limited availability of evidence and the stream of available products raises concerns.

A review of websites promoting this therapy revealed controversy regarding several aspects of this intervention. There is no consensus on the classification of reflexes or on the proper evaluation for testing them. Many scales, tests, and assessments are used to evaluate primary reflexes in infants (Zafeiriou, 2004). Different sources provide varying descriptions of a

single exercise (Johnson, 2004; Melillo, 2016). The required frequency of completing the exercise regimen varies widely between sources (Blythe, 2005; Johnson, 2004; Mellilo, 2016).

The background provided of reflex integration in children with ASD demonstrates the relevance of this intervention in occupational therapy. The hierarchy of reflexes, correlation with impairments, and integration of these reflexes suggests the importance for further exploration of this intervention. The controversies in research demonstrate the need for further analysis of proponents of reflex integration.

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**Background learning paper two.**

This EBP project will examine the reflex based interventions for children with Autism Spectrum Disorder. Newer interventions have been proposed to help children with Autism Spectrum Disorder integrate the lingering reflexes from infancy and promote the normative, physical development that is age appropriate. Proponents of these reflex based interventions believe that reflexes that do not disappear after a certain period of time will contribute to problems with gross motor skills, fine motor skills, and sensory integration associated with ASD. This background paper on reflex based interventions summarizes innate reflexes, brain development, physical exercise, and integration practices to treat children with ASD.

Reflexes are a natural way in which bodies react to outside stimuli. Babies are born with innate reflexes which help the baby adapt to his/her environment, primarily in the first year of life (Autism Exchange, 2016). The moro reflex, rooting reflex, and palmer reflex are identified as some reflexes that should be integrated by 4-6 months of age (Autism Exchange, 2016). If reflexes are not present or if the reflexes do not disappear after the first year of life, some people believe babies will begin to show signs of hypersensitivity, lack of impulse control, speech delays, fine motor deficits, and even changes in personality and moods (Autism Exchange, 2016; The CrossRoads Institute, 2016; Zafeiriou, 2004). The purpose of assessing reflex onset and delays is believed to be helpful in evaluating central nervous functioning and identifying symptoms of Autism Spectrum Disorder (Autism Exchange, 2016).

The authors believe that reflexes that elicit the fight-or-flight reflexive response should cease within the first year of life or the baby will become hypersensitive to his/her surroundings (My Child Will Thrive, 2016). Moreover, the authors believe these hypersensitive responses both affect the central nervous functions and contribute to symptoms of Autism Spectrum

Disorder, including difficulties tuning out background noises and adverse reactions to change (Autism Exchange, 2016; My Child Will Thrive, 2016). The authors believe children with Autism Spectrum Disorder have difficulties with gross motor skills that are likely due to issues with reflexes (Autism Exchange, 2016; Lang, Koegel, Ashbaugh, Regeister, Ence, Smith, 2010). In terms of treating ASD, authors believe that lack of physical activity exacerbates symptoms because the physical inactivity contributes to gross motor deficits and lack of body awareness (Lang et. al, 2010).

Physical exercise is claimed to improve symptoms of ASD because physical activity promotes physical stability (Lang et. al, 2010). Some treatments are believed to promote positive reflex development including ball squeezing for the grasp reflex, fencing for proprioceptive measures, “starfish” exercises for the moro reflex including arms and wrists, and face stroking to eliminate the sucking reflex (Melillo, 2016). Physical exercise is believed to increase occupational and physical performance and reduce lingering reflexes (Melillo, 2016; Lang et. al, 2010). Integration of motor development with neuro development allegedly helps improve the physical symptoms associated with ASD (Lang et. al, 2010; Melillo, 2016; My Child Will Thrive, 2016).

Reflex integration in outpatient therapy and home practices are believed to alleviate symptoms of ASD and to promote normative development across the lifespan. The Quantum Reflex Integration, often performed at home, combines auditory and reflex techniques to reportedly develop neurological process skills (QRI, 2016). The cold laser is believed to elicit quick results to connect nerve cells in the brain that heals damaged nerves (QRI, 2016). QRI is believed to help promote reflex development using laser therapy, and, ultimately, enhance the development of children with ASD (QRI, 2016). Proponents of QRI believe it helps with the

symptoms of ASD.

This summary of reflex intervention practices provides knowledge about innate reflexes, developmental delays, and available treatments for children with Autism Spectrum Disorder. Some believe physical exercise is the way to help alleviate symptoms of Autism Spectrum Disorder while others believe Quantum Reflex Integration is key for promoting the wellbeing of developmental deviations. Understanding the different methods of treating ASD is pertinent to understand the context of how developmental deviations are approached.

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Zafeiriou, D. I. (2004). Primitive reflexes and postural reactions in the neurodevelopmental examination. *Pediatric neurology*, 31(1), 1-8

**Background learning paper three.**

This EBP project will focus on reflex based interventions for children with ASD and a description of the characteristics of reflex integration. Background learning on this topic explored definitions of reflex integration, types of primitive reflexes, exercises for reflex integration, and the different techniques involved in reflex integration.

Reflex integration is a treatment approach that claims to use patterns of movement to establish nerve connections among the brain and the body. “Dr. Svetlana Masgutova describes a reflex as an ‘automatic response of the nervous system as a result of a trigger from a stimulus,’” (Therapy Junction, n. d.). The purpose of a reflex is for survival and protection. When a reflex does not develop correctly motor skills and movement are believed to be affected (Therapy Junction, n. d.). There are conditions that could reportedly benefit from reflex integration which include autism, learning disabilities, down syndrome, cerebral palsy, ADD/ADHD, etc. (Therapy Junction, n. d.). There are few websites that talk about the research behind reflex integration and how it is incorporated into therapy to promote improvement in a client.

Primitive reflexes are important for development and the presence or absence of a reflex may be part of the cause of motor, sensory, and developmental delays (Crossroads Institute, 2016). These reflexes are present in the first year of a child’s life and then get replaced with postural reflexes, if they are not replaced with postural reflexes that is when developmental delays are reported to occur (Autism Exchange, 2016). For example, one website claims the Moro reflex develops into the Strauss reflex and should not be active in a child past the age of one; they state that although this reflex helps the baby hang on and cry. The Moro reflex in an adult may be seen in a need to ask a lot of questions and establish control, and difficulty making relationships with another person (Crossroads Institute, 2016).



Therapists are using specific exercises in reflex integration to inhibit the primitive reflexes present in their clients. Face stroking, starfish, snow angels, ball squeezes, and fencer exercises are used to supposedly inhibit a specific reflex (Melillo, 2016). It is believed that in these exercises the frequency is more important than the intensity and the movement should have a purpose and be slow (Melillo, 2016). For example, the starfish exercise is proposed to inhibit the Moro reflex. The child starts in the fetal position and is asked to take a deep breath in and then throw their arms and legs out like a starfish while holding their breath for 5-7 seconds. After that the child will return to the original positions; this should be done 6 times in a row, a few times a day until the reflex is completely inhibited (Melillo, 2016). Dr. Robert Melillo is the creator of the Brain Balance-Achievement Center program. He has been a clinician for 25 years having experience with a variety of developmental disabilities and claims to have conducted years of brain research (Brain Balance, 2016). This program is designed to focus on addressing the main issue in learning disabilities and behavioral disorders (Brain Balance, 2016). There were not many valid sources for the types of exercises involved in reflex integration. Dr. Robert Melillo's website was the only source that we found that described specific exercises that benefit reflex integration.

Quantum reflex integration (QRI) is a common type of reflex integration used throughout the field. QRI uses cold lasers, sound, and reflex integration to provide the most beneficial treatment to the client (Quantum Reflex Integration Network, n.d.). QRI is used to re-pattern primitive reflexes and lifelong reflexes for effective neurological processing (Quantum Reflex Integration Network, n.d.). Bonnie Brandes is the founder of QRI and has been working with children and adults with learning and physical disabilities and behavioral issues for 28 years. She has worked with different machines and techniques for 30 years to incorporate frequencies into

her therapy (Quantum Reflex Integration Network, n.d.). Brandes provides QRI classes for parents and has developed a home program allowing parents to provide this service to their children. Brandes has reported improvements in clients that have autism, brain injury, cerebral palsy, and parkinson's disease. (Quantum Reflex Integration Network, n.d.). The sources found on QRI were very limited with a lack of evidence on the benefits for this technique.

This background summary of reflex based in emphasizes the importance of reflex integration. An understanding of definitions, application, types and benefits of reflex integration provides an important context for this project. There were limited sources that discussed the overall concept and benefits of reflex integration.

#### References

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<https://www.theautismexchange.com/therapies/reflex-therapy>

Brain Balance. (2016). About. Retrieved from <http://drrobertmelillo.com/about/>

The CrossRoads Institute. (2016). Primitive reflexes. Retrieved from

<http://www.crossroadsinstitute.org/child-programs/123-grow/inpp-reflexes.html>

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<http://reflexintegration.net/>

**Evidence searches.**

**Name of Library and Online Databases:** PubMed, Citation Tracking (through Google Scholar)

**Name of Database and Database Provider/System:** PubMed

**Preparing for Search Process**

- When using PubMed, I searched using both MeSH and all fields. MeSH corrected reflex therapy to reflexotherapy. However, this definition was not consistent with the types of intervention in this project. I used the broader categories of therapeutics and rehabilitation.
- My background learning identified primitive reflexes as a core component of reflex-based interventions. This also was not listed as a MeSH category, so I used MeSH terms reflex, abnormal. I also identified the MeSH term posture from articles and used this term in several subsequent searches.
- Applying a time filter eliminated almost every relevant article, so I removed the time filter for most of the searches.
- For this project, we identified the main population as children with ASD, so I added the MeSH terms child; child development; and child, preschool to several of the searches.

**Summarizing a Strategic Search Process**

Filters/Years	Keywords	Total Yield/ Relevant Hits	Date
None Years: Unlimited	"Reflex Integration"[All fields]	23/4 Niklasson, 2012 Ottenbacher, 1983 Pilecki et al., 2012 Ender & Eimon, 1978	November 10, 2016
None Years: Unlimited	("Autism Spectrum Disorder" [MeSH] AND "Reflex, Abnormal" [MeSH])	1/1 Samango-Sprouse et al., 2015	November 10, 2016
None Years: Unlimited	("Reflex, Abnormal"[Mesh]) AND "Child Development"[Mesh]	37/3 Futagi, Suzuki, & Goto, 1999 Futagi & Suzuki, 2010 Capute et al., 1984	November 10, 2016
None Years: Unlimited	((("Posture"[Mesh]) AND "Developmental Disabilities"[Mesh]) AND "Reflex, Abnormal"[Mesh])	3/1 Zafieiriou, 2004	November 10, 2016
None Years: 2006-2016	((("Reflex, Abnormal"[Mesh]) AND "Posture"[Mesh]) AND "Child"[Mesh])	2/0	November 10, 2016

None Years:2000-2016	((("Reflex, Abnormal"[Mesh]) AND "Posture"[Mesh]) AND "Child"[Mesh])	4/0	November 10, 2016
None Years: Unlimited	((("Reflex, Abnormal"[Mesh]) AND "Posture"[Mesh]) AND "Child"[Mesh])	31/2 Rider, 1972 Schneebergerdeataide, 1964	November 10, 2016
None Years: Unlimited	((("Therapeutics"[Mesh]) AND "Autism Spectrum Disorder"[Mesh]) AND "Reflex"[Mesh])	3/0	November 14, 2016
None Years: Unlimited	("Rehabilitation"[Mesh]) AND "Reflex, Abnormal"[Mesh] AND "Autism Spectrum Disorder"[Mesh])	0/0	November 14, 2016
None Years: Unlimited	((("autistic disorder"[MeSH] OR ("autistic"[All Fields] AND "disorder"[All Fields]) OR "autistic disorder"[All Fields] OR "autism"[All Fields]) AND Motor[All Fields]) AND (primitive[All Fields] AND ("reflex"[MeSH Terms] OR "reflex"[All Fields] OR "reflexes"[All Fields]))	4/1 Chinello, Gangli, Valenza, 2016	November 14, 2016
None Years: Unlimited	"Autistic Disorder"[Mesh] AND "Reflex"[Mesh] AND "child, preschool"[Mesh])	19/1 Accardo & Barrow, 2015	November 14, 2016
None Years: Unlimited	"movement disorders"[Mesh] AND "rehabilitation"[Mesh] and "reflex"[Mesh])	15/0	November 14, 2016
None Years: Unlimited	"Child Development"[MAJR] AND "Infant"[MeSH Terms] AND "Reflex, Abnormal/diagnosis"[MAJR]	2/2 Marquis et al., 1984 Capute et al. 1984	November 14, 2016

**Summary of 5 BEST Research Articles**

Chinello, A., Gangli, V. D., Valenza, E. (2016). Persistent primary reflexes affect motor acts:

Potential implications for autism spectrum disorder. *Research in Developmental Disabilities*, 1-9. doi:10.1016/j.ridd.2016.07.010

**Abstract:** In typical motor development progress in use of goal-directed actions and communicative gestures depends on the inhibition of several primitive reflexes, especially those that involve the hand or mouth. This study explored the relationship between the persistence of primitive reflexes that involve the hand or mouth and the motor repertoire in a sample of 12- to 17-month-old infants. Moreover, since children with Autism Spectrum Disorders (ASD) often have difficulty in performing skilled movements and show poor gesture repertoire, and since ASD represents the upper extreme of a constellation of traits that may be continuously distributed in the general population, we investigated the relationship between the persistence of primitive reflexes in the same sample of infants and the subclinical autistic traits measured in their parents. Results revealed that the persistence of the primitive reflexes correlated with motor repertoire irrespective of infant's age, and it was greater among infants whose parents had more subclinical autistic traits. Our findings suggest that the persistence of primitive reflexes might alter the developmental trajectory of future motor ability and therefore their evaluation might be an early indicator of atypical development. (Chinello, Gangli, & Valenza, 2016)

Futagi, Y. & Suzuki, Y. (2010 August). Neural mechanism and clinical significance of the plantar grasp reflex in infants. *Pediatric Neurology*, 43(2), 81-86.

doi:10.1016/j.pediatrneurol.2010.04.002

**Abstract:** The plantar grasp reflex can be elicited in all normal infants from 25 weeks of postconceptional age until the end of 6 months of corrected age according to the expected birth date. This reflex in human infants can be regarded as a rudiment of responses that were once essential for ape infants in arboreal life. The spinal center for this reflex is probably located at the L<sub>5</sub>-S<sub>2</sub> levels, which, however, are controlled by higher brain structures. Nonprimary motor areas may exert regulatory control of the spinal reflex mechanism through interneurons. In infants, this reflex can be elicited as the result of insufficient control of the spinal mechanism by the immature brain. In adults, lesions in nonprimary motor areas may cause a release of inhibitory control by spinal interneurons, leading to a reappearance of the reflex. The plantar grasp reflex in infants is of high clinical significance. A negative or diminished reflex during early infancy is often a sensitive indicator of spasticity. Infants with athetoid type cerebral palsy exhibit an extremely strong retention of the reflex, and infants with mental retardation also exhibit a tendency toward prolonged retention of the reflex. (Futagi & Suzuki, 2010)

Marquis, P. J., Ruiz, N. A., Lundy, M. S., & Dillard, R. G. (1984 June). Retention of primitive reflexes and delayed motor development in very low birth weight infants. *Journal of Developmental & Behavioral Pediatrics*, 5(3), 124-126.

**Abstract:** Primitive reflexes and motor development were evaluated in 127 very low birth weight (VLBW) infants (birth weight less than 1501 grams) at four months corrected age. The asymmetrical tonic neck reflex, tonic labyrinth reflex, and Moro reflex were assessed for each child. The ability of each child to reach (obtain a red ring) and roll were observed. The child's performance on the gross motor scale of the Denver Development Screening Test was recorded. Thirty-seven term infants were administered identical evaluations at four months of age. The VLBW infants retained stronger primitive reflexes and exhibited a significantly higher incidence of motor delays than term infants. Significant correlations existed between the strength of the primitive reflexes and early motor development for VLBW infants. This study confirms a high incidence of motor delays among VLBW infants and demonstrates a clear association between retained primitive reflexes and delayed motor development in VLBW infants. (Marquis, Ruiz, Lundy, & Dillard, 1984)

Rider, B. A. (1972 July). Relationship of postural reflexes to learning disabilities. *American Journal of Occupational Therapy*, 26(5), 239-243.

**Abstract:** Compared the prevalence of abnormal reflex responses in 38 normal 2nd graders and in 20 learning disabled 6-13 yr. olds. The learning disabled Ss had significantly more abnormal reflex responses than the normals ( $p < .02$ ). Some of the normal Ss exhibited abnormal reflex responses and others exhibited no abnormal reflexes. Ss who had no abnormal reflex responses scored higher on the Wide Range Achievement Test (WRAT) than did Ss who had abnormal responses. This correlation was significant for the Spelling test ( $p < .01$ ), approached significance in the Reading test, but failed to reach significance in the Arithmetic test. Boys in this group had significantly more abnormal reflex responses than the girls in the same class. (Rider, 1972)

Zafieriou, D. I. (2004). Primitive reflexes and postural reactions in the neurodevelopmental examination. *Pediatric Neurology*, 31(1), 1-8. doi:10.1016/j.pediatrneurol.2004.01.012

**Abstract:** The primitive reflexes and the postural reactions comprise one of the earliest, simplest, and most frequently used tools among child neurologists to assess the central nervous system integrity of infants and young children. Infants with cerebral palsy have been known to manifest persistence or delay in the disappearance of primitive reflexes and pathologic or absent postural reactions. The clinical significance of asymmetric tonic neck reflex, Moro, palmar grasp, plantar grasp, Galant, Babinski, Rossolimo, crossed extensor, suprapubic extensor, and heel reflex, alone or in combination, as well as their contribution to the early diagnosis and differential diagnosis of cerebral palsy, have been demonstrated in a number of studies. Moreover, infants with 5 or more abnormal postural reactions have developed either cerebral

palsy or developmental retardation as reported in a number of studies. Although a comprehensive neurologic examination in the context of a motor assessment instrument is preferable to an informal list of items, the combined examination of primitive reflexes and postural reactions should be considered by the child neurologist, as a simple but predictive screening test for the early identification of infants at risk for cerebral palsy. It is quick and easy to perform, both in nonhospital environments and in underdeveloped countries, where time and specific resources are limited. The combined examination is also useful in developed countries because many developmental disorders such as cerebral palsy appear in nonrisk groups whereas others are not detected by metabolic screening programs. (Zafieriou, 2004)

**Other Evidence Resources:**

**Evidence Resource:** Citation tracking through Google Scholar of the following article:  
Blythe, S. D. (2005). Releasing educational potential through movement: A summary of individual studies carried out using the INPP test battery and developmental exercise programme for use in schools with children with special needs. *Child Care in Practice*, 11, 415-432. doi: 10.1080/13575270500340234

***Preparing for Search Process***

- In my background learning from Project 1, I identified Sally Blythe, BSc, as one of the key practitioners overseeing reflex integration programs. When describing this intervention, the Institute for Neuro-Physiological Psychology [INPP] referenced Blythe's article published in a peer-reviewed journal, *Child Care in Practice*. While this article is relevant to our area of intervention, the research from this article was conducted over ten years ago. I skimmed this article and was curious to see what fields are using this study as evidence for movement-based intervention.
- I used Google Scholar citation tracking for two purposes: to see what fields are using this study as evidence for intervention and to determine if anyone has completed a follow-up to this study. I used the citation tracking tool on Google Scholar to identify the articles that have used Blythe's research.
- After identifying the articles that cited Blythe's work, I narrowed the search using the filter tool.

***Summarizing Strategic Process***

- Step 1 (November 10, 2016): I identified this key article through the INPP website.
- Step 2 (November 14, 2016): I found this article through Google Scholar, using the author, date, and journal title identified on the INPP website.
- Step 3 (November 14, 2016): I opened the "cited by 36" hyperlink found under the article of the article.
- Step 4 (November 14, 2016): Within the thirty-six citing articles, I added the filter of "autism" to all fields. I did not add a time filter because all thirty-six of the articles were published after 2005.
- Step 5 (November 15, 2016): Of the 11 remaining articles, I identified six that were relevant to reflex integration. They fell into the following categories:
  - a. Thesis projects in fulfillment of a Master's Degree (Grigg, 2016; Hagemann, 2014; Hoag, 2015)
  - b. Review of interventions, including reflex integration (Hyatt, Stephenson, & Carter, 2009; Stephenson, 2009)
  - c. Follow-up research (Callcott, 2012)
- Step 6 (November 15, 2016): When skimming these six articles, I noticed several studies repeatedly referenced. These articles had not previously arisen in my searches. I identified the articles most frequently cited in the six articles.
- Step 7 (November 15, 2016): Using the information from the reference list, I utilized Google Scholar to search for the articles using the author, title, and year (Jordan-Black, 2005; McPhillips, Hepper, & Mulhern, 1997).



*Summary of 5 BEST Research Articles or Credible Resources*

Callcott, D. (2012 June). Retained primary reflexes in pre-primary-aged Indigenous children:

The effect on movement ability and school readiness. *Australasian Journal of Early Childhood*, 37(2), 132-140.

**Abstract:** The research reported in this paper links children's movement skills with learning difficulties, particularly school readiness, in the early years. The aim of the research project was to (a) determine the prevalence and severity of retained reflexes, predominantly the Asymmetrical Tonic Neck Reflex (ATNR), and (b) investigate the movement skill ability of pre-primary-aged Indigenous children in the Kimberley region of Western Australia. This provided an important first step in understanding and addressing movement skill deficits that may compromise the acquisition of foundation school readiness skills in young Australian Indigenous children. This project challenged the stereotypical assumption (by non-Indigenous Australians) that the majority of Indigenous Australian children have well-developed or even above-average movement skill development, based on their being more likely than non-Indigenous children to engage in regular physical activity and perform well in sport. It was important to test this assumption if a comprehensive picture of the developmental challenges and educational disadvantages faced by Indigenous Australian children, particularly those in remote regional areas, was to be established. Sixty-five per cent of the sample of Indigenous children were found to have retained moderate to high levels of the Asymmetrical Tonic Neck Reflex (ATNR) which in previous research has been linked to developmental delay, not only in movement skills but also in areas strongly related to academic achievement. (Callcott, 2012)

Hoag, J. K. (2015). *Developing the brain through movement* (Unpublished master's thesis).

University of Victoria: Victoria, British Columbia.

**Abstract:** Movement has long been seen as facilitating learning. Recent research in neuroplasticity tells us the brain is a dynamic organ capable of change and that movement can affect executive function. This paper proposes to explore the relationships between movement, motor function and executive function in typical primary children. The role of primary reflexes in motor function and executive function is examined. A research study is proposed. The purpose of the study is to find if a specific movement program can facilitate the integration of primary reflexes, thus aiding in motor function, and the affect this may have on executive functioning in children in the primary grades. Results could have implications in the early years for practices that may lay a strong foundation for healthy neurodevelopment, responsible for executive function such as reading and selfregulation.

Hyatt, K., Stephenson, J., & Carter, M. (2009 May). A reiew of three controversial educational

practices: Perceptual motor programs, sensory integration, and tinted lenses. *Education &*

*Treatment of children*, 32(3), 313-342. doi:10.1353/etc.0.0054

**Abstract:** Children with disabilities have frequently participated in various interventions before the efficacy of those practices was scientifically validated. When subsequent scientific evidence failed to support particular practices, those that had already made inroads into the educational arena frequently continued to be used. Given the current emphasis on the use of empirically validated interventions, a review of research on the efficacy of educational interventions is consistent with guidelines from the No Child Left Behind Act (2001) and the Individuals with Disabilities Education Act (2004). The research findings regarding three relatively common, yet controversial, practices failed to support the continued use of perceptual motor programs, sensory integration therapy, and tinted lenses. Educators are encouraged to become informed consumers of research and implement evidence-based practices.

Jordan-Black, J. A. (2005). The effects of the Primary Movement programme on the academic performance of children attending ordinary primary school. *Journal of Research in*

*Special Educational Needs*, 5(3), 101-111. doi:10.1111/J.1471-3802.2005.00049.x

**Abstract:** The present study investigated the prevalence of a primary reflex (the Asymmetrical Tonic Neck Reflex) in children attending ordinary primary school and how this related to attainments in a number of academic areas. The effectiveness of a specific movement intervention programme in reducing primary reflex persistence and improving academic attainment was also evaluated. A comparative study of the progress of 683 children over a two-year period from Years 3 and 5, who completed an intervention programme known as Primary Movement, was carried out using the relative attainments of children at the same schools and standardised scores as baseline and follow-up measures. A second, quasi-experimental study followed the progress of four parallel groups in each of two large schools with the experimental side completing the movement intervention programme while the other side acted as the control. It was found that ATNR persistence was significantly associated with level of attainments in reading, spelling and mathematics and that boys were more at risk than girls for ATNR persistence. In both studies, it was found that the movement intervention programme had a very significant impact on reducing the levels of ATNR persistence in children and that this was associated with very significant improvements in reading and mathematics, in particular. This research provides further evidence of a link between the attainment of core educational skills and the interference that may result from an underlying developmental deficit. The effectiveness of the intervention programme in reducing ATNR persistence and in increasing academic attainments suggests that this programme could be used to complement other strategies that have been shown to have a positive effect on children's learning.

McPhillips, M., Hepper, P. G., Mulhern, G. (1997). Effects of replicating primary-reflex movements on specific reading difficulties in children: A randomized double-blind, controlled trial. *The Lancet* (North American Ed.), 355(9203), 537-541.

doi:10.1016/S0140-6736(99)02179-0

**Abstract:** Children with specific reading difficulties have problems that extend beyond the range of underlying language-related deficits (eg, they have difficulties with balance and motor control). We investigated the role of persistent primary reflexes (which are closely linked in the earliest months of life to the balance system) in disrupting the development of reading skills. We assessed the efficacy of an intervention programme based on replicating the movements generated by the primary-reflex system during fetal and neonatal life. A randomised, individually matched, double-blind, placebo-controlled design was used and children (aged 8–11 years) with persistent primary reflexes and a poor standard of reading were enrolled into one of three treatment groups: experimental (children were given a specific movement sequence); placebo-control (children were given non-specific movements); and control (no movements). From an initial sample of 98 children, 60 children, 20 in each group were matched on age, sex, verbal intelligence quotient (IQ), reading ability, and persistent asymmetrical tonic neck reflex. For asymmetrical tonic neck-reflex levels there was a significant (group by time) interaction ( $p < 0.001$ ). The experimental group showed a significant decrease in the level of persistent reflex over the course of the study (mean change  $-1.8$  [95% CI  $-2.4$  to  $-1.2$ ],  $p < 0.001$ ), whereas the changes in the placebo-control and control groups were not significant ( $-0.2$  [ $-0.9$  to  $0.6$ ] and  $-0.4$  [ $-0.9$  to  $0.2$ ]). This study provides further evidence of a link between reading difficulties and control of movement in children. In particular, our study highlights how the educational functioning of children may be linked to interference from an early neurodevelopmental system (the primary-reflex system). A new approach to the treatment of children with reading difficulties is proposed involving assessment of underlying neurological functioning, and appropriate remediation. (McPhillips, Hepper, & Mulhern, 1997).

**Library Database: PSYCInfo*****Preparing for Search Process***

- Reflex based interventions is not a title in PSYCInfo. There were studies about reflexes and there were studies about intervention strategies that included the word reflexes, but not a single study about reflex based interventions
- There was substantial research available for Autism Spectrum Disorder and reflexes. The intervention piece, however, was sparse.
- “Reflexes” yielded more results than “abnormal reflexes”
- Headings and subheadings:  
“Autism Spectrum Disorder”

***Summarizing a Strategic Search Process***

Filters/Years	Keywords	Total Yield/Relevant Hits	Date
Years: Unlimited	(“Autism Spectrum Disorder”[MeSH]) AND “reflexes” [Anywhere]	149/5 <b>Melillo, (2016)</b> <b>Samango-Sprouse et. al, (2015)</b>	November 13 <sup>th</sup> , 2016
Years: Unlimited	(“Autism Spectrum Disorder”[MeSH]) AND “reflexes”[Anywhere] OR “abnormal reflexes” [Anywhere] AND “early intervention”[Anywhere]	3/1 <b>Anderson, (2009)</b>	November 13 <sup>th</sup> , 2016
Years: Unlimited	(“Developmental Disabilities” [MeSH]) AND “reflexes [Anywhere] OR “reflex integration” [Anywhere]	31/4 <b>de Bildt, et. al, (2012)</b> McPhillips & Sheehy, (2004) Short, Watson, Ottenbacher & Rogers (1983) Willians & Burke, (1995)	November 13 <sup>th</sup> , 2016
Years: Unlimited	(“Reflex Integration” [MeSH]) AND “Occupational Therapy”[Anywhere]	5/3 Bigby, (1983) <b>Ottenbacher, (1982)</b> Parementer, (1983)	November 13 <sup>th</sup> , 2016
Type of Article: Journal, Journal Article Years: 10 years	(“Autism Spectrum Disorder”[MeSH]) AND “reflexes” [Anywhere]	41/4 Daluqatte, Miles, Sun & Yao, (2015) Fan, Miles, Takahashi & Yao, (2009) Kliemann, Dziobek, Hatri, Stiemke & Heekeren, (2010) <b>Samango-Sprouse, et. al, (2015)</b>	November 13 <sup>th</sup> . 2016

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### ***Summary of 5 Best Research Articles***

Anderson, G. M. (2009). Conceptualizing autism: The role for emergence. *Journal of the American Academy of Child & Adolescent Psychiatry*, 48(7), 688-691. Retrieved from <http://pearl.stkate.edu/login?url=http://search.proquest.com.pearl.stkate.edu/docview/622044497?accountid=26879>  
doi: <http://dx.doi.org.pearl.stkate.edu/10.1097/CHI.0b013e3181a5e3d5>

“Most behavioral, neurobiological, and genetic research has approached autism categorically. The potential separability of autism-related traits may provide especially fruitful reductionist routes to, research on autism. Many of the causative factors that are operating in autistic individuals are also probably playing a role in social, communicative, and repetitive behavior in family members and in the general population. The emergence of nonfamilial phenomena in the autistic individual is probably best represented by intellectual disability (ID). It is generally accepted that family members of individuals with autism do not have scholastic difficulties or cognitive impairment at rates much or at all above those seen in the general population. The lifetime prevalence of seizures in individuals meeting criteria for autism is approximately 33%. The remarkable persistence of primitive snout and visual rooting reflexes in children and young adults with autism has been reported. There are an increasing number of reports of early brain growth abnormality in a substantial proportion of individuals with autism. Future genetic, biological, behavioral, and therapeutic investigations in autism may well be guided to a large extent depending on the emergent or nonemergent nature of the trait being studied. (PsycINFO Database Record (c) 2016 APA, all rights reserved)”

de Bildt, A., Mulder, E. J., Van Lang, Natasja D. J., de With, S. A. Jytte, de Minderaa, R. B., Stahl, S. S., & Anderson, G. M. (2012). The visual rooting reflex in individuals with autism spectrum disorders and co-occurring intellectual disability. *Autism Research*, 5(1), 67-72. Retrieved from <http://pearl.stkate.edu/login?url=http://search.proquest.com.pearl.stkate.edu/docview/1095460277?accountid=26879>  
doi: <http://dx.doi.org.pearl.stkate.edu/10.1002/aur.225>

“The rooting reflex has long been studied by neurologists and developmentalists and is defined as an orientation toward tactile stimulation in the perioral region or visual stimulation near the

face. Nearly, all previous reports of the visual rooting reflex (VRR) concern its presence in adults with neurological dysfunction. Previously, the VRR was reported to be present in a majority of individuals with autism and absent in control subjects. In the present larger study, we examined the presence of the VRR in 155 individuals with ASD and co-occurring Intellectual Disability (ASD + ID: autism, N = 60; Pervasive Developmental Disorder-Not Otherwise Specified (PDD\_NOS), N = 95) and in a contrast group of 65 individuals with ID only. The VRR was present significantly more often in the ASD + ID (43.9%) group than in the ID-only group (24.6%;  $\chi^2_1$  (7.19; P = 0.007). Individuals with autism displayed a VRR more often (55.0%) than individuals with PDD-NOS (36.8%;  $\chi^2_1$  = 4.92; P = 0.026) and individuals with ID only (24.6%;  $\chi^2_1$  = 12.09; P = 0.001). A positive VRR was associated with lower IQ and adaptive functioning; in the ASD + ID group, ADI-R/ADOS domain scores were significantly higher in the VRR-positive subgroup. The results replicate and extend the finding of an increased occurrence of the VRR in autism. Although some association with IQ was observed, the VRR occurred substantially more often in the autism group compared with an intellectually disabled group, indicating some degree of specificity. Additional studies of infants and children with typical development, ASD and ID are needed to determine the utility of the VRR in ASD risk assessment and to elucidate possible specific behavioral associations. (PsycINFO Database Record (c) 2016 APA, all rights reserved)(journal abstract)”

Melillo, R. (2016). Persistent primitive reflexes and childhood neurobehavioral disorders. In G.

Leisman, & J. Merrick (Eds.), *Neuroplasticity in learning and rehabilitation*. (pp. 65-99)

Nova Biomedical Books, Hauppauge, NY. Retrieved from

<http://pearl.stkate.edu/login?url=http://search.proquest.com/docview/1791347364?accountid=26879>

“Persistent primitive reflexes have been noted in a number of neurobehavioral disorders and are thought to be related to delayed or absent developmental milestones in this population of children. This is also associated with the presence of clumsiness, incoordination, awkward posture, gait and other motor disturbances. The degree of motor incoordination seems to be related to cognitive dysfunction as well. ADHD, autism, dyslexia as well as almost all neurodevelopmental disorders have been associated with anatomical and functional effects that correlate with the motor incoordination, motor disturbance, cognitive delays and the presence of persistent primitive reflexes. For some time researchers have debated if the structural anatomic and volumetric differences in disorders such as ADHD and autism represent deviant developmental changes or whether they reflect a maturational delay. We review the literature that clearly demonstrates that these disorders and the structural differences represent cortical maturational delays not deviant development. We also note that persistent primitive reflexes are the earliest markers for this delay and that this delayed maturation will eventually lead to the presence of autism, ADHD, and other neurobehavioral disorders. We also note that these disorders and their recent reported increased incidence is related to a combination of genetic and epigenetic factors mostly driven by environmental and lifestyle changes affecting early motor development, sensory stimulation and activity dependent synaptogenesis and neuroplasticity.

Symptom variations between these neurobehavioral disorders may be related to asymmetrical maturational differences resulting from different rates of maturation of the right and left hemisphere. Asymmetric persistent primitive reflexes may also be an early marker related to this maturational imbalance. This abnormal pattern of hemispheric asymmetry may lead to desynchronization, underconnectivity, and ultimately a functional disconnection between regions of the brain and cortex. Lastly we comment of the possibility of exercises that can inhibit and remediate persistent primitive reflexes as one possible target for early treatment of these disorders. (PsycINFO Database Record (c) 2016 APA, all rights reserved)(chapter)”

Ottenbacher, K. (1982). Sensory integration therapy: Affect or effect. *American Journal of*

*Occupational Therapy*, 36(9), 571-578. Retrieved from

<http://ajot.aota.org/article.aspx?articleid=1887658> doi:10.5014/ajot.36.9.571

“Reviewed 8 studies examining the effectiveness of sensory integration therapy using recently developed quantitative methods that treat the literature review process as a unique research type. The studies investigated the effect of sensory integration therapy; included dependent measures of academic achievement, motor or reflex performance, and/or language function; compared at least 2 groups; and reported quantitative results of the effect of sensory integration therapy. The 8 studies contained 47 hypothesis tests that evaluated the effectiveness of sensory integration therapy. An analysis of these tests revealed that Ss (such as mentally retarded children) participating in sensory integration therapy performed significantly better than members in the control groups who did not receive therapy. The advantages of quantitative reviewing procedures are discussed, and use of the procedures with the developing occupational therapy research literature is recommended. (41 ref) (PsycINFO Database Record (c) 2016 APA, all rights reserved)”

Samango-Sprouse, C., Stapleton, E. J., Aliabadi, F., Graw, R., Vickers, R., Haskell, K., . . .

Gropman, A. L. (2015). Identification of infants at risk for autism spectrum disorder and developmental language delay prior to 12 months. *Autism*, 19(3), 327-337. Retrieved from

<http://pearl.stkate.edu/login?url=http://search.proquest.com/docview/1673081300?accountid=26879> doi: <http://dx.doi.org/10.1177/1362361314521329>

“Studies have shown an increased head circumference and the absence of the head tilt reflex as possible risk factors for autism spectrum disorder, allowing for early detection at 12 months in typically developing population of infants. Our aim was to develop a screening tool to identify infants prior to 12 months at risk for autism spectrum disorder and developmental learning delay, not affected by literacy or primary parental language, and provide immediate determination of risk for autism spectrum disorder. An abrupt head circumference acceleration and the absence of

head tilt reflex by 9 months were used to identify infants at risk for autism spectrum disorder. Stability of early findings was then investigated when compared to comprehensive standardized neurodevelopmental assessment results and complete neurological and genetics evaluations. A total of 1024 typically developing infants were enrolled by 9 months, with 14 identified as at risk for autism spectrum disorder and 33 for developmental learning delay. There was a good positive predictive value for the identification of autism spectrum disorder prior to 12 months. This study demonstrates an efficient means to identify infants at risk for autism spectrum disorder by 9 months of age and serves to alert primary care providers of infants who are vulnerable for autism spectrum disorder before symptoms are discernible by clinical judgment of primary care providers, parental concerns, or by screening questionnaires.”



**Evidence Resource:** Google Scholar

***Preparing for Search Process***

- The Samango-Sprouse et. al, (2015) article appeared in two of my searches and contained the most relevant information for the topic of reflex intervention in children with developmental disabilities. The article provided evidence from over one thousand infants that a large head circumference and an absence of the head tilt reflex is a possible risk factor for Autism Spectrum Disorder and language delays (Samango-Sprouse et. al, 2015) This article provides evidence for identifying infants under 12 months old who are at risk for developmental disabilities.
- **Goal: Is there more evidence to suggest that ASD can be screened before 12 months of age?** Since the reflex based interventions claim primitive reflexes should be gone as early as four months of age, it would be helpful to know when symptoms of autism appear. Previous evidence has shown symptoms of ASD emerging around 18 to 24 months (Samango-Sprouse et. al, 2015). If the appearance of symptoms of ASD are related to the delayed disappearance of primitive reflexes, then reflex based interventions could be more convincing.
  - The sources claimed both neural differences and reflexes that are present in children later diagnosed with Autism Spectrum Disorder. Some authors believe primitive reflexes that are apparent behind the first year are predictive of ASD, including the snout and visual rooting reflexes, the eyeblink reflex, the asymmetrical tonic neck reflex, the protective reflex, and more (Anderson, 2008; Stanton, Peloso, Brown, & Rodier, 2007; Teitelbaum, Teitelbaum, Fryman, & Maurer, 2002; Tietelbaum, Teitelbaum, Fryman, & Maurer, 2002). The articles ranged from small case studies to qualitative studies. Some studies agreed that reflexes should disappear within the first year of life and persistence of primitive reflexes indicates ASD (Anderson, 2008; Teitelbaum, Teitelbaum, Fryman, & Maurer, 2002; Tietelbaum, Teitelbaum, Fryman, & Maurer, 2002). Others suggested gestational environment and toxins could influence neural development leading to ASD (Stanton, Peloso, Brown, & Rodier, 2007). The more recent articles summarized retrospective and prospective studies around ASD detection and suggested there are pre-symptomatic signs and potential biomarkers that detect ASD early on (Zwaigenbaum, Bryson, & Garon, 2013). None of the studies found, however, examined reflex integration therapeutic practices.

***Documenting the Search Process***

- **Goal: Is there more evidence to suggest that ASD can be screened before 12 months of age?** The steps I used to find the more evidence on ASD screening before 12 months of age are as follows:
  - Searched “ASD screening infancy”
  - Narrowed search to “ASD infancy head reflexes”
  - Searched “Primitive reflexes ASD”
  - Searched “reflex integration ASD”
  - Chose the five best sources to which I had access without paying

*Summary of 5 Best Research Articles*

Anderson, G. M. (2008). The potential role for emergence in autism. *Autism Research, 1*(1), 18-30. doi: 10.1002/aur.2

“Although most research on autistic behavior has considered autism categorically, the increasingly apparent genetic and phenotypic complexities of autism are prompting a more dimensional approach to this area. The long-standing interest in a less categorical approach is made clear from a review of literature. The accumulating empirical support for viewing autism-related phenomena as separable and fractionable is outlined and includes data indicating that many of the behaviors occur in isolation in family members and the general population, are not highly correlated within individuals, and appear to be inherited separately. However, it is emphasized that some of the most common and characteristic phenomena observed in individuals diagnosed with autism do not run in their families. It is suggested that these novel, “emergent,” phenomena may arise in the individual from interacting configurations of co-occurring traits or from the interaction of genetic and biological factors underlying the traits. A number of autism-related phenomena including intellectual disability, seizures, persistence of primitive reflexes, stereotypies, self-injurious behavior, savant abilities, and morphological abnormalities, among others, are discussed as potentially being emergent. It is concluded that consideration of the role of emergence in autistic behavior and related phenomena should complement a reductionist approach and might help illuminate the components and complexities of autism.”

Stanton, M. E., Peloso, E., Brown, K. L., & Rodier, P. (2007). Discrimination learning and reversal of the conditioned eyeblink reflex in a rodent model of autism. *Behavioural brain research, 176*(1), 133-140. <https://doi.org/10.1016/j.bbr.2006.10.022>

“Offspring of rats exposed to valproic acid (VPA) on gestational day (GD) 12 have been advocated as a rodent model of autism because they show neuron loss in brainstem nuclei and the cerebellum resembling that seen in human autistic cases [20,37]. Studies of autistic children have reported alterations in acquisition of classical eyeblink conditioning [2,40] and in reversal of instrumental discrimination learning [9]. Acquisition of discriminative eyeblink conditioning depends on known brainstem-cerebellar circuitry whereas reversal depends on interactions of this circuitry with the hippocampus and prefrontal cortex. In order to explore behavioral parallels of the VPA rodent model with human autism, the present study exposed pregnant Long-Evans rats to 600 mg/kg VPA on GD12 [37] and tested their offspring from Postnatal Day (PND26–31) on discriminative eyeblink conditioning and reversal. VPA rats showed faster eyeblink conditioning, consistent with studies in autistic children [40]. This suggests that previously reported parallels between human autism and the VPA rodent model with respect to injury to brainstem-cerebellar circuitry [37] are accompanied by behavioral parallels when a conditioning task engaging this circuitry is used. VPA rats also showed impaired reversal learning, but this likely reflected “carry-over” of enhanced conditioning during acquisition rather than a reversal learning deficit like that seen in human autism. Further studies of eyeblink conditioning in

human autism and in various animal models may help to identify the etiology of this developmental disorder.”

Teitelbaum, P., Teitelbaum, O. B., Fryman, J., & Maurer, R. (2002). Reflexes gone astray in autism in infancy. *The Journal of Developmental and Learning Disorders*, 15, 18-24.

“The diagnostic criteria of Asperger's syndrome (AS), considered a part of the autistic spectrum disorder, are still unclear. A critical marker, which distinguishes AS from autism, is the presence of language. The ability of a child with AS to acquire and use language early results in the fact that AS usually is diagnosed much later than autism. Autism is not usually diagnosed until around the age of 3, whereas AS usually is not diagnosed until the child is 6 or 7 years of age. In the present article, using Eshkol–Wachman movement notation, we present evidence that abnormal movement patterns can be detected in AS in infancy. This finding suggests that AS can be diagnosed very early, independent of the presence of language. As shown earlier by us, almost all of the movement disturbances in autism can be interpreted as infantile reflexes “gone astray”; i.e., some reflexes are not inhibited at the appropriate age in development, whereas others fail to appear when they should. This phenomenon appears to apply to AS as well. Based on preliminary results, a simple test using one such reflex is proposed for the early detection of a subgroup of children with AS or autism.”

Teitelbaum, O., Benton, T., Shah, P. K., Prince, A., Kelly, J. L., & Teitelbaum, P. (2004).

Eshkol–Wachman movement notation in diagnosis: The early detection of Asperger's syndrome. *Proceedings of the National Academy of Sciences of the United States of America*, 101(32), 11909-11914. doi:10.1073/pnas.0403919101

“In the cases presented in this paper plus others we hypothesize that movement disturbances in infants can be interpreted as reflexes gone astray and may be early indicators for a diagnosis of autism. In the children reviewed some reflexes persist too long in infancy, whereas others first appear much later than they should. The asymmetrical tonic neck reflex is one reflex that may persist too long in autism. Head-verticalization in response to body tilt is a reflex that does not appear when it should in a subgroup of autistic-to-be infants. We suggest that it may be used by pediatricians to quickly screen for such autistic-to-be children, especially in families where there is a history of autism.”

Zwaigenbaum, L., Bryson, S., & Garon, N. (2013). Early identification of autism spectrum disorders. *Behavioural Brain Research*, 251, 133-146. doi: 10.1016/j.bbr.2013.04.004

“Earlier identification and diagnosis of autism spectrum disorders (ASDs) can improve opportunities for children to benefit from intervention and lessen the burden on concerned parents. This review summarizes current knowledge about early signs of autism. Convergent data from both retrospective studies and prospective studies of high-risk infants indicate that ASD

symptoms emerge in the first two years of life, affecting multiple developmental domains, mapping onto symptom dimensions consistent with current diagnostic frameworks including social-communication, and repetitive interests/behaviors but also extending to motor delays and atypical regulation of attention and emotion. Recent findings have shed new light on patterns of symptom onset and progression, and promise to inform early detection and diagnosis. Further attention to effective application of new findings and related challenges in building health system capacity to ensure timely access to specialized assessment and interventions is needed to fully realize the promise of improved outcomes resulting from this research.”

**Library Database: OT Search*****Preparing for Search Process:***

- Started with a simple search of “Reflex integration,” there is not an option for a MeSH heading
- I only found 9 articles from this search
- Then I conducted a power search where I uses “reflex integration” as the key word and limited it to just journal articles, resulting in only 6 articles
- Then I used “Quantum Reflex Integration” as a keyword and no articles came up for this search
- Then I used “primitive reflexes” as a key word and found 7 articles, this was the best search but a few of the sources were books

***Summarizing a Strategic Search Process***

Filters/Years	Keywords	Total Yield/Relevant Hits	Date
Journal Articles (Endler. 1978) Years: Unlimited	Reflex Integration	6/-	11/14/16
None (Mailloux et al., 2014) Years: Unlimited	Reflex Integration	9/-	11/14/16
None (Pimental, 1996) Years: Unlimited	Primitive Reflexes	7/-	11/14/16

***Summary of 5 Best Research Articles***

Endler, P. (1978). Postural and reflex integration in schizophrenic patients. *The American Journal of Occupational Therapy*. 32(7). 456-459.

**Abstract:** The relationship among primitive postural reflexes, postural and bilateral integration, and premorbid adjustment were examined in 29 subjects who were divided into 3 groups: normal, chronic process non paranoid schizophrenic, and chronic paranoid schizophrenic. Significant differences were found between the normal and schizophrenic groups on the tonic labyrinthine reflex and on five of the six measures of postural and bilateral integration. No significant differences were found between the two schizophrenic groups on any of the test variables. There were significant positive correlations between the tonic labyrinthine reflex, postural and bilateral integration, and premorbid status in the subjects studied.

Mailloux, Z., Leão, M., Becerra, T. A., Mori, A. B., Soechting, E., Roley, S. S., . . . Cermak, S.

A. (2014). Modification of the postrotary nystagmus test for evaluating young children.

*The American Journal of Occupational Therapy*, 68(5), 514-21. Retrieved from

<http://pearl.stkate.edu/login?url=http://search.proquest.com/docview/1563107873?accountid=26879>

**Abstract:** This article explores the use of the postrotary nystagmus (PRN) test for children younger than current norms (children 4.0 yr-8.11 yr). In the first study, 37 children ages 4-9 yr were examined in the standard testing position and in an adult-held adapted position to determine whether holding a child affected the reflex. Because the position did not affect the reflex, in the second study, PRN in 44 children ages 2 mo-47 mo was compared with published normative mean raw scores for 44 children age 5 yr to determine whether norms for older children were applicable to younger children. No statistically significant differences were found between <4-yr-old and 5-yr-old children, suggesting that the PRN test can be used in infants and toddlers with valid comparison to current norms for 4-yr-olds on the Sensory Integration and Praxis Tests (4.0 yr-8.11 yr). Future research exploring the predictive value of this measure is warranted.

Pimentel, E. (1996). The disappearing reflex: A reevaluation of its role in normal and abnormal

development. *Physical and Occupational Therapy in Pediatrics*. 16(4). 19-41. Doi:

10.1080/J006v16n04\_02

**Abstract:** The objectives of this article are to examine theoretical views regarding the appearance and disappearance of primitive reflexes and to discuss their implications for therapeutic intervention. According to the traditional view, primitive reflexes are inhibited or integrated by higher central nervous system centers. After central nervous system (CNS) damage, these primitive reflexes are released from inhibition by higher centers. This view implies a model of CNS organization for motor control that is hierarchically organized. Alternatively, according to the more contemporary systems view, the development of reflexive and volitional behavior is the results of an interaction of central and external environmental influences. Research on primitive stepping indicates that such factors as decreased body mass and practice can contribute to the prolonged retention of this reflex. The systems view implies a distributed control model on CNS motor control in which peripheral and CNS factors participate in the control of movement. If environmental demands can alter reflexive as well as volitional movement, then the traditional view of the relationship between primitive and pathological reflexes is challenged. The systems view and implied distributed control of the CNS should lead therapists to reassess their treatment rationales.

**Evidence Resource(s):** OT organizations (AOTA)***Preparing for Search Process***

- I have been skeptical on the research and progress behind reflex integration so I decided to simply search the AOTA website for “reflex integration” to see how relevant and useful reflex integration is in occupational therapy

***Documenting the Search Process***

- I typed “reflex integration into the search engine on the AOTA website and found 25 results. Most of these results were pdfs including guidelines, schedules, and announcements. I found one research article about clients with Cerebral Palsy and motor delay however the page/link could not be found.
- Then I typed “primitive reflexes” into the search engine and only 4 sources came up but once again the links did not work. It led me to a page that said “page could not be found.”
- Under ‘practice’ I clicked on ‘Rehabilitation and disability evidence-based practice resources’ and did not find anything related to reflex integration or primitive reflexes.
- Then under ‘practice’ I clicked on ‘children and youth’ and then clicked on ‘children & youth evidenced based practice resources’ and found the article listed below, it was found under the ‘early intervention’ column
- Under the ‘children & youth evidenced based practice resources’ there was an autism column but that only included information about sensory integration, play, leisure, etc. I did not find anything here about reflex integration
- Then I clicked on the ‘publication and news’ tab where I then clicked on the “American Journal of Occupational therapy” tab where I was able to click on a click to get to the AJOT online. Then I searched ‘reflex integration here and found 26 matches, one of the articles was one that I cited above from the OT search database.
- After this I searched “primitive reflexes” in the AJOT search engine and found 3 results, none of which related to reflex integration

***Summary of 5 best Research Articles***

Smith, J., Clark, G., and Schlabeck, T. (2013). Systematic review of interventions used in

occupational therapy to promote motor performance for children ages birth–5 years.

*American Journal of Occupational Therapy*. 67. 413-424. doi:10.5014/ajot.2013.005959

**Abstract:** We examined the research evidence for interventions used in occupational therapy to promote the motor performance of young children ages 0–5 yr. We identified 24 trials, Levels I–III, that met our review criteria. The studies fell into three categories: (1) developmental interventions for infants (ages 0–3 yr), (2) interventions for young children with or at risk for cerebral palsy (CP), and (3) visual–motor interventions for preschool children (ages 3–5 yr). Developmental interventions showed low positive short-term effects with limited evidence for long-term effects, and findings on the benefits of neurodevelopmental treatment were inconclusive. Interventions using specific protocols for children with CP resulted in positive effects. Visual–motor interventions for children with developmental delays (ages 3–5 yr) resulted

in short-term effects on children's visual-motor performance. Of the intervention approaches used in occupational therapy, those that embed behavioral and learning principles appear to show positive effects.



**Appraisal of Evidence****Initial Appraisal: Primary Research Studies.**

Type of article	Overall Type: Primary Research Study Specific Type: Comparative Study
APA Reference	Callcott, D. (2012 June). Retained primary reflexes in pre-primary-aged Indigenous children: The effect on movement ability and school readiness. <i>Australasian Journal of Early Childhood</i> , 37(2), 132-140.
Abstract	The research reported in this paper links children's movement skills with learning difficulties, particularly school readiness, in the early years. The aim of the research project was to (a) determine the prevalence and severity of retained reflexes, predominantly the Asymmetrical Tonic Neck Reflex (ATNR), and (b) investigate the movement skill ability of pre-primary-aged Indigenous children in the Kimberley region of Western Australia. This provided an important first step in understanding and addressing movement skill deficits that may compromise the acquisition of foundation school readiness skills in young Australian Indigenous children. This project challenged the stereotypical assumption (by non-Indigenous Australians) that the majority of Indigenous Australian children have well-developed or even above-average movement skill development, based on their being more likely than non-Indigenous children to engage in regular physical activity and perform well in sport. It was important to test this assumption if a comprehensive picture of the developmental challenges and educational disadvantages faced by Indigenous Australian children, particularly those in remote regional areas, was to be established. Sixty-five per cent of the sample of Indigenous children were found to have retained moderate to high levels of the Asymmetrical Tonic Neck Reflex (ATNR) which in previous research has been linked to developmental delay, not only in movement skills but also in areas strongly related to academic achievement.
Author	Credentials: M. Ed Position and Institution: Lecturer, Edith Cowan University Publication History in Peer-Reviewed Journals: 8
Publication	Type of publication: Peer-reviewed scholarly journal Publisher: Early Childhood Australia Other: Evidenced-based articles
Date and Citation History	Date of publication: 2012 Cited By: 2
Stated Purpose or	"...the aim of this project was to investigate the prevalence and severity of retained primary reflexes among preschool-aged Australian Indigenous

Research Question	children and to determine its potential impact on educational attainment” (p. 134).
Author’s Conclusion	“In light of this research, the retention of primary reflexes may have a significant influence... in the attainment of movement skills and school readiness attributes.” (p. 139)
Overall Relevance to PICO	Overall Relevance to PICO: Limited Relevance Rationale: This article partially addresses our P (children with retained primitive reflexes). It mentions our I (INPP) in the discussion. It does not address our C or O.
Overall Quality of Article	Overall Quality of Article: Low Rationale: Scholarly, internationally recognized journal. Published within last 10 years. Author relatively unestablished. Article not cited by other sources.

Type of article	Overall Type: Primary research Specific Type: Regression analysis/comparative study
APA Reference	Chinello, A., Gangli, V. D., Valenza, E. (2016). Persistent primary reflexes affect motor acts: Potential implications for autism spectrum disorder. <i>Research in Developmental Disabilities</i> , 1-9. doi:10.1016/j.ridd.2016.07.010
Abstract	In typical motor development progress in use of goal-directed actions and communicative gestures depends on the inhibition of several primitive reflexes, especially those that involve the hand or mouth. This study explored the relationship between the persistence of primitive reflexes that involve the hand or mouth and the motor repertoire in a sample of 12- to 17-month-old infants. Moreover, since children with Autism Spectrum Disorders (ASD) often have difficulty in performing skilled movements and show poor gesture repertoire, and since ASD represents the upper extreme of a constellation of traits that may be continuously distributed in the general population, we investigated the relationship between the persistence of primitive reflexes in the same sample of infants and the subclinical autistic traits measured in their parents. Results revealed that the persistence of the primitive reflexes correlated with motor repertoire irrespective of infant's age, and it was greater among infants whose parents had more subclinical autistic traits. Our findings suggest that the persistence of primitive reflexes might alter the developmental trajectory of future motor ability and therefore their evaluation might be an early indicator of atypical development.
Author	Credentials: Physiotherapist Position and Institution: Unita Locale Socio Sanitario, Padova, Italy Publication History in Peer-Reviewed Journals: none
Publication	Type of publication: Peer-reviewed scholarly medical journal Publisher: Elsevier
Date and Citation History	Date of publication: 2016 Cited By: None
Stated Purpose or Research Question	"This study attempted to address this gap by exploring the relationship between the persistence of primitive reflexes that involve the hand or mouth and the motor repertoire in a sample of 12- to 17-month-old infants drawn from the general population" (p. 2).
Author's Conclusion	"Results revealed that the persistence of the primitive reflexes correlated with motor repertoire irrespective of infant's age, and it was greater among infants whose parents had more subclinical autistic traits." (p. 1)

Overall Relevance to PICO	Overall Relevance to PICO: Moderate Relevance Rationale: This article directly related to the P (children with ASD). It addressed primitive reflexes, a core theme behind reflex integration. It did not directly address the I, C, or O.
Overall Quality of Article	Overall Quality of Article: Low Quality Rationale: Reputable journal and publisher. Publication within last 5 years. Author not established. Article not cited.

Type of article	Overall Type: Primary Research Study Specific Type: Regression analysis
APA Reference	de Bildt, A., Mulder, E. J., Van Lang, Natasja D. J., de With, S. A. Jytte, de Minderaa, R. B., Stahl, S. S., & Anderson, G. M. (2012). The visual rooting reflex in individuals with autism spectrum disorders and cooccurring intellectual disability. <i>Autism Research</i> , 5(1), 67-72.
Abstract	<p>“The rooting reflex has long been studied by neurologists and developmentalists and is defined as an orientation toward tactile stimulation in the perioral region or visual stimulation near the face. Nearly, all previous reports of the visual rooting reflex (VRR) concern its presence in adults with neurological dysfunction. Previously, the VRR was reported to be present in a majority of individuals with autism and absent in control subjects. In the present larger study, we examined the presence of the VRR in 155 individuals with ASD and co-occurring Intellectual Disability (ASD + ID: autism, <math>N = 60</math>; Pervasive Developmental Disorder-Not Otherwise Specified (PDD_NOS), <math>N = 95</math>) and in a contrast group of 65 individuals with ID only. The VRR was present significantly more often in the ASD + ID (43.9%) group than in the ID-only group (24.6%; <math>\chi^2_1 = 7.19</math>; <math>P = 0.007</math>). Individuals with autism displayed a VRR more often (55.0%) than individuals with PDD-NOS (36.8%; <math>\chi^2_1 = 4.92</math>; <math>P = 0.026</math>) and individuals with ID only (24.6%; <math>\chi^2_1 = 12.09</math>; <math>P = 0.001</math>). A positive VRR was associated with lower IQ and adaptive functioning; in the ASD + ID group, ADI-R/ADOS domain scores were significantly higher in the VRR-positive subgroup. The results replicate and extend the finding of an increased occurrence of the VRR in autism. Although some association with IQ was observed, the VRR occurred substantially more often in the autism group compared with an intellectually disabled group, indicating some degree of specificity. Additional studies of infants and children with typical development, ASD and ID are needed to determine the utility of the VRR in ASD risk assessment and to elucidate possible specific behavioral associations.”</p>
Author	Credentials: Psychiatrist Position and Institution: Researcher at University Medical Center Groningen, Groningen, The Netherlands Publication History in Peer-Reviewed Journals: 4 articles
Publication	Type of publication: Online database Publisher: Wiley Online Library Other: Autism Research

Date and Citation History	Date of publication: 2012 Cited By: 2
Stated Purpose or Research Question	“In the present larger study, we examined the presence of the VRR in 155 individuals with ASD and co-occurring Intellectual Disability” (p. 1).
Author’s Conclusion	“The VRR occurred substantially more often in the autism group compared with an intellectually disabled group, indicating some degree of specificity” (p. 1).
Overall Relevance to PICO	Overall Relevance to PICO: Strong Relevance Rationale: Analyzes a primitive reflex and the outcomes in adulthood, but does not explore interventions.
Overall Quality of Article	Overall Quality of Article: Weak Quality Rationale: The online library database is not credible and it was cited two times.

Type of article	Overall Type: Primary Research Study Specific Type: Correlation study
APA Reference	Endler, P. (1978). Postural and reflex integration in schizophrenic patients. <i>The American Journal of Occupational Therapy</i> , 32(7), 456-459.
Abstract	The relationship among primitive postural reflexes, postural and bilateral integration, and premorbid adjustment were examined in 29 subjects who were divided into 3 groups: normal, chronic process non paranoid schizophrenic, and chronic paranoid schizophrenic. Significant differences were found between the normal and schizophrenic groups on the tonic labyrinthine reflex and on five of the six measures of postural and bilateral integration. No significant differences were found between the two schizophrenic groups on any of the test variables. There were significant positive correlations between the tonic labyrinthine reflex, postural and bilateral integration, and premorbid status in the subjects studied.
Author	Credentials: M.S., OTR Position and Institution: Brockton Veterans Administration Hospital Publication History in Peer-Reviewed Journals: none
Publication	Type of publication: Scholarly peer-reviewed journal Publisher: American Occupation Therapy Association (AOTA) Other: Official journal of AOTA
Date and Citation History	Date of publication: 1978 Cited By: 11
Stated Purpose or Research Question	“A correlation study was used to determine whether reflex integration and performance on selected subtests of Southern California Sensory Integration Test (5) were significantly correlated in schizophrenic subjects” (p. 456)
Author’s Conclusion	“Significant differences were found between the normal and schizophrenic groups on the tonic labyrinthine reflex and on five of the six measures of postural and bilateral integration. No significant differences were found between the two schizophrenic groups on any of the test variables. There were significant positive correlations between the tonic labyrinthine reflex, postural and bilateral integration, and premorbid status in the subjects studied.” (p. 456)
Overall Relevance to PICO	Overall Relevance to PICO: Limited Relevance Rationale: Different population (P) than preferred. It addressed primitive reflexes (A), but not integration therapy (O or C).
Overall Quality	Overall Quality of Article: Moderate Quality

of Article	Rationale: Reputable journal and publisher. Publication 40 years old. Author not established.
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Type of article	Overall Type: Primary research study Specific Type: Comparative Study
APA Reference	Jordan-Black, J. A. (2005). The effects of the Primary Movement programme on the academic performance of children attending ordinary primary school. <i>Journal of Research in Special Educational Needs</i> , 5(3), 101-111. doi:10.1111/J.1471-3802.2005.00049.x
Abstract	The present study investigated the prevalence of a primary reflex (the Asymmetrical Tonic Neck Reflex) in children attending ordinary primary school and how this related to attainments in a number of academic areas. The effectiveness of a specific movement intervention programme in reducing primary reflex persistence and improving academic attainment was also evaluated. A comparative study of the progress of 683 children over a two-year period from Years 3 and 5, who completed an intervention programme known as Primary Movement, was carried out using the relative attainments of children at the same schools and standardised scores as baseline and follow-up measures. A second, quasi-experimental study followed the progress of four parallel groups in each of two large schools with the experimental side completing the movement intervention programme while the other side acted as the control. It was found that ATNR persistence was significantly associated with level of attainments in reading, spelling and mathematics and that boys were more at risk than girls for ATNR persistence. In both studies, it was found that the movement intervention programme had a very significant impact on reducing the levels of ATNR persistence in children and that this was associated with very significant improvements in reading and mathematics, in particular. This research provides further evidence of a link between the attainment of core educational skills and the interference that may result from an underlying developmental deficit. The effectiveness of the intervention programme in reducing ATNR persistence and in increasing academic attainments suggests that this programme could be used to complement other strategies that have been shown to have a positive effect on children's learning.
Author	Credentials: PhD Position and Institution: Research Fellow, School of Psychology, Queen's University Publication History in Peer-Reviewed Journals: 6
Publication	Type of publication: Jorsen Scholarly Journal Publisher: Nasen Other: Wiley Online Library
Date and Citation History	Date of publication: 2005 Cited By: 21

Stated Purpose or Research Question	“This study evaluates the effects of a movement programme, known as Primary Movement, on the development of core educational skills (reading, spelling, mathematics) in children (6–11 years old) attending ordinary primary school” (p. 101).
Author’s Conclusion	“In conclusion, the results of the present study suggest that the use of a specific movement intervention programme (Primary Movement) may have a very significant effect on the academic progress of primary school children...the impact of the programme is evident across a wide range of children including those with...learning difficulties” (p. 109-110).
Overall Relevance to PICO	Overall Relevance to PICO: Strong Relevance Rationale: Addresses children with learning difficulties and movement intervention program with primary movement. Compared Primary Movement to standardized scores. Gave evidence of increasing academic attainment.
Overall Quality of Article	Overall Quality of Article: Moderate Quality Rationale: Journal is reputable but not peer-reviewed. Author is relatively unestablished. Published within the last fifteen years. Cited by 5 other sources.

Type of article	Overall Type: Primary Research Study Specific Type: Identification study
APA Reference	Mailloux, Z., Leão, M., Becerra, T. A., Mori, A. B., Soechting, E., Roley, S. S., . . . Cermak, S. A. (2014). Modification of the postrotary nystagmus test for evaluating young children. <i>The American Journal of Occupational Therapy</i> , 68(5), 514-521.
Abstract	This article explores the use of the postrotary nystagmus (PRN) test for children younger than current norms (children 4.0 yr–8.11 yr). In the first study, 37 children ages 4–9 yr were examined in the standard testing position and in an adult-held adapted position to determine whether holding a child affected the reflex. Because the position did not affect the reflex, in the second study, PRN in 44 children ages 2 mo–47 mo was compared with published normative mean raw scores for 44 children age 5 yr to determine whether norms for older children were applicable to younger children. No statistically significant differences were found between <4-yr-old and 5-yr-old children, suggesting that the PRN test can be used in infants and toddlers with valid comparison to current norms for 4-yr-olds on the Sensory Integration and Praxis Tests (4.0 yr–8.11 yr). Future research exploring the predictive value of this measure is warranted.
Author	Credentials: OTD, OTR/L, FAOTA Position and Institution: Thomas Jefferson University Publication History in Peer-Reviewed Journals: 57
Publication	Type of publication: Scholarly peer-reviewed journal Publisher: American Occupational Therapy Association Other: Official journal of AOTA
Date and Citation History	Date of publication: 2014 Cited By: 3
Stated Purpose or Research Question	“The importance of early screening, assessment, and intervention planning is crucial in all educational and health-related fields, including occupational therapy. This focus on prevention and early intervention affords the opportunity to identify and intervene as soon as possible to ensure optimal lifelong occupational performance” (p. 514).
Author’s Conclusion	“The results of this study indicate that there is not a significant difference in duration of PRN as a function of whether the child is sitting independently or is held in the lap of an adult. This finding indicates that either position may be used to assess the duration of the PRN reflex and supports clinical practice that has used this method to assess PRN in children unable to maintain the standard, independent sitting position” (p. 520).

Overall Relevance to PICO	Overall Relevance to PICO: Limited Rationale: Addressed appropriate population and primitive reflexes but not reflex integration therapy.
Overall Quality of Article	Overall Quality of Article: Moderate Rationale: Reputable journal and publisher. Publication within past 2 years. Author is established but article is cited only a few times.

Type of article	Overall Type: Primary Research Study Specific Type: Correlation study
APA Reference	Marquis, P. J., Ruiz, N. A., Lundy, M. S., & Dillard, R. G. (1984 June). Retention of primitive reflexes and delayed motor development in very low birth weight infants. <i>Journal of Developmental &amp; Behavioral Pediatrics</i> , 5(3), 124-126.
Abstract	Primitive reflexes and motor development were evaluated in 127 very low birth weight (VLBW) infants (birth weight < 1501 grams) at four months corrected age. The asymmetrical tonic neck reflex, tonic labyrinthine reflex, and Moro reflex were assessed for each child. The ability of each child to reach (obtain a red ring) and roll were observed. The child's performance on the gross motor scale of the Denver Development Screening Test was recorded. Thirty-seven term infants were administered identical evaluations at four months of age. The VLBW infants retained stronger primitive reflexes and exhibited a significantly higher incidence of motor delays than term infants. Significant correlations existed between the strength of the primitive reflexes and early motor development for VLBW infants. This study confirms a high incidence of motor delays among VLBW infants and demonstrates a clear association between retained primitive reflexes and delayed motor development in VLBW infants.
Author	Credentials: M.D., L.P.T Position and Institution: Doctor Publication History in Peer-Reviewed Journals: 432
Publication	Type of publication: Scholarly peer-reviewed journal Publisher: Lippincott-Raven Other: Ovid
Date and Citation History	Date of publication: June 1984 Cited By: 14
Stated Purpose or Research Question	“Primitive reflexes and motor development were evaluated in 127 very low birth weight (VLBW) infants (birth weight < 1501 grams) at four months corrected age. The asymmetrical tonic neck reflex, tonic labyrinthine reflex, and Moro reflex were assessed for each child” (124).
Author’s Conclusion	“This study confirms a high incidence of motor delays among VLBW infants and demonstrates a clear association between retained primitive reflexes and delayed motor development in VLBW infants” (124).

Overall Relevance to PICO	Overall Relevance to PICO: Strong Relevance Rationale: Relates to the retention of primitive reflexes in relation to motor development and development.
Overall Quality of Article	Overall Quality of Article: Weak Quality Rationale: Outdated, very small sample size, and focuses on developmental patterns rather than reflex interventions.

Type of article	Overall Type: Primary Research Specific Type: Double-blind study
APA Reference	McPhillips, M., Hepper, P. G., Mulhern, G. (2000). Effects of replicating primary-reflex movements on specific reading difficulties in children: A randomized double-blind, controlled trial. <i>The Lancet</i> (North American Ed.), 355(9203), 537-541. doi:10.1016/S0140-6736(99)02179-0
Abstract	<p>Background Children with specific reading difficulties have problems that extend beyond the range of underlying language- related deficits (eg, they have difficulties with balance and motor control). We investigated the role of persistent primary reflexes (which are closely linked in the earliest months of life to the balance system) in disrupting the development of reading skills.</p> <p>Methods We assessed the efficacy of an intervention programme based on replicating the movements generated by the primary-reflex system during fetal and neonatal life. A randomised, individually matched, double-blind, placebo- controlled design was used and children (aged 8–11 years) with persistent primary reflexes and a poor standard of reading were enrolled into one of three treatment groups: experimental (children were given a specific movement sequence); placebo- control (children were given non-specific movements); and control (no movements).</p> <p>Findings From an initial sample of 98 children, 60 children, 20 in each group were matched on age, sex, verbal intelligence quotient (IQ), reading ability, and persistent asymmetrical tonic neck reflex. For asymmetrical tonic neck-reflex levels there was a significant (group by time) interaction (<math>p &lt; 0.001</math>). The experimental group showed a significant decrease in the level of persistent reflex over the course of the study (mean change 1.8 [95% CI 2.4 to 1.2], <math>p &lt; 0.001</math>), whereas the changes in the placebo-control and control groups were not significant ( 0.2 [ 0.9 to 0.6] and 0.4 [ 0.9 to 0.2]). Interpretation This study provides further evidence of a link between reading difficulties and control of movement in children. In particular, our study highlights how the educational functioning of children may be linked to interference from an early neurodevelopmental system (the primary-reflex system). A new approach to the treatment of children with reading difficulties is proposed involving assessment of underlying neurological functioning, and appropriate remediation.</p>
Author	Credentials: B. Sc. (Hepper and Mulhern--PhD) Position and Institution: School of Psychology, Queen's University of Belfast Publication History in Peer-Reviewed Journals: 17
Publication	Type of publication: Scholarly peer-reviewed journal Publisher: Elsevier Other: ScienceDirect

Date and Citation History	Date of publication: 2000 Cited By: 117
Stated Purpose or Research Question	“We aimed to find out whether the ATNR could be inhibited by the stereotypical movements of the primary-reflex system (including ATNR movement) and whether reading skills would improve as ATNR persistence decreased” (p. 538).
Author’s Conclusion	The results suggest that the repetition of primary-reflex movements plays a major part in the inhibition of primary reflexes and that inhibition can be brought about at a much later stage in development than is generally accepted.(p. 540).
Overall Relevance to PICO	Overall Relevance to PICO: Strong Relevance Rationale: Addresses a slightly different P (children with reading difficulties). Addresses I (primary-reflex movements). It fit the C by comparing three different treatment groups (experimental, placebo-control, control). It addressed the O (decrease in persistent reflex).
Overall Quality of Article	Overall Quality of Article: Moderate Quality Rationale: Reputable journal. Author is moderately established. Source is heavily cited by other articles.



Type of article	Overall Type: Primary Research Specific Type: Correlation Study
APA Reference	Rider, B. A. (1972 July). Relationship of postural reflexes to learning disabilities. <i>American Journal of Occupational Therapy</i> , 26(5), 239-243.
Abstract	Prevalence of abnormal reflex responses in normal second-grade children was compared with a group of learning disabled children. The learning disabled children had significantly more abnormal reflex responses than the normal children. Some of the normal second-grade children exhibited abnormal reflex responses and others exhibited no abnormal reflexes. Wide Range Achievement Test scores for these children were compared according to whether they demonstrated abnormal reflex responses or not. Children who had no abnormal reflex responses scored higher on the achievement tests than did children who had abnormal responses. This correlation was significant for the spelling subtest of the WRAT, approached significance in the reading subtest, but failed to reach significance in the arithmetic subtest. Boys in this group had significantly more abnormal reflex responses than the girls in the same class.
Author	Credentials: M.S., OTR Position and Institution: Assistant professor at the University of Kansas Publication History in Peer-Reviewed Journals: 34
Publication	Type of publication: Scholarly peer-reviewed journal Publisher: American Psychological Association Other: APA PsycNET
Date and Citation History	Date of publication: 1972 Cited By: 14
Stated Purpose or Research Question	“The purpose of this study is to determine whether a relationship exists between postural reflex level and academic performance” (p. 239).
Author’s Conclusion	“The results of this study also supply empirical support to the importance of early motor development to later cognitive development. The children in the study who showed deficits in early primitive reflex integration, also were deficient in academic achievement” (p. 243).
Overall Relevance to PICO	Overall Relevance to PICO: Moderate Relevance Rationale: Partially matches the P (children with reflex delays). Addresses reflexes, the basis for I (reflex intervention). Does not address C or O.
Overall Quality	Overall Quality of Article: Moderate Quality

of Article	Rationale: Established author. Reputable journal. Cited several times. Published more than 30 years ago.
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Type of article	Overall Type: Primary Research Study Specific Type: Identification study
APA Reference	Samango-Sprouse, C., Stapleton, E. J., Aliabadi, F., Graw, R., Vickers, R., Haskell, K., . . . Gropman, A. L. (2015). Identification of infants at risk for autism spectrum disorder and developmental language delay prior to 12 months. <i>Autism, 19</i> (3), 327-337.
Abstract	Studies have shown an increased head circumference and the absence of the head tilt reflex as possible risk factors for autism spectrum disorder, allowing for early detection at 12 months in typically developing population of infants. Our aim was to develop a screening tool to identify infants prior to 12 months at risk for autism spectrum disorder and developmental learning delay, not affected by literacy or primary parental language, and provide immediate determination of risk for autism spectrum disorder. An abrupt head circumference acceleration and the absence of head tilt reflex by 9 months were used to identify infants at risk for autism spectrum disorder. Stability of early findings was then investigated when compared to comprehensive standardized neurodevelopmental assessment results and complete neurological and genetics evaluations. A total of 1024 typically developing infants were enrolled by 9 months, with 14 identified as at risk for autism spectrum disorder and 33 for developmental learning delay. There was a good positive predictive value for the identification of autism spectrum disorder prior to 12 months. This study demonstrates an efficient means to identify infants at risk for autism spectrum disorder by 9 months of age and serves to alert primary care providers of infants who are vulnerable for autism spectrum disorder before symptoms are discernible by clinical judgment of primary care providers, parental concerns, or by screening questionnaires.
Author	Credentials: C.A. Position and Institution: George Washington University Publication History in Peer-Reviewed Journals: 36
Publication	Type of publication: Peer-reviewed journal Publisher: Sage Journals
Date and Citation History	Date of publication: 2014 Cited By: 9
Stated Purpose or Research Question	“Although numerous screening procedures have been developed, a reliable and effective mechanism to identify ASD prior to 12 months continues to be elusive, because of the variability of developmental progression in infancy and difficulty identifying reliable biomarkers and known variance in developmental trajectories of infants” (p. 1).

Author's Conclusion	“This strongly suggests that these biomarkers have merit in the identification of infants at risk for ASD at an early age in a manner that is impervious to literacy level, primary language, and SES of the families” (p. 9).
Overall Relevance to PICO	Overall Relevance to PICO: Moderate Relevance Rationale: Hones in on ASD population and primitive reflexes within that population. Does not assess intervention or outcome.
Overall Quality of Article	Overall Quality of Article: Moderate Quality Rationale: Published in a peer-reviewed journal with specific dates and times to screen infants.

Type of article	Overall Type: Primary Research Study Specific Type: Comparative study
APA Reference	Stanton, M. E., Peloso, E., Brown, K. L., & Rodier, P. (2007). Discrimination learning and reversal of the conditioned eyeblink reflex in a rodent model of autism. <i>Behavioural Brain Research</i> , 176(1), 133-140.
Abstract	Offspring of rats exposed to valproic acid (VPA) on gestational day (GD) 12 have been advocated as a rodent model of autism because they show neuron loss in brainstem nuclei and the cerebellum resembling that seen in human autistic cases 20 and 37. Studies of autistic children have reported alterations in acquisition of classical eyeblink conditioning 2 and 40 and in reversal of instrumental discrimination learning [9]. Acquisition of discriminative eyeblink conditioning depends on known brainstem-cerebellar circuitry whereas reversal depends on interactions of this circuitry with the hippocampus and prefrontal cortex. In order to explore behavioral parallels of the VPA rodent model with human autism, the present study exposed pregnant Long-Evans rats to 600 mg/kg VPA on GD12 [37] and tested their offspring from Postnatal Day (PND26–31) on discriminative eyeblink conditioning and reversal. VPA rats showed faster eyeblink conditioning, consistent with studies in autistic children [40]. This suggests that previously reported parallels between human autism and the VPA rodent model with respect to injury to brain stem-cerebellar circuitry [37] are accompanied by <i>behavioral parallels</i> when a conditioning task engaging this circuitry is used. VPA rats also showed impaired reversal learning, but this likely reflected “carry-over” of enhanced conditioning during acquisition rather than a reversal learning deficit like that seen in human autism. Further studies of eyeblink conditioning in human autism and in various animal models may help to identify the etiology of this developmental disorder.
Author	Credentials: department of psychology at University of Delaware, PhD Position and Institution: University of Delaware Publication History in Peer-Reviewed Journals: 459
Publication	Type of publication: Scholarly Peer-reviewed journal Publisher: Elsevier
Date and Citation History	Date of publication: 2007 Cited By: 53
Stated Purpose or Research Question	“In order to explore behavioral parallels of the VPA rodent model with human autism, the present study exposed pregnant Long-Evans rats to 600 mg/kg VPA on GD12 and tested their offspring from Postnatal Day (PND26–31) on discriminative eyeblink conditioning and reversal.” (p. 133).

Author's Conclusion	“VPA rats showed faster eyeblink conditioning, consistent with studies in autistic children. This suggests that previously reported parallels between human autism and the VPA rodent model with respect to injury to brain stem-cerebellar circuitry are accompanied by <i>behavioral</i> parallels... Further studies of eyeblink conditioning in human autism and in various animal models may help to identify the etiology of this developmental disorder.” (p. 133)
Overall Relevance to PICO	Overall Relevance to PICO: Limited Relevance Rationale: Different population (P) than preferred, using animals. Addresses autism.
Overall Quality of Article	Overall Quality of Article: Moderate Quality Rationale: Reputable journal and publisher. Publication in the past 10 years. Author is present in a variety of other studies.

Type of article	Overall Type: Primary Research Study Specific Type: Comparison study
APA Reference	Teitelbaum, O., Benton, T., Shah, P. K., Prince, A., Kelly, J. L., & Teitelbaum, P. (2004). Eshkol–Wachman movement notation in diagnosis: The early detection of Asperger's syndrome. <i>Proceedings of the National Academy of Sciences of the United States of America</i> , <i>101</i> (32), 11909-11914.
Abstract	<p>The diagnostic criteria of Asperger's syndrome (AS), considered a part of the autistic spectrum disorder, are still unclear. A critical marker, which distinguishes AS from autism, is the presence of language. The ability of a child with AS to acquire and use language early results in the fact that AS usually is diagnosed much later than autism. Autism is not usually diagnosed until around the age of 3, whereas AS usually is not diagnosed until the child is 6 or 7 years of age. In the present article, using Eshkol–Wachman movement notation, we present evidence that abnormal movement patterns can be detected in AS in infancy. This finding suggests that AS can be diagnosed very early, independent of the presence of language. As shown earlier by us, almost all of the movement disturbances in autism can be interpreted as infantile reflexes “gone astray”; i.e., some reflexes are not inhibited at the appropriate age in development, whereas others fail to appear when they should. This phenomenon appears to apply to AS as well. Based on preliminary results, a simple test using one such reflex is proposed for the early detection of a subgroup of children with AS or autism. Classification and diagnostic criteria for autism spectrum disorder and its related syndromes are mostly the result of accumulated clinical observations and lack a uniform nosology (1–4). Frith (3) proposes that this lack of uniformity in classification and diagnostic criteria is caused by errors in defining clinical categories. She states: “In defining clinical categories two kinds of error are common: the categories aimed at are too small and leave the majority of patients unaccounted for, or they are too large and do not differentiate patients who, in most clinicians' opinions, present different types of problems. In autistic spectrum disorders the twin dangers are omnipresent, accounting for pendulum swings between over-inclusion and ultra-specificity.” Another aspect to be assessed, according to Wing (4), is the relationship between syndromes featuring impaired social interaction, mental retardation, other childhood disorders affecting cognition, and language and social function. This aspect is acutely present when Asperger's syndrome (AS) and autism are considered, because each can be seen as a different limb of the same tree. Klin and Volkmar (2) put it this way: “Designation of Asperger's syndrome as a `variant' or `subtype' of autism (e.g., high-function autism, or adults with autism) would be acceptable, but it would not add to a categorical classification system.” This statement is complicated by the fact</p>

	<p>that children with a diagnosis of AS often receive fewer services than those with a diagnosis of autism. In the present article, the comparison of movement patterns in infants diagnosed as autistic versus those diagnosed as AS shows that similar patterns of movement disturbances exist in both syndromes. Thus, the assessment of movement patterns, which are the infant's "first language," can serve as a common baseline when comparing and studying different syndromes. Because the infant's movement-behavior is prelingual and presocial, the neural mechanisms at the core of these syndromes can be focused on with the possibility of identifying objective early reflex markers for the detection of AS and autism. Compared with autism, AS is usually diagnosed rather late. The early severe deficits in social behavior and severe language abnormalities found in children with autism do not occur, thus leaving the AS child undiagnosed until much later (often he/she remains undiagnosed until teenage years and beyond). Frith (3) states: "From the point of view of the diagnostician there is much support for the idea of Asperger's syndrome shading into normality. After all, the diagnosis is, so far, based on behavior and not on tests that clearly identify underlying problems." In the present study, we show that abnormal movement patterns (similar to those found in infants with autism) also exist in infants who will later be diagnosed as AS.</p>
Author	<p>Credentials: PhD, Graduate research professor  Position and Institution: Department of Psychology, University of Florida  Publication History in Peer-Reviewed Journals: 11</p>
Publication	<p>Type of publication: Scholarly peer-reviewed journal  Publisher: The National Academy of Sciences  Other: CrossMark</p>
Date and Citation History	<p>Date of publication: 2004  Cited By: 151</p>
Stated Purpose or Research Question	<p>"In the present study, we show that abnormal movement patterns (similar to those found in infants with autism) also exist in infants who will later be diagnosed as AS." (p. 11909)</p>
Author's Conclusion	<p>"In summary, infantile reflexes are easy to spot and can be used as early detection signs. When these reflexes persist too long or do not appear when they should, the motor development of the infant and, subsequently, other aspects of his behavior will be affected. Clearly then, they can serve as early detection markers for abnormal neurological development in AS and autism." (p. 11914)</p>



Overall Relevance to PICO	Overall Relevance to PICO: Strong Relevance Rationale: Appropriate population. It addressed primitive reflexes but not integration therapy.
Overall Quality of Article	Overall Quality of Article: Moderate Quality Rationale: Reputable journal and publisher. Publication within the last 15 years. Author is established.

**Initial Appraisal: Review of Research Studies.**

Type of article	Overall Type: Review of research Specific Type: Summary of independent research studies
APA Reference	Blythe, S. D. (2005). Releasing educational potential through movement: A summary of individual studies carried out using the INPP test battery and developmental exercise programme for use in schools with children with special needs. <i>Child Care in Practice, 11</i> , 415-432. doi: 10.1080/13575270500340234
Abstract	<p>This paper provides a summary of findings from a series of independent studies that have been undertaken separately. The studies used a specific developmental test battery*/the Institute for Neuro-Physiological Psychology (INPP) Developmental Test Battery for use in schools with children with special educational needs*/with a total of 810 children, the object being to assess whether neurological dysfunction was a significant factor underlying academic achievement. All children were tested using the INPP Developmental Test Battery together with additional standard educational measures to assess drawing and reading at the beginning and end of the programme. The progress of 339 children aged four to five years of age was tracked through the school year to see whether children with higher scores on the INPP Developmental Test Battery (indications of neurological dysfunction) performed less well academically at the end of the school year. A smaller number of children in mainstream classes (235 children) aged 8 /10 years undertook a specific programme of developmental exercises (The INPP Schools' Developmental Exercise Programme) for 10 minutes a day under teacher supervision over the course of one academic year. Two hundred and five children aged 8 /10 years also underwent the INPP Tests but did not take part in the Developmental Exercise Programme. The third group acted as a control group. No pre-selection was made among these groups at the beginning of the study. One study included a fourth group of 31 children who were given non-specific exercises for the same time period each day as the experimental group (INPP exercises) to see whether general daily exercises were more or less effective than the specific INPP exercises. Children in this study were seven to nine years of age. The results showed that the children who participated in the daily INPP exercises made significantly greater improvement on measures for neurological dysfunction, balance and coordination. Children who had scores of more than 25% on tests for neurological dysfunction and whose reading age was less than their chronological age at the outset also showed small but significantly greater progress in reading than children who did not take part in the programme.</p>
Author	Credentials: MSc (Psych)

	Position and Institution: Director of The Institute for Neuro-Physiological Psychology Publication History in Peer-Reviewed Journals: Established (43)
Publication	Type of publication: Scholarly Peer-reviewed Journal Publisher: Taylor & Francis
Date and Citation History	Date of publication: 2005 Cited By: 36
Stated Purpose or Research Question	“The studies used a specific developmental test battery /the Institute for Neuro-Physiological Psychology (INPP) Developmental Test Battery for use in schools with children with special educational needs /with a total of 810 children, the object being to assess whether neurological dysfunction was a significant factor underlying academic achievement. All children were tested using the INPP Developmental Test Battery together with additional standard educational measures to assess drawing and reading at the beginning and end of the programme.” (p. 415)
Author’s Conclusion	“The INPP programme was effective in reducing signs of neurological dysfunction in the experimental groups compared with the control groups. Balance, coordination and drawing also showed greater improvement in the experimental groups irrespective of the children’s level of educational attainment at the beginning of the programme.” (p. 429)
Overall Relevance to PICO	Overall Relevance to PICO: Strong Rationale: Matches the P (children with retained reflexes), the I (INPP), C (compared with control groups), and O (improvement in neurological dysfunction, balance, coordination and reading).
Overall Quality of Article	Overall Quality of Article: Moderate Rationale: Reputable journal and published within last fifteen years. Author is director of INPP and has a MSc. Source cited by several scholarly journals.

Type of article	Overall Type: Systemic Review of Research Specific Type: Review of Plantar Grasp
APA Reference	Futagi, Y. & Suzuki, Y. (2010 August). Neural mechanism and clinical significance of the plantar grasp reflex in infants. <i>Pediatric Neurology</i> , 43(2), 81-86. doi:10.1016/j.pediatrneurol.2010.04.002
Abstract	The plantar grasp reflex can be elicited in all normal infants from 25 weeks of postconceptional age until the end of 6 months of corrected age according to the expected birth date. This reflex in human infants can be regarded as a rudiment of responses that were once essential for ape infants in arboreal life. The spinal center for this reflex is probably located at the L5-S2 levels, which, however, are controlled by higher brain structures. Nonprimary motor areas may exert regulatory control of the spinal reflex mechanism through interneurons. In infants, this reflex can be elicited as the result of insufficient control of the spinal mechanism by the immature brain. In adults, lesions in nonprimary motor areas may cause a release of inhibitory control by spinal interneurons, leading to a reappearance of the reflex. The plantar grasp reflex in infants is of high clinical significance. A negative or diminished reflex during early infancy is often a sensitive indicator of spasticity. Infants with athetoid type cerebral palsy exhibit an extremely strong retention of the reflex, and infants with mental retardation also exhibit a tendency toward prolonged retention of the reflex.
Author	Credentials: MD Position and Institution: Department of Pediatric Neurology; Osaka Medical Center and Research Institute for Maternal and Child Health; Publication History in Peer-Reviewed Journals: Extensive
Publication	Type of publication: Scholarly Publisher: Elsevier Other: ScienceDirect
Date and Citation History	Date of publication: 2010 Cited By: 10
Stated Purpose or Research Question	“Based on our experience and on the literature, this review mainly concerns the neural mechanism and diagnostic significance of the plantar grasp reflex in infants” (p. 81).
Author’s Conclusion	“The plantar grasp reflex in infants is of high clinical significance. . . . Infants with athetoid type cerebral palsy exhibit an extremely strong retention of the reflex, and infants with mental retardation also exhibit a tendency toward prolonged retention of the reflex” (p. 81).

Overall Relevance to PICO	Overall Relevance to PICO: Limited Relevance Rationale: Partially addressed P (CP and DD not ASD). Partially addressed primitive reflexes, core part of I. Did not address C or O.
Overall Quality of Article	Overall Quality of Article: Good Quality Rationale: Published in past 10 years by reputable journal. Established author. Cited by several articles.

Type of article	Overall Type: Review of Research Studies Specific Type: Literature Review; Research Proposal
APA Reference	Hoag, J. K. (2015). <i>Developing the brain through movement</i> (Unpublished master's thesis). University of Victoria: Victoria, British Columbia.
Abstract	Movement has long been seen as facilitating learning. Recent research in neuroplasticity tells us the brain is a dynamic organ capable of change and that movement can affect executive function. This paper proposes to explore the relationships between movement, motor function and executive function in typical primary children. The role of primary reflexes in motor function and executive function is examined. A research study is proposed. The purpose of the study is to find if a specific movement program can facilitate the integration of primary reflexes, thus aiding in motor function, and the affect this may have on executive functioning in children in the primary grades. Results could have implications in the early years for practices that may lay a strong foundation for healthy neurodevelopment, responsible for executive function such as reading and self regulation.
Author	Credentials: BA, MEd Position and Institution: Master's student at University of British Columbia Publication History in Peer-Reviewed Journals: 101
Publication	Type of publication: Research Proposal Publisher: University of Victoria Libraries Other: UVicSpace
Date and Citation History	Date of publication: 2015 Cited By: 0
Stated Purpose or Research Question	"Due to recent developments in neuroscience, the brain is no longer seen as static, but a dynamic organ with the ability to grow and change (Doidge, 2008). Movement is seen as an effective strategy to change the brain." (p. 6)
Author's Conclusion	"Will there be a significant difference between the experimental group (movement program (MP)) as compared to the children in the control group (no movement program with regards to changes observed and assessed from baseline to follow up (9 months) in the results of motor function (mf) and executive function (ef) evaluation?" (p. 35-36)

Overall Relevance to PICO	Overall Relevance to PICO: Limited Rationale: Relates to the neuroplasticity of the developing brain, but a research proposal is not empirical evidence.
Overall Quality of Article	Overall Quality of Article: Weak Rationale: A research proposal can only cite other sources but cannot be used in a meta analysis or in this project.

Type of article	Overall Type: Review of Research Studies Specific Type: Meta analysis
APA Reference	Hyatt, K., Stephenson, J., & Carter, M. (2009 May). A review of three controversial educational practices: Perceptual motor programs, sensory integration, and tinted lenses. <i>Education &amp; Treatment of Children</i> , 32(3), 313-342. doi:10.1353/etc.0.0054
Abstract	Children with disabilities have frequently participated in various interventions before the efficacy of those practices was scientifically validated. When subsequent scientific evidence failed to support particular practices, those that had already made inroads into the educational arena frequently continued to be used. Given the current emphasis on the use of empirically validated interventions, a review of research on the efficacy of educational interventions is consistent with guidelines from the No Child Left Behind Act (2001) and the Individuals with Disabilities Education Act (2004). The research findings regarding three relatively common, yet controversial, practices failed to support the continued use of perceptual motor programs, sensory integration therapy, and tinted lenses. Educators are encouraged to become informed consumers of research and implement evidence-based practices.
Author	Credentials: EdD Position and Institution: Chair, Department of Special Education, Western Washington University, Bellingham Publication History in Peer-Reviewed Journals: Moderate
Publication	Type of publication: Scholarly, Not peer-reviewed Publisher: West Virginia University Press
Date and Citation History	Date of publication: 2009 Cited By: 64
Stated Purpose or Research Question	“Given the current emphasis on the use of empirically validated interventions, a review of research on the efficacy of educational interventions is consistent with guidelines from the No Child Left Behind Act (2001) and the Individuals with Disabilities Education Act (2004).” (Abstract)
Author’s Conclusion	“The research findings regarding three relatively common, yet controversial, practices failed to support the continued use of perceptual motor programs, sensory integration therapy, and tinted lenses. Educators are encouraged to become informed consumers of research and implement evidence-based practices.” (Abstract)



Overall Relevance to PICO	Overall Relevance to PICO: Limited Relevance Rationale: Relates to educational practices and the laws, but not to reflex integration.
Overall Quality of Article	Overall Quality of Article: Moderate Quality Rationale: Published in a peer-reviewed journal and is within the last 10 years

Type of article	Overall Type: Review of Research Studies Specific Type: Meta analysis
APA Reference	Melillo, R. (2016). Persistent primitive reflexes and childhood neurobehavioral disorders. In G. Leisman, & J. Merrick (Eds.), <i>Neuroplasticity in learning and rehabilitation</i> (pp. 65-99, Chapter vi, 263 Pages). Hauppauge, New York: Nova Biomedical Books.
Abstract	<p>Persistent primitive reflexes have been noted in a number of neurobehavioral disorders and are thought to be related to delayed or absent developmental milestones in this population of children. This is also associated with the presence of clumsiness, incoordination, awkward posture, gait and other motor disturbances. The degree of motor incoordination seems to be related to cognitive dysfunction as well. ADHD, autism, dyslexia as well as almost all neurodevelopmental disorders have been associated with anatomical and functional effects that correlate with the motor incoordination, motor disturbance, cognitive delays and the presence of persistent primitive reflexes. For some time researchers have debated if the structural anatomic and volumetric differences in disorders such as ADHD and autism represent deviant developmental changes or whether they reflect a maturational delay. We review the literature that clearly demonstrates that these disorders and the structural differences represent cortical maturational delays not deviant development. We also note that persistent primitive reflexes are the earliest markers for this delay and that this delayed maturation will eventually lead to the presence of autism, ADHD, and other neurobehavioral disorders. We also note that these disorders and their recent reported increased incidence is related to a combination of genetic and epigenetic factors mostly driven by environmental and lifestyle changes affecting early motor development, sensory stimulation and activity dependent synaptogenesis and neuroplasticity. Symptom variations between these neurobehavioral disorders may be related to asymmetrical maturational differences resulting from different rates of maturation of the right and left hemisphere. Asymmetric persistent primitive reflexes may also be an early marker related to this maturational imbalance. This abnormal pattern of hemispheric asymmetry may lead to desynchronization, underconnectivity, and ultimately a functional disconnection between regions of the brain and cortex. Lastly we comment of the possibility of exercises that can inhibit and remediate persistent primitive reflexes as one possible target for early treatment of these disorders.</p>
Author	<p>Credentials: M.D. Position and Institution: National Institute for Brain and Rehabilitation Sciences, Biomechanics Laboratory, ORT-Braude College of Engineering, Karmiel, Israel</p>

	Publication History in Peer-Reviewed Journals: 55
Publication	Type of publication: Psych journal Publisher: ProQuest Other: PSYCInfo
Date and Citation History	Date of publication: 2016 Cited By: 196
Stated Purpose or Research Question	“We review the literature that clearly demonstrates that these disorders and the structural differences represent cortical maturational delays not deviant development. We also note that persistent primitive reflexes are the earliest markers for this delay and that this delayed maturation will eventually lead to the presence of autism, ADHD, and other neurobehavioral disorders.” (p. 1)
Author’s Conclusion	“This abnormal pattern of hemispheric asymmetry may lead to desynchronization, underconnectivity, and ultimately a functional disconnection between regions of the brain and cortex. Lastly we comment of the possibility of exercises that can inhibit and remediate persistent primitive reflexes as one possible target for early treatment of these disorders.” (p. 1)
Overall Relevance to PICO	Overall Relevance to PICO: Strong Relevance Rationale: Reviews the literature around primitive reflexes and the degree of motor incoordination in relation to ASD and other developmental disabilities.
Overall Quality of Article	Overall Quality of Article: Limited Quality Rationale: Review article that is difficult to find and cited sparsely.

Type of article	Overall Type: Review of Research Studies Specific Type: Literature Review
APA Reference	Ottenbacher, K. (1982). Sensory integration therapy: Affect or effect. <i>American Journal of Occupational Therapy</i> , 36(9), 571-578.
Abstract	<p>The results of studies examining the effectiveness of sensory integration therapy were reviewed, using recently developed quantitative methods that treat the literature review process as a unique type of research. Forty-nine studies were located initially. Eight of these studies met the following criteria: (a) they investigated the effect of sensory integration therapy; (b) they included dependent measures of academic achievement, motor or reflex performance, and / or language function; (c) they included a comparison between at least two groups; and (d) they reported quantitative results of the effect of sensory integration therapy. The 8 studies contained a total of 47 statistical hypothesis tests that evaluated the effectiveness of sensory integration therapy. An analysis of these tests, using quantitative reviewing methods, revealed that subjects participating in sensory integration therapy performed significantly better than members in the control groups who did not receive sensory integration therapy.</p> <p>The application of sensory integration therapy to various client populations is discussed in relation to the existing empirical support revealed in the studies reviewed. The advantages of quantitative reviewing procedures are discussed, and use of the procedures with the developing occupational therapy research literature is recommended.</p>
Author	<p>Credentials: PhD, OTR  Position and Institution: Assistant Professor Occupational Therapy Program at University of Wisconsin-Madison  Publication History in Peer-Reviewed Journals: 347</p>
Publication	<p>Type of publication: Literature Review  Publisher: American Occupational Therapy Association  Other: Official journal of American Occupational Therapy Association</p>
Date and Citation History	<p>Date of publication: 1982  Cited By: 131</p>
Stated Purpose or Research Question	<p>“Sensory integration theory as developed by Ayres (5) has generated considerable research in occupational therapy and related areas: however, most of this research has been concerned with identifying particular neuropsychological characteristics associated with sensory integrative dysfunction (6-13).” (p. 571)</p>

Author's Conclusion	“The effect of sensory integration therapy applied to the representative populations appears to have empirical support. However, the justification for some applications of sensory integration therapy may be more affect than demonstrated effect. No studies meeting the criteria were found that evaluated the effect of sensory integration therapy applied to client populations diagnosed as having emotional or psychiatric disorders.” (p. 577)
Overall Relevance to PICO	Overall Relevance to PICO: Limited Relevance Rationale: Relates to the sensory integration aspect, but does not tackle the reflex intervention portion.
Overall Quality of Article	Overall Quality of Article: Good Quality Rationale: Author's credentials are strong, the article provides structure for future research, and it helps guide the practice of OT.

Type of article	Overall Type: Review of Research Studies Specific Type: Meta analysis
APA Reference	Smith, J., Clark, G., and Schlabeck, T. (2013). Systematic review of interventions used in occupational therapy to promote motor performance for children ages birth–5 years. <i>American Journal of Occupational Therapy</i> , 67, 413-424. doi:10.5014/ajot.2013.005959
Abstract	We examined the research evidence for interventions used in occupational therapy to promote the motor performance of young children ages 0–5 yr. We identified 24 trials, Levels I–III, that met our review criteria. The studies fell into three categories: (1) developmental interventions for infants (ages 0–3 yr), (2) interventions for young children with or at risk for cerebral palsy (CP), and (3) visual–motor interventions for preschool children (ages 3–5 yr). Developmental interventions showed low positive short-term effects with limited evidence for long-term effects, and findings on the benefits of neurodevelopmental treatment were inconclusive. Interventions using specific protocols for children with CP resulted in positive effects. Visual–motor interventions for children with developmental delays (ages 3–5 yr) resulted in short-term effects on children’s visual–motor performance. Of the intervention approaches used in occupational therapy, those that embed behavioral and learning principles appear to show positive effects.
Author	Credentials: EdD, OTR/L, FAOTA Position and Institution: Professor at Ohio State University Publication History in Peer-Reviewed Journals: 153
Publication	Type of publication: Scholarly peer-reviewed journal Publisher: American Occupational Therapy Association
Date and Citation History	Date of publication: July 2013 Cited By: 24
Stated Purpose or Research Question	“Although early intervention services for low-birthweight preterm infants can ameliorate impairments and prevent developmental delays, longitudinal studies have demonstrated that preterm infants remain at risk for cerebral palsy (CP), developmental coordination disorders, and learning disabilities.” (p. 413)
Author’s Conclusion	“An understanding of development is essential to designing interventions for all young children; however, designing activities that follow a developmental sequence may not be sufficient to affect clinically significant motor performance outcomes.” (p. 419)

Overall Relevance to PICO	Overall Relevance to PICO: Limited Relevance Rationale: Relates to OT interventions for promoting motor performance, but does not address reflex integration.
Overall Quality of Article	Overall Quality of Article: Good Quality Rationale: Published in AJOT, cited a moderate amount, and the authors has reputable credentials.

Type of article	Overall Type: Review of Research Specific Type: Systematic review
APA Reference	Teitelbaum, P., Teitelbaum, O. B., Fryman, J., & Maurer, R. (2002). Reflexes gone astray in autism in infancy. <i>THE JOURNAL OF DEVELOPMENTAL AND LEARNING DISORDERS</i> , 6, 15-22.
Abstract	In the cases presented in this paper plus others we hypothesize that movement disturbances in infants can be interpreted as reflexes gone astray and may be early indicators for a diagnosis of autism. In the children reviewed some reflexes persist too long in infancy, whereas others first appear much later than they should. The asymmetrical tonic neck reflex is one reflex that may persist too long in autism. Head-verticalization in response to body tilt is a reflex that does not appear when it should in a subgroup of autistic-to-be infants. We suggest that it may be used by pediatricians to quickly screen for such autistic-to-be children, especially in families where there is a history of autism.
Author	Credentials: PhD Position and Institution: Department of Psychology, University of Florida Publication History in Peer-Reviewed Journals: 187
Publication	Type of publication: Scholarly Publisher: The Interdisciplinary Council on Development and Learning, Inc.
Date and Citation History	Date of publication: 2002 Cited By: 5
Stated Purpose or Research Question	“In the present paper, we will re-analyze some of these movement disturbances in terms of infantile reflexes” (p. 15).
Author’s Conclusion	“We believe that movement disturbances in autism and Asperger’s syndrome are related to the sequential development of infantile reflexes” (p.16).
Overall Relevance to PICO	Overall Relevance to PICO: Moderate Relevance Rationale: Fully addressed population primitive reflexes.
Overall Quality of Article	Overall Quality of Article: Moderate Quality Rationale: Published in last 15 years by reputable journal. Established author. Only cited by a few other articles.



Type of article	Overall Type: Review of Research Specific Type: Systematic review
APA Reference	Zafieriou, D. I. (2004). Primitive reflexes and postural reactions in the neurodevelopmental examination. <i>Pediatric Neurology</i> , 31(1), 1-8. doi:10.1016/j.pediatrneurol.2004.01.012
Abstract	The primitive reflexes and the postural reactions comprise one of the earliest, simplest, and most frequently used tools among child neurologists to assess the central nervous system integrity of infants and young children. Infants with cerebral palsy have been known to manifest persistence or delay in the disappearance of primitive reflexes and pathologic or absent postural reactions. The clinical significance of asymmetric tonic neck reflex, Moro, palmar grasp, plantar grasp, Galant, Babinski, Rossolimo, crossed extensor, suprapu- bic extensor, and heel reflex, alone or in combination, as well as their contribution to the early diagnosis and differential diagnosis of cerebral palsy, have been demonstrated in a number of studies. Moreover, infants with 5 or more abnormal postural reactions have developed either cerebral palsy or developmental retardation as reported in a number of studies. Although a comprehensive neurologic examination in the context of a motor assessment instrument is preferable to an informal list of items, the combined examination of primitive reflexes and postural reac- tions should be considered by the child neurologist, as a simple but predictive screening test for the early identification of infants at risk for cerebral palsy. It is quick and easy to perform, both in non-hospital environments and in underdeveloped countries, where time and specific resources are limited. The combined examination is also useful in developed countries because many developmental disorders such as cerebral palsy appear in nonrisk groups whereas others are not detected by metabolic screening programs.
Author	Credentials: MD, PhD Position and Institution: Child Neurologist; Aristotle University of Thessaloniki Publication History in Peer-Reviewed Journals: Extensive
Publication	Type of publication: Scholarly peer-reviewed journal Publisher: Elsevier
Date and Citation History	Date of publication: 2004 Cited By: 116
Stated Purpose or Research Question	“The purpose of the current article is to review and critically discuss the major primitive reflexes and postural reactions as an integral part of the neurologic examination of the infant. This review will also summarize the diagnostic relevance of specific primitive reflexes or postural reactions,

	alone or in combination, regarding an early diagnosis of cerebral palsy and developmental retardation.” (p. 1)
Author’s Conclusion	Although there are a considerable number of instruments dealing with the early diagnosis of motor abnormalities, the combined examination of primitive reflexes and postural reactions still has a place in the neurologic examination of the neonate or infant.” (p. 7)
Overall Relevance to PICO	Overall Relevance to PICO: Limited Quality Rationale: Matched P (children, developmental disabilities). Addressed part of I (primitive and postural reflexes). Does not address C or O.
Overall Quality of Article	Overall Quality of Article: Good Quality Rationale: Reputable journal. Established author. Cited by many peer-reviewed articles. Published within the past 15 years.

Type of article	Overall Type: Review of Research Specific Type: Systematic review
APA Reference	Zwaigenbaum, L., Bryson, S., & Garon, N. (2013). Early identification of autism spectrum disorders. <i>Behavioural Brain Research</i> , 251, 133-146.
Abstract	Earlier identification and diagnosis of autism spectrum disorders (ASD) can improve opportunities for children to benefit from intervention and lessen the burden on concerned parents. This review summarizes current knowledge about early signs of autism. Convergent data from both retrospective studies and prospective studies of high-risk infants indicate that ASD symptoms emerge in the first two years of life, affecting multiple developmental domains, mapping onto symptom dimensions consistent with current diagnostic frameworks including social-communication, and repetitive interests/behaviors but also extending to motor delays and atypical regulation of attention and emotion. Recent findings have shed new light on patterns of symptom onset and progression, and promise to inform early detection and diagnosis. Further attention to effective application of new findings and related challenges in building health system capacity to ensure timely access to specialized assessment and interventions is needed to fully realize the promise of improved outcomes resulting from this research.
Author	Credentials: PhD Position and Institution: Department of Pediatrics; University of Alberta, Canada Publication History in Peer-Reviewed Journals: 195
Publication	Type of publication: Scholarly Publisher: Elsevier
Date and Citation History	Date of publication: 2013 Cited By: 110
Stated Purpose or Research Question	“This review summarizes current knowledge about early signs of autism. Convergent data from both retrospective studies and prospective studies of high-risk infants indicate that ASD symptoms emerge in the first two years of life, affecting multiple developmental domains, mapping onto symptom dimensions consistent with current diagnostic frameworks including social-communication, and repetitive interests/behaviors but also extending to motor delays and atypical regulation of attention and emotion.” (p. 133).
Author’s Conclusion	“There is now robust evidence from both retrospective and prospective studies that behavioral signs of ASD can be detected early in infancy” (p. .461).

Overall Relevance to PICO	Overall Relevance to PICO: Moderate Relevance Rationale: Fully addressed population. Does not address primitive reflexes.
Overall Quality of Article	Overall Quality of Article: Strong Quality Rationale: Published in last 5 years by reputable journal. Established author. Cited by several articles.

**Initial Appraisal: Conceptual or Theoretical Articles.**

Type of article	Overall Type: Conceptual article Specific Type: n/a
APA Reference	Anderson, G. M. (2008). The potential role for emergence in autism. <i>Autism Research, 1</i> (1), 18-30.
Abstract	Although most research on autistic behavior has considered autism categorically, the increasingly apparent genetic and phenotypic complexities of autism are prompting a more dimensional approach to this area. The long-standing interest in a less categorical approach is made clear from a review of literature. The accumulating empirical support for viewing autism-related phenomena as separable and fractionable is outlined and includes data indicating that many of the behaviors occur in isolation in family members and the general population, are not highly correlated within individuals, and appear to be inherited separately. However, it is emphasized that some of the most common and characteristic phenomena observed in individuals diagnosed with autism do not run in their families. It is suggested that these novel, “emergent,” phenomena may arise in the individual from interacting configurations of co-occurring traits or from the interaction of genetic and biological factors underlying the traits. A number of autism-related phenomena including intellectual disability, seizures, persistence of primitive reflexes, stereotypies, self-injurious behavior, savant abilities, and morphological abnormalities, among others, are discussed as potentially being emergent. It is concluded that consideration of the role of emergence in autistic behavior and related phenomena should complement a reductionist approach and might help illuminate the components and complexities of autism.
Author	Credentials: PhD Position and Institution: Child Study Center, Yale University of Medicine Publication History in Peer-Reviewed Journals: 6,670
Publication	Type of publication: Scholarly Publisher: Wiley Periodical, Inc.
Date and Citation History	Date of publication: 2008 Cited By: 14
Stated Purpose or Research Question	“Although most research on autistic behavior has considered autism categorically, the increasingly apparent genetic and phenotypic complexities of autism are prompting a more dimensional approach to this area. The long-standing interest in a less categorical approach is made clear from a review of literature” (p. 18).

Author's Conclusion	“It is concluded that consideration of the role of emergence in autistic behavior and related phenomena should complement a reductionist approach and might help illuminate the components and complexities of autism” (p.30).
Overall Relevance to PICO	Overall Relevance to PICO: Moderate Relevance Rationale: Fully addressed population and primitive reflexes.
Overall Quality of Article	Overall Quality of Article: Moderate Quality Rationale: Published in last 10 years by reputable journal. Established author. Cited by a other articles.

Type of article	Overall Type: Conceptual article Specific Type: n/a
APA Reference	Anderson, G. M. (2009). Conceptualizing autism: The role for emergence. <i>Journal of the American Academy of Child &amp; Adolescent Psychiatry</i> , 48(7), 688-691.
Abstract	“Most behavioral, neurobiological, and genetic research has approached autism categorically. However, over the years, a number of researchers have suggested that autism may be better understood by examining the component behavioral and cognitive abnormalities (reviewed in detail elsewhere 1 ). In 1971, Wing and Wing <sup>2</sup> stated that the “multiple impairments (of autism) can vary in severity and can occur independently in various childhood conditions.” In 1989, Goodman <sup>3</sup> posed the question: “Infantile autism: a syndrome of multiple primary deficits?” In 1996, McBride and colleagues <sup>4</sup> argued for a more dimensional approach, saying “The components can be considered individually,” and that there should be a “consideration of the interactions between domains.” The multidimensional perspective is reflected in the increasing use of the terms such as “autism spectrum” and “broader autism phenotype.””
Author	Credentials: Ph.D. Position and Institution: n/a Publication History in Peer-Reviewed Journals: 101
Publication	Type of publication: Peer-reviewed journal Publisher: American Academy of Child & Adolescent Psychiatry Other: ScienceDirect
Date and Citation History	Date of publication: 2009 Cited By: 3
Stated Purpose or Research Question	“Many of the causative factors that are operating in autistic individuals are also probably playing a role in social, communicative, and repetitive behavior in family members and in the general population. However, at the same time that components are considered in isolation, it must be taken into account that some of the most distinctive, intriguing, and perplexing aspects of autism might arise from an interaction of the separable aspects or of the factors underlying these fractionable and familial traits” (p. 688).
Author’s Conclusion	“ Many of the phenomena nominated as potentially emergent seem to be associated with, and perhaps require, substantial impairment or abnormality from across the three major domains of autistic behavior. While the present domain based DSM-IV diagnostic criteria for autism define a heterogeneous group, it is a group highly enriched in individuals showing novel and nonfamilial (emergent) phenomena” (p. 691).

Overall Relevance to PICO	Overall Relevance to PICO: Moderate Relevance Rationale: Conceptualizes the environmental and neurobiological influences of ASD.
Overall Quality of Article	Overall Quality of Article: Weak Quality Rationale: Conceptual article that is difficult to find, contains little empirical evidence, and is cited sparsely.



Type of article	Overall Type: Conceptual article Specific Type: n/a
APA Reference	Pimentel, E. (1996). The disappearing reflex: A reevaluation of its role in normal and abnormal development. <i>Physical and Occupational Therapy in Pediatrics</i> , 16(4), 19-41. doi:10.1080/J006v16n04_02
Abstract	The objectives of this article are to examine theoretical views regarding the appearance and disappearance of primitive reflexes and to discuss their implications for therapeutic intervention. According to the traditional view, primitive reflexes are inhibited or integrated by higher central nervous system centers. After central nervous system (CNS) damage, these primitive reflexes are released from inhibition by higher centers. This view implies a model of CNS organization for motor control that is hierarchically organized. Alternatively, according to the more contemporary systems view, the development of reflexive and volitional behavior is the results of an interaction of central and external environmental influences. Research on primitive stepping indicates that such factors as decreased body mass and practice can contribute to the prolonged retention of this reflex. The systems view implies a distributed control model on CNS motor control in which peripheral and CNS factors participate in the control of movement. If environmental demands can alter reflexive as well as volitional movement, than traditional view of the relationship between primitive and pathological reflexes is challenged. The systems view and implied distributed control of the CNS should lead therapists to reassess their treatment rationales.
Author	Credentials: PhD Position and Institution: Instructor of Neuroanatomy, College of Physicians and Surgeons, Columbia University, New York Publication History in Peer-Reviewed Journals: 103
Publication	Type of publication: Scholarly Publisher: Taylor & Francis
Date and Citation History	Date of publication: 2009 Cited By: 1
Stated Purpose or Research Question	“The objectives of this article are to examine theoretical views regarding the appearance and disappearance of primitive reflexes and to discuss their implications for therapeutic intervention” (p. 19).
Author’s Conclusion	“The systems view and implied distributed control of the CNS should lead therapists to reassess their treatment rationales” (p.41).

Overall Relevance to PICO	Overall Relevance to PICO: Limited Relevance Rationale: Addresses primitive reflexes but not reflex integration.
Overall Quality of Article	Overall Quality of Article: Limited Quality Rationale: Published in last 10 years by reputable journal. Established author. Cited by only one other article.

**Critical appraisals.**

Jordan-Black, J. A. (2005). The effects of the Primary Movement programme on the academic performance of children attending ordinary primary school. *Journal of Research in Special Educational Needs*, 5(3), 101-111. doi:10.1111/J.1471-3802.2005.00049.x

Chinello, A., Gangli, V. D., Valenza, E. (2016). Persistent primary reflexes affect motor acts: Potential implications for autism spectrum disorder. *Research in Developmental Disabilities*, 1-9. doi:10.1016/j.ridd.2016.07.010

Blythe, S. (2005). Releasing educational potential through movement: A summary of individual studies carried out using the INPP test battery and developmental exercise programme for use in school with children with special needs, *Child Care in Practice*, 11(4). 415-432. doi:10.1080/13575270500340234

## Rhythmic Movement Training

### Executive Summary

#### Final EBP question and PICO.

Are reflex-based interventions effective for improving occupational performance when treating children with developmental disabilities?

	Keywords	More Broad and Narrow Keywords	Synonyms, abbreviations, spelling variants
<b>P</b> (Patient/Population/Problem)	Children with developmental disabilities	Autism Spectrum Disorder Dyslexia Attention Deficit Disorder/Attention Deficit Hyperactivity Disorder Cerebral Palsy	ASD ADD/ADHD CP
<b>I</b> (Assessment/Intervention)	Occupational Therapy Reflex integration Primitive reflexes	Quantum Reflex Integration Rhythmic Movement Training Masgutova Method Posture	QRI RMT MNRI
<b>C</b> (Comparison)	ABA Developmental groups		
<b>O</b> (Outcome)	Occupational Performance,	Processing skills	ADL

	Participation	Functional independence Social skills Motor Planning, Academic Performance, Communication	
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**Themes.**

***Description of the intervention.***

Rhythmic Movement Training (RMT) is a type of reflex based intervention which is currently being used with individuals with differing diagnoses across the lifespan. “Rhythmic Movement Training is a system of gentle rhythmic movements and reflex integration activities for developing emotional balance, learning ability, ease of movement and sensory integration” (Story, 2010, para. 1). The precise rhythmic movements are proposed to stimulate new connections within the brain that help the brain and nervous system and incorporate primitive infant reflexes (Rhythmic Movement Training (RMT), 2014, para. 1).

Examples of the primitive reflexes include: Moro Reflex, Fear Paralysis Reflex, Tonic Labyrinthine Reflex, Symmetrical and Asymmetrical Tonic Neck Reflex, and Spinal Galant (Move Play Thrive, 2010). Ideally, an infant would have the opportunities to integrate these primitive reflexes until they are no longer active (Rhythmic Movement Training International, 2016). When there is incomplete integration of these primitive reflexes, it is believed to contribute to autism, ADD/ADHD, sensory integration disorders, behavior challenges, vision and hearing challenges, and developmental delay (RMTi, 2016.). RMT is an intervention approach that claims to alleviate symptoms in individuals who have learning challenges such as dyslexia

or autism spectrum disorder (ASD). RMT also claims to be effective for people with emotional imbalances, schizophrenia, Parkinson's, behavioral problems, and PTSD, stating that it can be of benefit for anyone looking to reduce stress, develop reflex-integration, and live well (RMTi, 2016).

Dyslexia is described as a sensory processing dysfunction that can manifest motor coordination problems (Dempsey, 2015). Movements of the RMTi program reportedly address strengthening, coordinating the body, and improving vision (Dempsey, 2015). ASD is a neurodevelopmental disorder that can include impairments in communication and social interaction. Some proponents claim that people who have ASD may benefit from the calming and passive rocking movements of RMT (Dempsey, n.d.). RMT passive movements such as rocking are also believed to stimulate and improve auditory processing (Bennell, 2016). Both passive and active movements of RMT are said to encourage stimulation of the vestibular system (Bennell, 2016).

There are several private practices that offer courses to become certified in providing the intervention. Cost is not provided on the majority of the websites, nor is the frequency of the intervention. During the research process, only one site was found that listed the cost of the intervention. This private practice offers courses to become certified in RMT at \$600 per course, and the cost for receiving RMT ranged from \$195 to \$250 per hour (Story, 2010).

***Developers/proponents, researchers, and organization/company.***

Rhythmic movement training was proposed by individuals under the domains of movement therapy, psychiatry, and kinesiology. The foundation of RMT came from Kerstin Linde, a Swedish movement training specialist, who developed movements based on her observations of how infants are meant to move (RMTi, 2016). Swedish psychiatrist Harald

Blomberg and Australian educator and kinesiologist, Moira Dempsey wrote the book *Movements That Heal* and together they developed RMT based on the findings from Kerstin Linde (RMTi, 2016). Moira Dempsey is the founder of Rhythmic Movement Therapy International, an organization that appears to be the foundation of education and training for RMT recipients and consultants (RMTi, 2016). RMTi is the main source of information available regarding RMT and its uses. The majority of the information found on RMT websites were authored by the main developers of RMT. Conflicting information was found regarding the history and background of RMT. There are no researchers that have specifically studied the effectiveness of RMT. There is minimal amount of research on the practice of RMT, and none have been considered scholarly.

***Description of the quality and quantity of available evidence.***

To date there was no scholarly research on the topic of rhythmic movement training. There were very few unpublished dissertations found which used rhythmic movement training. Given the lack of research on this topic, the search results led to focusing on primitive reflexes in children and whether those reflexes were absent or present in children with developmental disabilities. Of the available evidence regarding primitive reflexes, eight primary research studies and six conceptual/theoretical articles were found. No systematic reviews or primary reviews were found on this specific topic. The overall quality of the journals that published the primary research studies were weak however there was one study in *The Lancet* that was found to be reputable. In this randomized, double-blind, controlled trial, the findings “suggest that the repetition of primary-reflex movements plays a major part in the inhibition of primary reflexes and that inhibition can be brought about at a much later stage in the development than is generally accepted” (McPhillips, Hepper & Mulhern, 1997, p. 540). Rhythmic movement

training has yet to be evaluated under any expert review groups. A significant amount of non-peer reviewed sources including RMT web pages and dissertations were found in this search.

*Summary of the current evidence and reviews of evidence.*

Three articles were selected for a critical appraisal. In the McPhillips, Hepper & Mulhern (1997) study mentioned above, the purpose was to examine the role that persistent primary reflexes have in the disruption of developing reading skills. The researchers “assessed the efficacy of an intervention programme based on replicating the movements generated by the primary-reflex system during fetal and neonatal life. A randomised, individually matched, double-blind, placebo-controlled design was used and children (aged 8-11 years) with persistent primary reflexes and a poor standard of reading were enrolled into one of three treatment groups: experimental (children were given a specific movement sequence); a placebo-control (children were given non-specific movements); and control (no movements)” (McPhillips, Hepper & Mulhern, 1997, p. 537). The findings “suggest that the repetition of primary-reflex movements plays a major part in the inhibition of primary reflexes and that inhibition can be brought about at a much later stage in the development than is generally accepted” (McPhillips, Hepper & Mulhern, 1997, p. 540).

The second article selected for a critical appraisal was a case control study that “sought to assess the relationship between reflex retention and AD/HD symptomatology and academic achievement. Initially, the study examined whether boys diagnosed with AD/HD exhibited higher levels of reflex retention than boys with *shadow* symptoms of the disorder (CLEBs) and boys with no (or near to no) symptoms of the disorder (Ables). A path analysis was then conducted to examine interrelationships amongst the four reflexes, as well as the relationship between these and AD/HD symptomatology and academic achievement” (Taylor, Houghton &



Chapman, 2004, p. 26). The findings of this study suggested that there was a significant relationship between primitive reflex retention and AD/HD classifications (Taylor, Houghton & Chapman, 2004). This article did not identify any study limitations and did not report information that should have been available in order to determine credibility.

The third article selected for a critical appraisal was a case control study that sought to determine “whether ADHD children in the school age (8-11 years) will have higher level of persisting primitive reflexes Moro and Galant compared to a control group of children of the same age” (Konicarova & Petr, 2012 p. 135). The design of the study included the researchers being given instructions on how to observe the children for the presence of Moro and Galant reflexes in both groups of children. (Konicarova & Petr, 2012) Findings suggested that “ADHD participants have higher ratings of primitive reflexes i.e. Moro reflex and Galant reflex in comparison to healthy participants who had lower scores of the primitive reflexes” (Konicarova & Petr, 2012 p.137). The article did not include the basic information necessary to help evaluate its credibility, so it is hard to rule out the possibility that there are alternative explanations for these differences in reflex scores.

The overlapping theme between the three articles regarded primitive reflex retention in children. Outcomes suggest the significance of reflex retention in predicting problem behaviors in children. The authors implied there was an importance to determining the persistence of primitive reflexes when considering learning difficulties. It is important to keep in mind that these studies do not directly relate to RMT nor do they help determine the effectiveness of RMT. Rather, they review the presence of primitive reflexes in children with differing developmental disabilities, which is the basis of the RMT intervention.

**Expert review table.**

Table 1

*Summary of Evidence and Recommendations by Expert Review Groups for Rhythmic Movement Training*

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).  <a href="https://tiac.wisconsin.gov/summary-determinations-regarding-level-evidence.htm">https://tiac.wisconsin.gov/summary-determinations-regarding-level-evidence.htm</a>
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., 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.  <a href="http://autismpdc.fpg.unc.edu/sites/autismpdc.fpg.unc.edu/files/2014-EBP-Report.pdf">http://autismpdc.fpg.unc.edu/sites/autismpdc.fpg.unc.edu/files/2014-EBP-Report.pdf</a>
Association for Science in Autism Treatment (ASAT)	Not reviewed	Association for Science in Autism Treatment (n.d.) Treatments in alphabetical order.  <a href="http://www.asatonline.org/for-parents/learn-more-about-specific-treatments/treatments-in-alphabetical-order/">http://www.asatonline.org/for-parents/learn-more-about-specific-treatments/treatments-in-alphabetical-order/</a>
Cochrane Collaboration	Not reviewed	Cochrane Collaboration (2016).  <a href="http://www.cochrane.org/">http://www.cochrane.org/</a>
U.S. Department of Health and Human 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

Centers for Medicare & Medicaid Services.	<a href="http://www.impaqint.com/sites/default/files/files/Autism_Spectrum_Disorders.pdf">http://www.impaqint.com/sites/default/files/files/Autism_Spectrum_Disorders.pdf</a>	
National Autism Center	Not reviewed	National Autism Center (2015). National Standards Project, Phase 2. Retrieved from <a href="http://www.nationalautismcenter.org/national-standards-project/phase-2/">http://www.nationalautismcenter.org/national-standards-project/phase-2/</a>
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. <a href="http://pediatrics.aappublications.org/content/pediatrics/120/5/1162.full.pdf">http://pediatrics.aappublications.org/content/pediatrics/120/5/1162.full.pdf</a>

***Summary.***

Proponents for RMT built upon the foundation that primitive reflex movements begin in utero and remain important over time as the brain develops neural connections to learn, behave, and communicate (RMTi, 2016). Unintegrated primitive reflexes are proposed to be a contributing factor to learning disabilities, vision and hearing delays, and disorders like attention deficit hyperactivity disorder and autism spectrum disorders (RMTi, 2016). RMT incorporates movement-based therapy and primitive reflexes at a young age in an effort to help with the overall development and growth of individuals. There is no research to be found on RMT for children with developmental disabilities to date. RMT has not been listed or reviewed by organizations such as Wisconsin Treatment Intervention Advisory Committee. Based on our research we would assign this intervention a Level 4 because there is no evidence base for this

intervention, however it is not believed to cause harm. Research is needed to determine whether there is an evidence base to support the proposed benefits of using RMT for children with developmental disabilities.

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Story, S. (2010). Brain Development through Movement and Play. Retrieved November 2, 2016, from Move-Play-Thrive, <http://www.moveplaythrive.com/articles-by-move-play-thrive/what-is-rhythmic-movement-training>

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**Background Learning and Evidence Searches****Table of resources.**

Table 2.  
*Online Sources that Address Rhythmic Movement Training*

Title/Name	Brief Description	Source
Rhythmic Movement Training International (RMTi)	Defines Rhythmic Movement Training (RMT) Explains primitive reflexes Provides articles related to the reflexes, but not specific to RMT Same organization has two different web pages Founder, Moira Dempsey	<a href="http://www.rhythmicmovement.com/index.php/en/research-and-articles">http://www.rhythmicmovement.com/index.php/en/research-and-articles</a> <a href="http://rhythmicmovement.org/">http://rhythmicmovement.org/</a>
Superior Therapy Connections	Proposed impacts of RMT Discusses how RMT originated Provides video examples Private practice OT Refers back to the RMTi website Founder, Heidi McLarty	<a href="http://www.superiortherapyconnections.com/rhythmic-movement-training-rmt.html">http://www.superiortherapyconnections.com/rhythmic-movement-training-rmt.html</a>
Blomberg Rhythmic Movement Training	History of Blomberg Training method Based on Kerstin Linde's (Body/Movement Therapist) rhythmic exercises RMT use in specific disorders Founder, Harald Blomberg	<a href="http://www.blombergmt.com/rhythmic-movement-training/">http://www.blombergmt.com/rhythmic-movement-training/</a>
Integrate through Movement	Describes neurodevelopmental movement and primary motor reflex patterns Related interventions Refers back to Blomberg RMT website Private Practice, licensed in Blomberg RMT and Brain Gym Founder, Sheri Hoss	<a href="http://www.integratethroughmovement.com/">http://www.integratethroughmovement.com/</a>
Brain Development through Movement and Play	Reflex Integration for entire age span Case studies Claimed emotional and physical challenges Refers back to RMTi and Blomberg RMT websites Founder, Sonia Story	<a href="http://www.moveplaythrive.com/">http://www.moveplaythrive.com/</a>

**Background learning paper one.**

This evidence based practice (EBP) project will focus on reflex based interventions and specifically Rhythmic Movement Training (RMT). The paper will summarize basic definitions, history, potential benefits, and the claimed effectiveness of RMT. Although the information comes from different websites many of the sources lead back to the main RMT site. However, the websites do not agree on the origins of RMT.

A review of definitions of primitive reflexes and rhythmic movement training is important foundation for this EBP project. “Rhythmic Movement Training (RMT) is a system of gentle rhythmic movements and reflex integration activities for developing emotional balance, learning ability, ease of movement and sensory integration” (Story, 2010, para. 1). Precise rhythmic movements are believed to stimulate new connections within the brain that help out the brain and nervous system and incorporate primitive infant reflexes (Rhythmic Movement Training (RMT), 2014, para. 1). Primitive reflexes are reflexive actions that originate from the Central Nervous System (CNS). The reflexive actions are in reply to a stimulus, in normally developing infants (Rhythmic Movement Training (RMT), 2014, para. 6). Babies engage in rhythmic movements to allegedly activate their brain to combine the primitive reflexes (Rhythmic Movement Training (RMT), 2014, para. 6). Tummy time, rolling, crawling and engaging in such instinctual movement for the development of their brain are described as examples of rhythmic movement (Rhythmic Movement Training (RMT), 2014, para. 8).

The origins of RMT and beliefs about primitive reflexes are uncertain. One website claims that, “RMT originated in Stockholm, Sweden by Kerstin Linde in the 1970’s when she began using movements with a rhythmic element for people with developmental and movement challenges” (Rhythmic Movement Training (RMT), 2014, para. 3). The site believes she devised

a series of movements based on the natural movements used by babies, typically newborns to two months, to combine their primitive reflexes (Rhythmic Movement Training (RMT), 2014, para. 6). Another website claimed that “Dr. Harald Blomber, MD, a psychiatrist from Sweden, is the founder and originator of Rhythmic Movement Training” (Hoss, 2013, para. 6). They believe that Blomber had assistance from Linde back in 1985 in the development of RMT (Hoss, 2013, para. 6). One thing that was consistent between the two websites was that the proponents of RMT collaborated at some point.

The basic premises of RMT are similar for the main websites. Stimuli from rhythmic movements in the first year of life is crucial for the development and growth of the brain (Story, 2010, para. 3). If a child does not get enough stimulation during the early months of life it can result in an inability to process and access the cortex information. (Story, 2010, para. 5). If this happens, it is claimed that infants will have trouble focusing, thinking, learning, planning and managing emotions (Story, 2010, para. 5).

Researchers claim that RMT is most beneficial in infants with developmental disabilities such as; children with ADD/ADHA, learning disabilities, developmental, sensory processing disorders and many other challenges (Rhythmic Movement Training (RMT), 2014, para. 2). Some people who face these challenges report that RMT helps to assist and improve the following areas, anxiety, hypersensitivity, balance, coordination, posture, focus and memory (Rhythmic Movement Training (RMT), 2014, para. 2).

There are a number of programs that are promoting the use of RMT. One organization is Rhythmic Training International (RMTi). RMTi is a nonprofit organization that offers different types of training sessions for individuals to get licensed in RMT (Inc., 2016, para. 2). RMTi works with a wide variety of individuals reportedly providing the basis for increasing the overall



ability in all areas of life for individuals through replicating movements (Inc., 2016, para. 8).

RMTi provides a range of classes to benefit a wide spectrum of people (Inc., 2016, para. 8).

Integrate through Movement is another program that provides RMT classes. This specific program was developed by Sheri Hoss. Sheri is a licensed Blomber Rhythmic Movement Training instructor and has specialized background in neurodevelopment (Hoss, 2013, para. 1). Multi-sensory, neurodevelopmental movement and sensorimotor, are all reflex integrating therapies this specific program provides (Hoss, 2013, para. 3). The program claims to help individuals through the experience of movement to improve academic skills, performance, and normal life functions (Hoss, 2013, para. 3).

In conclusion, RMT claims to address movements and reflexes at a very young age to help with the overall development and growth of a individual. This background learning provides the foundation for continued review to examine the effectiveness of RMT.

## References

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- Rhythmic Movement Training (RMT). (2014). Retrieved November 3, 2016, from Superior Therapy Connections, <http://www.superiortherapyconnections.com/rhythmic-movement-training-rmt.html>
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- Inc., M. A. T. (2016). What is rhythmic movement training international (RMTi)? Retrieved November 3, 2016, from RMTi, <http://rhythmicmovement.org/rmt-explained>

**Background learning paper two.**

This EBP project will focus on Rhythmic Movement Training (RMT), which is a reflex based intervention and a comprehensive treatment model. Background learning on this topic focused on the definitions of RMT, introduction to the different primitive reflexes, and the proposed beneficiaries of RMT. Background Learning also focused on the legitimacy of the research that has been done thus far within RMT.

Supporters of RMT base their work on the primitive reflexes that we have as infants. Primitive reflexes are the repetitive, automatic movements that infants make that are proposed to develop the brain (Rhythmic Movement Training International, 2016). These movements originate in the brain stem and “lay down the patterns of neural networks and myelinisation of pathways that allow the connection of the various areas of the brain that are so important later on for learning, behaviour, communication, relationships, and emotional well being” (RMTi, 2016, “Why are Primitive Reflexes Important?”). In other words, the brain requires stimulation for nerve growth, and the main stimulation is believed to come from engaging in rhythmic movements (Move Play Thrive, 2010). This is because the senses of balance, tactile, and proprioception are all fully engaged while doing rhythmic movements (Move Play Thrive, 2010).

Examples of the primitive reflexes include: Moro Reflex, Fear Paralysis Reflex, Tonic Labyrinthine Reflex, Symmetrical and Asymmetrical Tonic Neck Reflex, and Spinal Galant (Move Play Thrive, 2010). Ideally, an infant would have the opportunities to integrate these primitive reflexes until they are no longer active (RMTi, 2016). When there is incomplete integration of these primitive reflexes, it is believed to contribute to autism, ADD/ADHD, sensory integration disorders, behavior challenges, vision and hearing challenges, and developmental delay (RMTi, 2016.).

Rhythmic Movement Training can be used with individuals with differing diagnoses and across the lifespan. RMT is a motor training program developed on the basis of typical primitive reflexes in infants (Blomberg, 2016). Blomberg proposed an early version of RMT program, which he based on the rhythmic exercises he learned from Swedish body therapist, Kerstin Linde (Blomberg, 2016). RMT also claims to be effective for people with emotional imbalances, schizophrenia, Parkinson's, behavioral problems, and PTSD (RMTi, 2016). Supporters of RMT believe that RMT helps increase functioning of attention, visual skills, speech and language development, sensory processing, emotional maturity, impulse control and physical strength among others (Move Play Thrive, 2010).

Currently, there is limited research regarding the proposed benefits of RMT. Few studies focus specifically on Rhythmic Movement Training, but rather examined the primitive reflexes or reflex based interventions in general. Links on many RMT websites either brought up a page that no longer existed or had irrelevant articles. Additionally, the case studies that are specific to RMT were conducted by the proponents of RMT and are not published in scholarly peer reviewed journal articles. Furthermore, there are inconsistencies in information on the origins of RMT, with conflicting information being displayed on two of the major websites for RMT.

The background learning that has been done so far on Rhythmic Movement Training shows us that there is much more research that needs to be done in order to determine the validity of this comprehensive treatment model.

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Retrieved from <http://rhythmicmovement.org/importance-of-primitive-reflexes>

**Background learning paper three.**

This EBP project will focus on interventions that are reflex based. More specifically, this portion of the project will analyze the current literature on rhythmic movement training (RMT). Background learning on this topic explored definitions of RMT, common intervention approaches of RMT, diagnoses RMT is used as an intervention for.

Rhythmic movement training (RMT) was proposed by individuals under domains of movement therapy, psychiatry, and kinesiology. The foundation of RMT came from Kerstin Linde, a Swedish movement training specialist, who developed movements based on her observations of how infants are meant to move (“What is Rhythmic Movement Training International (RMTi)?”). Swedish psychiatrist Harald Blomberg and Australian educator and kinesiologist, Moira Dempsey wrote the book, *Movements That Heal* and together they developed RMT based on the findings from Kerstin Linde (“Our history”). Moira Dempsey is the founder of Rhythmic Movement Therapy International, an organization that is the foundation of education and training for RMT recipients and consultants (“What is Rhythmic Movement Training International (RMTi)?”). RMTi is the main source of information available regarding RMT and its uses.

RMT has a foundation built upon repetitive and automatic movements, also known as primitive reflexes (“The importance of integrating primitive reflexes”). Primitive reflex movements begin in utero and remain important over time as the brain develops neural connections to learn, behave, and communicate (“The importance of integrating primitive reflexes”). Some of these reflexes include the Moro Reflex, Fear Paralysis Reflex, Tonic Labrynthine Reflex, Symmetrical Tonic Neck Reflex, Asymmetrical Tonic Neck Reflex, Spinal Galant, and other reflexes which are further explained in detail on the RMTi website (“The

importance of integrating primitive reflexes”). Unintegrated primitive reflexes are proposed to be a contributing factor to learning disabilities, vision and hearing delays, and disorders like attention deficit hyperactivity disorder (ADHD) and autism spectrum disorders (ASD) (“Why are primitive reflexes important?”).

RMT is an intervention approach that claims to alleviate symptoms in individuals who have learning challenges such as dyslexia or an ASD. RMTi claims that RMT can be of benefit for anyone looking to reduce stress, develop reflex-integration, and live well (“What is rhythmic movement training international (RMT?”). Dyslexia is described as a sensory processing dysfunction that can manifest motor coordination problems (Dempsey, 2015). Movements of the RMTi program reportedly address strengthening, coordinating the body, and improving vision (Dempsey, 2015). ASD is a neurodevelopmental disorder that can include impairments in communication and social interaction. Some proponents claim that people who have ASD may benefit from the calming and passive rocking movements of RMT (Dempsey, n.d.). RMT passive movements such as rocking are also believed to stimulate and improve auditory processing (Bennell, 2016). Both passive and active movements of RMT are said to encourage stimulation of the vestibular system (Bennell, 2016).

This background summary of reflex based intervention specifically discussed the current literature on RMT. Information was found regarding the development, foundation, and common intervention approaches of RMT. Throughout this exploratory process, it has become evident that the different sources pertaining to RMT are all referenced from the main organization of RMT, which is RMTi

## References

- Bennell, E. (2016). Listening, auditory processing, reflex links and support with RMT. Retrieved from  
from  
[http://rhythmicmovement.org/images/Listening\\_Auditory\\_Processing\\_Reflexes\\_and\\_support\\_with\\_RMT.pdf](http://rhythmicmovement.org/images/Listening_Auditory_Processing_Reflexes_and_support_with_RMT.pdf)
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### Evidence searches.

#### Library Database: PUBMED

##### *Preparing for Search Process*

- Rhythmic Movement Training does not come up in the initial PUBMED search. With that being said, my sub group set up a meeting time with the OT librarian, Cynthia to be sure we were using the right search words and techniques. At first Cynthia suggested typing Rhythmic Movement Training with quotation marks in the search. Still no research/evidence/articles showed up. Next, Cynthia suggested getting rid of the word training in the search. Still no result appeared. We continued to have no luck finding anything relating exactly to Rhythmic Movement Training.
- With that being said, Cynthia provided us with the idea to break the initial idea up into a broader topic. Myself and two other group members decided we would research more in depth about primitive reflexes. The Rhythmic Movement Training websites we found in the background learning mention primitive reflexes and the relation with Rhythmic Movement Training.
- Into PUBMED I typed primitive reflexes. Many articles did come up but not many that would be beneficial.
- I typed primitive reflexes, “primitive reflexes”, reflex integration, primitive reflexes in children, reflexes in newborns and reflexes and still even had difficulty finding significant/supportive primitive information to help support/relate to the Rhythmic Movement Training.
- From my keywords/Mesh words below you will find for some many articles did come up but not all of them related to this specific topic.

##### *Summarizing a Strategic Search Process*

Filters/Years	Keywords	Total Yield / Relevant Hits	Date
Type of Article: Journal: Research in developmental disabilities Journal: Clinical medicine research	primitive[All Fields] AND ("reflex"[MeSH Terms] OR "reflex"[All Fields] OR "reflexes"[All Fields])	2/390 <b>Chinello, Alice A, 2015</b> <b>Sohn, Min M, 2011</b>	Nov., 2016
Type of Article: International journal of pediatrics	primitive[All Fields] AND ("reflex"[MeSH Terms] OR "reflex"[All Fields] OR "reflexes"[All Fields]) AND ("child"[MeSH Terms] OR "child"[All Fields] OR "children"[All Fields])	3/90 <b>Futagi, Yasuyuki Y, 2012</b> <b>Olhweiler, Lygia L, 2005</b> <b>Zafeiriou, Dimitrios, 2004</b>	Nov., 2016

Type of Article: Pediatric neurology	"newborns"[All Fields] AND "reflexes"[All Fields] AND "primitive reflexes"[All Fields]	1/10 <b>Saraga, Marijan M, 2007</b>	Nov., 2016
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### Summary of 5 BEST Research Articles

Chinello, A., Di Gangi, V., & Valenza, E. (2016). Persistent primary reflexes affect motor acts:

Potential implications for autism spectrum disorder. *Research in Developmental*

*Disabilities*. doi:10.1016/j.ridd.2016.07.010

In typical motor development progress in use of goal-directed actions and communicative gestures depends on the inhibition of several primitive reflexes, especially those that involve the hand or mouth. This study explored the relationship between the persistence of primitive reflexes that involve the hand or mouth and the motor repertoire in a sample of 12- to 17-month-old infants. Moreover, since children with Autism Spectrum Disorders (ASD) often have difficulty in performing skilled movements and show poor gesture repertoire, and since ASD represents the upper extreme of a constellation of traits that may be continuously distributed in the general population, we investigated the relationship between the persistence of primitive reflexes in the same sample of infants and the subclinical autistic traits measured in their parents. Results revealed that the persistence of the primitive reflexes correlated with motor repertoire irrespective of infant's age, and it was greater among infants whose parents had more subclinical autistic traits. Our findings suggest that the persistence of primitive reflexes might alter the developmental trajectory of future motor ability and therefore their evaluation might be an early indicator of atypical development.

Futagi, Y., Toribe, Y., & Suzuki, Y. (2012). The grasp reflex and Moro reflex in infants:

Hierarchy of primitive reflex responses. *International Journal of Pediatrics*, 2012,1–10.

doi:10.1155/2012/191562

The plantar grasp reflex is of great clinical significance, especially in terms of the detection of spasticity. The palmar grasp reflex also has diagnostic significance. This grasp reflex of the hands and feet is mediated by a spinal reflex mechanism, which appears to be under the regulatory control of nonprimary motor areas through the spinal interneurons. This reflex in human infants can be regarded as a rudiment of phylogenetic function. The absence of the Moro reflex during the neonatal period and early infancy is highly diagnostic, indicating a variety of compromised conditions. The center of the reflex is probably in the lower region of the pons to the medulla. The phylogenetic meaning of the reflex remains unclear. However, the hierarchical interrelation among these primitive reflexes seems to be essential for the arboreal life of monkey newborns, and the possible role of the Moro reflex in these newborns was discussed in relation to the interrelationship.

Saraga, M., Rešić, B., Krnić, D., Jelavić, T., Sinovčić, I., & Tomasović, M. (2007). A

Stereotypic "Elbowing" movement, a possible new primitive reflex in newborns.

*Pediatric Neurology*, 36(2), 84–87. doi:10.1016/j.pediatrneurol.2006.09.013

The primitive reflexes are brainstem-mediated and play various roles in the child's psychomotor development. The objective of the current study is to describe a new pattern of primitive reflex, noticed in 52 of 81 randomly chosen newborns and young infants during pressing of the subcostal region. Some of them reacted by three-phase stereotypic movement as follows: phase 1: quick adduction of upper arm with flexion of the forearm, with elbow directed toward the site of stimuli, touching the stimulated area; phase 2: abduction and retroflexion of upper arm with the movement of removing the stimulus with the elbow; phase 3: extension and pronation of the forearm. The prevalence of this newly described reflex was 64.2%. The incidence of all three phases together was highest at Day 16 (63.5%); phase 1 was the most frequent at Day 30 (88.5%) in 52 children with positive reflex. At Day 86, only 18.4% of them retained the first phase of the movement and 2% retained the third phase. All reflexes appeared until Day 30. We believe that we have described a new primitive reflex, with all characteristics essential for primitive reflexes. It is definitely involuntary, complex, stereotypic, with decreased incidence over time. Because of the defensive purpose and peculiar manner of this reflex, we named it the "elbowing reflex."

Sohn, M. M. (2011). Assessment of primitive reflexes in high-risk newborns. *Journal of Clinical*

*Medicine Research*. doi:10.4021/jocmr706w

#### Background:

Assessment of primitive reflexes is one of the earliest, simplest, and most frequently used assessment tools among health care providers for newborns and young infants. However, very few data exist for high-risk infants in this topic. Among the various primitive reflexes, this study was undertaken particularly to describe the sucking, Babinski and Moro reflexes in high-risk newborns and to explore their relationships with clinical variables.

#### Methods:

This study is a cross-sectional descriptive study. Sixty seven high-risk newborns including full-term infants required intensive care as well as premature infants were recruited in a neonatal intensive care unit using convenient sampling method. The sucking, Babinski and Moro reflexes were assessed and classified by normal, abnormal and absence. To explore their relationships with clinical variables, birth-related variables, brain sonogram results, and behavioral state (the Anderson Behavioral State Scale, ABSS) and mental status (the Infant Coma Scale, ICS) were assessed.

#### Results:

The sucking reflex presented a normal response most frequently (63.5%), followed by Babinski reflex (58.7%) and Moro reflex (42.9%). Newborns who presented normal sucking and Babinski reflex responses were more likely to have older gestational age, heavier birth and current weight,

higher Apgar scores, shorter length of hospitalization, better respiratory conditions, and better mental status assessed by ICS, but not with Moro reflex.

Conclusions:

High risk newborns presented more frequent abnormal and absence responses of primitive reflex and the proportions of the responses varied by reflex. Further researches are necessary in exploring diverse aspects of primitive reflexes and revealing their clinical implication in the high-risk newborns that are unique and different to normal healthy newborns.

Zafeiriou, D. I. (2004). Primitive reflexes and postural reactions in the neurodevelopmental

examination. *Pediatric Neurology*, 31(1), 1–8. doi:10.1016/j.pediatrneurol.2004.01.012

The primitive reflexes and the postural reactions comprise one of the earliest, simplest, and most frequently used tools among child neurologists to assess the central nervous system integrity of infants and young children. Infants with cerebral palsy have been known to manifest persistence or delay in the disappearance of primitive reflexes and pathologic or absent postural reactions. The clinical significance of asymmetric tonic neck reflex, Moro, palmar grasp, plantar grasp, Galant, Babinski, Rossolimo, crossed extensor, suprapubic extensor, and heel reflex, alone or in combination, as well as their contribution to the early diagnosis and differential diagnosis of cerebral palsy, have been demonstrated in a number of studies. Moreover, infants with 5 or more abnormal postural reactions have developed either cerebral palsy or developmental retardation as reported in a number of studies. Although a comprehensive neurologic examination in the context of a motor assessment instrument is preferable to an informal list of items, the combined examination of primitive reflexes and postural reactions should be considered by the child neurologist, as a simple but predictive screening test for the early identification of infants at risk for cerebral palsy. It is quick and easy to perform, both in nonhospital environments and in underdeveloped countries, where time and specific resources are limited. The combined examination is also useful in developed countries because many developmental disorders such as cerebral palsy appear in nonrisk groups whereas others are not detected by metabolic screening programs

**Individual Assignment:** Other Evidence Resources**Evidence Resource(s):** Google***Search Process & Findings***

- My group has had a difficult time finding reliable information. I continued to search Google and am still unable to come up with good concrete information. From the few Rhythmic Movement Training sites that do exist they are private practices of people. The main site for Rhythmic Movement Training is the <http://www.rhythmicmovement.org/>
- Within, the website page above one of my sub group members pointed out a dissertation written in 2012 by a former St. Catherine graduate, Mary Gazca back in May 2012. The title of the dissertation is Rebooting Development with a Rhythmic Motor Intervention for Children. On the Website we were unable to click and find the dissertation but then when searching for it in the library database we were able to find it to check out from the library. It took a few days to actually get a hold of but finally the St. Kate's library was able to find it for us.
- I personally do not see that this dissertation has been published. However, Gazca does list several resources at the end that she used through the process. It was interesting to see that none of the references listed had any title with rhythmic movement. All the references listed had to do with things relating to rhythmic movement. Such as motor function in infants, primitive reflexes, and developmental coordination disorders.
- The dissertation does touch on different aspects of Rhythmic Movement Training such as theories of motor development and motor deficits/interventions early but nothing specific to the therapy.
- I find it interesting that many of the articles she used are based on many of the articles I found about primitive reflexes.

***Other Google searches***

I continue to struggle to find good concrete accredited information on Rhythmic Movement Training. When typing in Rhythmic Movement Training in Google the best resources I found I have listed below. The information regarding RMT does overlap some but the thing is not one site appears to be accredited. Many of the sites are owned/run by a single person and it is like their own practice. I went through and summarized the best five I feel from the initial background learning.

**Best Resources and Articles**

Story, S. (2010). Brain Development through Movement and Play. Retrieved November 2, 2016,

from Move-Play-Thrive, <http://www.moveplaythrive.com/articles-by-move-play-thrive/what-is-rhythmic-movement-training>

Description of site:

- Reflex Integration for entire age span
- Case studies

- Claimed emotional and physical challenges
- Refers back to RMTi and Blomberg RMT websites
- 

Rhythmic Movement Training (RMT). (2014). Retrieved November 3, 2016, from Superior

Therapy Connections, <http://www.superiortherapyconnections.com/rhythmic-movement-training-rmt.html>

Description of site:

- Proposed impacts of RMT
- Discusses how RMT originated
- Provides video examples
- Private practice OT
- Refers back to the RMTi website

Hoss, S. (2013). Rhythmic movement training. Retrieved November 3, 2016, from Integrate

through Movement, <http://www.integratethroughmovement.com/rhythmic-movement/>

Description of site:

- Describes neurodevelopmental movement and primary motor reflex patterns
- Related interventions
- Refers back to Blomberg RMT website
- Private Practice, licensed in Blomberg RMT

Inc., M. A. T. (2016). What is rhythmic movement training international (RMTi)? Retrieved

November 3, 2016, from RMTi, <http://rhythmicmovement.org/rmt-explained>

Description of site:

- Defines Rhythmic Movement Training (RMT)
- Explains primitive reflexes
- Provides articles related to the reflexes, but not specific to RMT

**Library Database: OT Search*****Preparing for Search Process***

- To prepare for the search process, my subgroup and I met with Cynthia, the librarian for the Occupational Therapy program. After briefing her on our research topic, she recommended 4 databases for us to search. She also showed us how to use Mesh terms in PubMed. Cynthia taught us strategies to widen our search base since we were having difficulty finding any scholarly sources directly related to Rhythmic Movement Training.
- We decided to start our search with Rhythmic Movement Training and from there we widened our search to Primitive Reflexes and Reflex Integration/Reflex Based Intervention searches.
- In the OT Search database, they have a 261-page PDF document (OT Thesaurus) that gives the approved subject headings as well as Mesh terms. This was a very tedious process to go through. Some points of interest
  - Moro Reflex/Reaction: use Reflex, abnormal
  - Movement [Mesh]
  - Reflex [Mesh]
  - Reflex, primitive
  - Intervention Process, Occupational Therapy

***Summarizing a Strategic Search Process***

Filters/Years	Keywords	Total Yield / Relevant Hits	Date
None Years: Unlimited	Rhythmic AND Movement [Mesh] AND Training	1/-	Nov. 16, 2016
None Years: Unlimited	Primitive AND Reflex [Mesh]	42/4 Capute, et al., 1978 Fiorentino, 1973 Pimentel, 1996 Stern, 1971	Nov. 16, 2016
None Years: Unlimited	Primitive AND Reflex [Mesh} AND Intervention	1/1 Pimentel,1996	Nov. 16, 2016
None Years: Unlimited	Reflex [Mesh] AND Abnormal	21/1 Pimentel,1996	Nov. 16, 2016
None Years: Unlimited	Reflex [Mesh] AND Integration	9/-	Nov. 16, 2016
None Years: Unlimited	Reflex [Mesh] AND Intervention	3/1 Pimentel,1996	Nov. 16, 2016

**Summary of 5 BEST Research Articles**

Capute A. J., Accardo P. J., Vining E. P., Rubenstein J. E., Walcher J. R., Harryman S., Ross A.

(1978). Primitive reflex profile. A pilot study. *Physical Therapy*, (58)9, 1061-1065.

Seven primitive reflexes used by physical and occupational therapists in evaluating children with cerebral palsy were each graded on a 0 to 4+ scale to constitute a Primitive Reflex Profile. The reflexes studied were the asymmetrical tonic neck reflex, the symmetrical tonic neck reflex, the tonic labyrinthine reflex, the positive support reflex, the derotational righting reflex, the Moro reflex, and the Galant reflex. The Primitive Reflex Profile was studied in 53 cerebral palsied patients to assess both the feasibility of its administration and its usefulness in discriminating functional levels of ambulation. The Primitive Reflex Profile was administered by at least two members of a team consisting of four pediatric developmentalists and two physical therapists. In using this instrument, the extreme functional groups were clearly defined and showed the expected overlap with the intermediate classification.

Fiorentino, N. R. (1973). *Reflex testing methods for evaluating C.N.S. development*. Springfield,

IL: Charles C Thomas.

By Mary R. Fiorentino, Newington Children's Hospital, Newington, Connecticut. With a Foreword by Burr H. Curtis. This book is useful in the initial and periodic examination of all infants and children through six years of age. It can be used in the diagnosis and evaluation of such patients where abnormal reflexive reactions are suspected. The assessment of other patients who might need neurophysio-logically oriented treatment is included. A basis for physiatrists which encompasses the diagnosis and program planning for rehabilitation is given. A section is provided for determining the maturation level and abnormal reflexes for a treatment program.

Pimentel, E. D. (1996). The disappearing reflex: A reevaluation of its role in normal and

abnormal development. *Physical & Occupational Therapy in Pediatrics*, 16(4), 19-42.

doi:10.1080/J006v16n04\_02

The objectives of this article are to examine theoretical views regarding the appearance and disappearance of primitive reflexes and to discuss their implications for therapeutic intervention. According to the traditional view, primitive reflexes are inhibited or integrated by higher central nervous system centers. After central nervous system (CNS) damage, these primitive reflexes are released from inhibition by higher centers. This view implies a model of CNS organization for motor control that is hierarchically organized. Alternatively, according to the more contemporary systems view, the development of reflexive and volitional behavior is the results of an interaction of central and external environmental influences. Research on primitive stepping indicates that such factors as decreased body mass and practice can contribute to the prolonged retention of this reflex. The systems view implies a distributed control model on CNS motor control in which peripheral and CNS factors participate in the control of movement. if environmental demands



can alter reflexive as well as volitional movement, then the traditional view of the relationship between primitive and pathological reflexes is challenged. The systems view and implied distributed control of the CNS should lead therapists to reassess their treatment rationales.

Stern, F. M. (1971). The Reflex Development of the Infant. *The American Journal of Occupational Therapy*, (25)3, 155-158.

No abstract available.

**Evidence Resource(s):** Websites/ OT Seeker***Preparing for Search Process***

- In preparing for this search process I already knew that it would be highly unlikely I would find many scholarly sources given our search outcomes so far. For this reason, I figured I would have better outcomes using links to articles from both credible and non-credible websites. I also wanted to search OT specific websites to see if any research, warnings, or conclusions have been made.

***Documenting the Search Process***

- OT Seeker:
  - Step 1: I searched “Rhythmic Movement Training” and received eight hits with none of them being relevant.
  - Step 2: I searched “Reflex Based Intervention” and received three hits with one of them being relevant. This was actually a journal article in the database ScienceDirect, which may help find other articles for future searches since I did not have much luck using the database OT Search.
- AOTA:
  - Step 1: I searched “Rhythmic Movement Training” and received nine hits with none of them being relevant.
  - Step 2: I searched “Reflex Based Intervention” and received 31 hits with none of them being relevant.
- Rhythmicmovement.org
  - Step 1: This is one of the main websites as it is one of the individuals who had an early influence in Rhythmic Movement Training. This individual, Moira Dempsey, along with another early influencer, Harald Blomberg, wrote a book on Rhythmic Movement Training called *Movements that Heal*. I checked with our school library and they do not have it. I did check on Amazon, but it was more money than I would like to spend so I am going to continue my search at local libraries.
  - Step 2: This website has an entire page dedicated to resources. I am unsure of the reliability of most, as many are broken links that don’t bring you to the source and others are just word documents written by Moira Dempsey that are not scholarly, peer reviewed articles. I have compiled some below that I felt were more reliable than others.

***Summary of 5 BEST Research Articles***

Blomberg, H., Dempsey, M. (2011). *Movements that Heal: Rhythmic Movement Training and Primitive Reflex Integration*. Australia: Bookpal.

Movements that Heal looks at the reasons behind why the Rhythmic Movement Training and Primitive Reflex Integration programme works. It discusses the developmental and environmental reasons behind many learning, sensory, emotional and behavioural challenges.

Grigg, T.M. (2016). The voice of parents who have used rhythmic movement training with their child. (Master's Thesis). Retrieved from <http://rhythmicmovement.org/images/TessaGriggM-2016.pdf>

This study investigates the experiences of seven families who have used Rhythmic Movement Training (RMT) as an intervention with their child with retained primitive reflexes. The theoretical framework of phenomenology and interpretivism was the basis for a qualitative phenomenological research design used to gather and analyse data. Four RMT practitioners in New Zealand were invited to nominate families who were willing to participate in one semi-structured interview. The collective voice of 14 parents captured their reasons for seeking additional help with their child's development issues, finding RMT, using RMT within their family routine and their perceptions of the benefits they experienced and the costs, both financial and time, incurred. RMT is a programme which uses a series of movements to encourage the integration of retained primitive reflexes. While there is a small amount of research around movement programmes that target retained primitive reflexes, to-date there appears to be no empirical studies completed on RMT. The parents in this study found that RMT was relatively easy to manage within their family routine and that it was a low-impact, cost-effective intervention with a range of perceived benefits for the child who had completed RMT. Further study into the efficacy of RMT would be beneficial with the understanding from this study that the programme is perceived as manageable within a family routine by this group of families.

Konicarova, J., Petr, B. (2012). Retained Primitive Reflexes and ADHD in Children. *Activitas Nervosa Superior*, 54(3-4), 135-138.

Particularly important postnatal developmental reflexes that diminish in later stages of development are Moro reflex and Galant reflex that belong among the so-called primitive reflexes. According to current evidence persistence of the primitive reflexes is related to certain specific neuropsychiatric disorders. According to current knowledge there is no evidence whether these reflexes play a role in Attention Deficit and Hyperactivity Disorder (ADHD). To develop these findings we have tested a hypothesis whether ADHD children in the school age (8-11 years) will have higher level of persisting primitive reflexes Moro and Galant compared to a control group of children of the same age. Results of this study show that ADHD children have high occurrence of primitive reflexes compared to the control group, which indicates that ADHD

symptoms may present a compensation of unfinished developmental stages related to diminishing Moro and Galant reflexes. Key words: ADHD; Galant Reflex; Moro Reflex; Developmental disorders; Primitive reflexes

McPhillips, M., Hepper, P., & Mulhern, G. (2000). Effects of replicating primary-reflex movements on specific reading difficulties in children: A randomised, double-blind, controlled trial. *The Lancet*, 355(9203), 537-541.

doi:[http://dx.doi.org.pearl.stkate.edu/10.1016/S0140-6736\(99\)02179-0](http://dx.doi.org.pearl.stkate.edu/10.1016/S0140-6736(99)02179-0)

### **Background**

Children with specific reading difficulties have problems that extend beyond the range of underlying language-related deficits (eg, they have difficulties with balance and motor control). We investigated the role of persistent primary reflexes (which are closely linked in the earliest months of life to the balance system) in disrupting the development of reading skills.

### **Methods**

We assessed the efficacy of an intervention programme based on replicating the movements generated by the primary-reflex system during fetal and neonatal life. A randomised, individually matched, double-blind, placebo-controlled design was used and children (aged 8–11 years) with persistent primary reflexes and a poor standard of reading were enrolled into one of three treatment groups: experimental (children were given a specific movement sequence); placebo-control (children were given non-specific movements); and control (no movements).

### **Findings**

From an initial sample of 98 children, 60 children, 20 in each group were matched on age, sex, verbal intelligence quotient (IQ), reading ability, and persistent asymmetrical tonic neck reflex. For asymmetrical tonic neck-reflex levels there was a significant (group by time) interaction ( $p < 0.001$ ). The experimental group showed a significant decrease in the level of persistent reflex over the course of the study (mean change  $-1.8$  [95% CI  $-2.4$  to  $-1.2$ ],  $p < 0.001$ ), whereas the changes in the placebo-control and control groups were not significant ( $-0.2$  [ $-0.9$  to  $0.6$ ] and  $-0.4$  [ $-0.9$  to  $0.2$ ]).

### **Interpretation**

This study provides further evidence of a link between reading difficulties and control of movement in children. In particular, our study highlights how the educational functioning of children may be linked to interference from an early neurodevelopmental system (the primary-reflex system). A new approach to the treatment of children with reading difficulties is proposed involving assessment of underlying neurological functioning, and appropriate remediation.

Taylor, M., Houghton, S., Chapman, E., (2004). Primitive reflexes and attention-deficit/hyperactivity disorder: Developmental origins of classroom dysfunction.

*International Journal of Special Education* 19(1), 23-37.

The present research studied the symptomatologic overlap of AD/HD behaviours and retention of four primitive reflexes (Moro, Tonic Labyrinthine Reflex [TLR], Asymmetrical Tonic Neck Reflex [ATNR], Symmetrical Tonic Neck Reflex [STNR]) in 109 boys aged 7-10 years. Of these, 54 were diagnosed with AD/HD, 34 manifested subsyndromal coordination, learning, emotional and/or behavioural symptoms of AD/HD, and 21 had no (or near to no) symptoms of AD/HD. Measures of AD/HD symptomatology and of the boys' academic performance were also obtained using the Conners' rating scale and the WRAT-3, respectively. Results indicated that, in general, boys diagnosed with AD/HD had significantly higher levels of reflex retention than non-diagnosed boys. Results also indicated both direct and indirect relationships between retention of the Moro, ATNR, STNR and TLR reflexes with AD/HD symptomatology and mathematics achievement. The pattern of relationships between these variables was also consistent with the notion of the Moro acting as a gateway for the inhibition of the other three reflexes.

**Name of Library and Online Databases: CINAHL*****Preparing for Search Process***

- Rhythmic movement training (RMT) is not a subject heading. When I first searched for rhythmic movement training I applied no filters or anything just to see if there is any scholarly information about RMT. The only suggested subject heading they provided me with that was related at all to my topic was “sleep-wake transition disorders.” It looks like the subject headings won’t be very beneficial for this search unless I change my keywords.
- When initially searching “rhythmic movement training” into CINAHL nothing of relevance popped up, so we sought out assistance from the librarian Cynthia to assist in our search. She verified we were searching correctly and there is nothing on rhythmic movement training.
- So based on that, we decided to go off what we found in the previous assignment. We learned RMT is related to primitive reflexes, so I then exchanged the “RMT” keywords for words like “primitive reflexes” “therapy” “integration”
- Limited articles popped up, and very few of relevancy. Unfortunately I was only able to gather two research articles from CINAHL that may have some relevancy.

***Summarizing a Strategic Search Process***

Filters/Years	Keywords	Total Yield/ Relevant Hits	Date
None Years: unlimited	“Rhythmic” “movement” “training”	4/0	11/13/16
None Years: unlimited	Boolean/Phrase “primitive” “reflexes”	53/0	11/13/16
None Years: unlimited	“primitive” “reflex” [SU]	46/2	11/14/16
None Years: unlimited	“primitive reflexes” “therapy”	11/0 (nothing new)	11/14/16
None Years: unlimited	“primitive reflex integration”	56/0 (nothing new)	11/14/16

***Summary of 5 BEST Research Articles***

Kobesova, A. & Kolar, P. (2014). Developmental kinesiology: Three levels of motor control in the assessment and treatment of the motor system. *Journal of Bodywork and Movement Therapies*, 18(1), 23-33.

Three levels of sensorimotor control within the central nervous system (CNS) can be distinguished. During the neonatal stage, general movements and primitive reflexes are controlled at the spinal and brain stem levels. Analysis of the newborn's spontaneous general movements and the assessment of primitive reflexes is crucial in the screening and early

recognition of a risk for abnormal development. Following the newborn period, the subcortical level of the CNS motor control emerges and matures mainly during the first year of life. This allows for basic trunk stabilization, a prerequisite for any phasic movement and for the locomotor function of the extremities. At the subcortical level, orofacial muscles and afferent information are automatically integrated within postural–locomotor patterns. Finally, the cortical (the highest) level of motor control increasingly becomes activated. Cortical control is important for the individual qualities and characteristics of movement. It also allows for isolated segmental movement and relaxation. A child with impaired cortical motor control may be diagnosed with developmental dyspraxia or developmental coordination disorder. Human ontogenetic models, i.e., developmental motor patterns, can be used in both the diagnosis and treatment of locomotor system dysfunction.

Smith, S. L., Gossman, M. R., & Canan, B. C. (1982). Selected Primitive Reflexes in Children with Cerebral Palsy. *Physical Therapy*, 62(8), 1115-1120. Retrieved from <http://ptjournal.apta.org.pearl.stkate.edu/content/62/8/1115>.

The purpose of this study was to determine the consistency of reflex responses of subjects in varying behavioral states. The following selected primitive reflexes were examined in children with spastic quadriplegic cerebral palsy: tonic labyrinthine, asymmetrical tonic neck, symmetrical tonic neck, crossed extension, and Moro. Our hypothesis was that a subject's reflex responses would vary as a function of his behavioral state. Ten children, ages 3 to 6 years, participated in the study. Reflex responses were elicited using a specified protocol. A behavioral-state scale was defined, and the subject's behavioral state was noted before each reflex stimulus was applied. Each subject completed eight test sessions. Test sessions were videotaped with portable video equipment. Reflex responses were scored from videotapes following the final test session. Results of the study indicated a significant inverse relationship between progression on the behavioral-state scale and consistency of reflex responses; the higher the numerical rating, the less the consistency of response. Findings of our study support those who recommend optimal states for testing and indicate that caution should be used when interpreting test results based on a single examination.

**Other Evidence Resources: Google Scholar*****Preparing for Search Process***

a. I began by searching Google scholar for rhythmic movement training and after scrolling through the pages of irrelevant information, I noticed a thesis project on RMT (Grigg, 2016). After skimming this article, I decided to see what sources the author used to provide evidence for RMT. There was a lengthy reference section in this paper, so I wrote down a few of them that discussed primitive reflexes and child development that may be relevant to this project. Interestingly, none of the references explicitly discuss “rhythmic movement training.”

b. Also, my group and I found an unpublished dissertation from a St. Kate’s student (Gazca, 2012) regarding the topic of RMT. We obtained the hard copy and intend to analyze this because it has been cited on the main RMTi websites as a resource of research of RMT. It does make me skeptical of its credibility because it was never published. Interestingly again, none of the references explicitly discuss “rhythmic movement training.”

***Summarizing Strategic Process***

a. Typing in “rhythmic movement training” into google scholar provided 65 results. I was able to gather two articles (as mentioned above).

b. After playing around with different word choices, I decided to look at the references for these sources I did find to see if there were any articles that may be of relevance.

***Summary of 5 BEST Research Articles of Credible Resources***

Gazca, M. (2012). *Rebooting Development with a Rhythmic Motor Intervention for Children*

(Doctoral dissertation, St. Catherine University).

The continuing proliferation of developmental difficulties in children that result in widespread challenges in learning and behavior pushes inquiry into their etiologies and remedies. Current research, within both traditional and contemporary theoretical models of motor development, has found a predictive relationship between early motor deficits and later motor, emotional, and cognitive ability. While there is a clear mandate for early intervention to mitigate further dysfunction, and therapists have addressed underlying factors for years, there is not a consensus on its effectiveness. Rhythmic Movement Training (RMT) is a natural motor intervention from Sweden that appears to have a multi-faceted effect on neurodevelopment by addressing underlying sensory, vestibular, cerebellar, and early motor processes. The purpose of this study is to evaluate if RMT is an effective intervention to address motor deficits and enhance development. This study surveyed parents, teachers, and therapists online who are using RMT in 15 countries, asking them to evaluate the usefulness of the program according to their experience. Based on feedback from 79 RMT practitioners around the world, this study suggests that the Rhythmic Movements could be especially helpful for their ability to address underlying motor deficits, release tensions, improve attention, and enhance the effectiveness of educational methods. This finding supports the literature that addressing underlying systems can improve higher levels of development.



Grigg, T. M. (2016). The voice of parents who have used Rhythmic Movement Training with their child.

This study investigates the experiences of seven families who have used Rhythmic Movement Training (RMT) as an intervention with their child with retained primitive reflexes. The theoretical framework of phenomenology and interpretivism was the basis for a qualitative phenomenological research design used to gather and analyse data. Four RMT practitioners in New Zealand were invited to nominate families who were willing to participate in one semi-structured interview. The collective voice of 14 parents captured their reasons for seeking additional help with their child's development issues, finding RMT, using RMT within their family routine and their perceptions of the benefits they experienced and the costs, both financial and time, incurred. RMT is a programme which uses a series of movements to encourage the integration of retained primitive reflexes. While there is a small amount of research around movement programmes that target retained primitive reflexes, to-date there appears to be no empirical studies completed on RMT. The parents in this study found that RMT was relatively easy to manage within their family routine and that it was a low-impact, cost-effective intervention with a range of perceived benefits for the child who had completed RMT. Further study into the efficacy of RMT would be beneficial with the understanding from this study that the programme is perceived as manageable within a family routine by this group of families.

McPhillips, M., Hepper, P. G., & Mulhern, G. (2000). Effects of replicating primary reflex movements on specific reading difficulties in children: a randomised, double blind, controlled trial. *The Lancet*, 335, 537–541.

### **BACKGROUND:**

Children with specific reading difficulties have problems that extend beyond the range of underlying language-related deficits (eg, they have difficulties with balance and motor control). We investigated the role of persistent primary reflexes (which are closely linked in the earliest months of life to the balance system) in disrupting the development of reading skills.

### **METHODS:**

We assessed the efficacy of an intervention programme based on replicating the movements generated by the primary-reflex system during fetal and neonatal life. A randomised, individually matched, double-blind, placebo-controlled design was used and children (aged 8-11 years) with persistent primary reflexes and a poor standard of reading were enrolled into one of three treatment groups: experimental (children were given a specific movement sequence); placebo-control (children were given non-specific movements); and control (no movements).

### **FINDINGS:**

From an initial sample of 98 children, 60 children, 20 in each group were matched on age, sex, verbal intelligence quotient (IQ), reading ability, and persistent asymmetrical tonic neck reflex. For asymmetrical tonic neck-reflex levels there was a significant (group by time) interaction ( $p < 0.001$ ). The experimental group showed a significant decrease in the level of persistent reflex over the course of the study (mean change  $-1.8$  [95% CI  $-2.4$  to  $-1.2$ ],  $p < 0.001$ ), whereas the changes in the placebo-control and control groups were not significant ( $-0.2$  [ $-0.9$  to  $0.6$ ] and  $-0.4$

[-0.9 to 0.2]).

**INTERPRETATION:**

This study provides further evidence of a link between reading difficulties and control of movement in children. In particular, our study highlights how the educational functioning of children may be linked to interference from an early neurodevelopmental system (the primary-reflex system). A new approach to the treatment of children with reading difficulties is proposed involving assessment of underlying neurological functioning, and appropriate remediation.

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attentiondeficit/hyperactivity disorder: Developmental origins of classroom dysfunction.

*International Journal of Special Education*, 19(1), 23-37.

The present research studied the symptomatologic overlap of AD/HD behaviours and retention of four primitive reflexes (Moro, Tonic Labyrinthine Reflex [TLR], Asymmetrical Tonic Neck Reflex [ATNR], Symmetrical Tonic Neck Reflex [STNR]) in 109 boys aged 7-10 years. Of these, 54 were diagnosed with AD/HD, 34 manifested sub-syndromal coordination, learning, emotional and/or behavioural symptoms of AD/HD, and 21 had no (or near to no) symptoms of AD/HD. Measures of AD/HD symptomatology and of the boys' academic performance were also obtained using the Conners' rating scale and the WRAT-3, respectively. Results indicated that, in general, boys diagnosed with AD/HD had significantly higher levels of reflex retention than non-diagnosed boys. Results also indicated both direct and indirect relationships between retention of the Moro, ATNR, STNR and TLR reflexes with AD/HD symptomatology and mathematics achievement. The pattern of relationships between these variables was also consistent with the notion of the Moro acting as a gateway for the inhibition of the other three reflexes.

Teitelbaum, P., Teitelbaum, O. B., Fryman, J., & Maurer, R. (2002). Reflexes gone astray in

autism in infancy. *The Journal of Developmental and Learning Disorders*, 15.

In the cases presented in this paper plus others we hypothesize that movement disturbances in infants can be interpreted as reflexes gone astray and may be early indicators for a diagnosis of autism. In the children reviewed some reflexes persist too long in infancy, whereas others first appear much later than they should. The asymmetrical tonic neck reflex is one reflex that may persist too long in autism. Head-verticalization in response to body tilt is a reflex that does not appear when it should in a subgroup of autistic-to-be infants. We suggest that it may be used by pediatricians to quickly screen for such autistic-to-be children, especially in families where there is a history of autism.

**Appraisal of Evidence****Initial Appraisal of Evidence: Primary Research Studies.**

Type of article	Overall Type: Primary research study Specific Type: Quantitative research study
APA Reference	Konicarova, J., Petr, B. (2012). Retained Primitive Reflexes and ADHD in Children. <i>Activitas Nervosa Superior</i> , 54(3-4), 135-138.
Abstract	Particularly important postnatal developmental reflexes that diminish in later stages of development are Moro reflex and Galant reflex that belong among the so-called primitive reflexes. According to current evidence persistence of the primitive reflexes is related to certain specific neuropsychiatric disorders. According to current knowledge there is no evidence whether these reflexes play a role in Attention Deficit and Hyperactivity Disorder (ADHD). To develop these findings we have tested a hypothesis whether ADHD children in the school age (8-11 years) will have higher level of persisting primitive reflexes Moro and Galant compared to a control group of children of the same age. Results of this study show that ADHD children have high occurrence of primitive reflexes compared to the control group, which indicates that ADHD symptoms may present a compensation of unfinished developmental stages related to diminishing Moro and Galant reflexes. Key words: ADHD; Galant Reflex; Moro Reflex; Developmental disorders; Primitive reflexes
Author	Credentials: Ph.D. Position and Institution: Department of Psychology, Faculty of Social Studies, Masaryk University, Brno, Czech Republic Publication History in Peer-Reviewed Journals: limited
Publication	Type of publication: scholarly peer-reviewed journal Publisher: Center for Neuropsychiatric Research of Traumatic Stress Other: Publishes results of original basic, clinical and theoretical research of the brain and mental processes, as well as diseases of the nervous system within the spectrum from natural to mind sciences.
Date and Citation History	Date of publication: 2012 Cited by: 4
Stated Purpose or Research Question	With respect to these missing findings (or at least very rare) we have proposed and tested the hypothesis to which extent ADHD will be related to persisting Moro and Galant reflexes in children in the school age (8-11 years) compared to a control group of children of the same age. (p. 135)
Author's	Results of this study support the hypothesis that ADHD diagnosis is closely

Conclusion	linked to persisting primitive Moro and Galant reflexes in children in the school age. These persisting developmental stages related to certain motor and cognitive functions may indicate that ADHD present a compensation of unfinished developmental stages related to diminishing of primitive reflexes that may occur as a response to various stimuli. (p. 137)
Overall Relevance to PICO	Overall Relevance to PICO: Moderate Rationale: Directly related to the “P”. Indirectly related to the “I” since reflex integration would depend on the presence of absence of primitive reflexes which is what this article was about. Directly related to “C” as the study had a control group of children without ADHD. O is not related.
Overall Quality of Article	Overall Quality of Article: Moderate Rationale: Article is only 4 years old and was published in a scholarly journal. Article is based on a primary research study directly related to the presence of primitive reflexes. Would have liked to see it cited more times or by an author who has more publication history.

Type of article	Overall Type: Primary Research Specific Type: It is a study that explored the relationship between the persistence of primitive reflexes that involve the hand and mouth and the motor repertoire in a sample of 12 to 17 month old infants.
APA Reference	Chinello, A., Di Gangi, V., & Valenza, E. (2016). Persistent primary reflexes affect motor acts: Potential implications for autism spectrum disorder. <i>Research in Developmental Disabilities, 16</i> , Advance online publication doi:10.1016/j.ridd.2016.07.010
Abstract	In typical motor development progress in use of goal-directed actions and communicative gestures depends on the inhibition of several primitive reflexes, especially those that involve the hand or mouth. This study explored the relationship between the persistence of primitive reflexes that involve the hand or mouth and the motor repertoire in a sample of 12- to 17-month-old infants. Moreover, since children with Autism Spectrum Disorders (ASD) often have difficulty in performing skilled movements and show poor gesture repertoire, and since ASD represents the upper extreme of a constellation of traits that may be continuously distributed in the general population, we investigated the relationship between the persistence of primitive reflexes in the same sample of infants and the subclinical autistic traits measured in their parents. Results revealed that the persistence of the primitive reflexes correlated with motor repertoire irrespective of infant's age, and it was greater among infants whose parents had more subclinical autistic traits. Our findings suggest that the persistence of primitive reflexes might alter the developmental trajectory of future motor ability and therefore their evaluation might be an early indicator of atypical development.
Author	Credentials: unidentified Position and Institution: Physiotherapist at ULSS 16 - Unità Locale Socio Sanitaria, Padova, Italy. Publication History in Peer-Reviewed Journals: Found only five other articles in PubMed by Chinello. When searching in Google Scholar nothing came up.
Publication	Type of publication: Research in Developmental Disabilities peer reviewed journal. Publisher: Elsevier Ltd. Other: PubMed database
Date and Citation History	Date of publication: 2016 Google Scholar Cited by: 0
Stated Purpose or	“It was found that motor skills at 18 months were good predictors of communication skills at 3 years, supporting the hypothesis that early

Research Question	variance in motor abilities is useful in understanding later development of language and communication.” (p. 1)
Author’s Conclusion	“Our findings suggest that the persistence of primitive reflexes might alter the development trajectory of future motor ability and therefore their evaluation might be an early indicator of atypical development.” (abstract)
Overall Relevance to PICO	Overall Relevance to PICO: Moderate Rationale: Primitive reflexes play a bigger part in reflex based interventions. This research study provides evidence of the importance of evaluation of primitive reflexes at a young age.
Overall Quality of Article	Overall Quality of Article: Moderate Rationale: Came from reliable source PUBMED. Published within the last couple of years (2016).

Type of article	Overall Type: Primary research study Specific Type: Roles in the child's psychomotor development.
APA Reference	Saraga, M., Rešić, B., Krnić, D., Jelavić, T., Sinovčić, I., & Tomasović, M. (2007). A Stereotypic "Elbowing" movement, a possible new primitive reflex in newborns. <i>Pediatric Neurology</i> , 36(2), 84–87. doi:10.1016/j.pediatrneurol.2006.09.013
Abstract	The primitive reflexes are brainstem-mediated and play various roles in the child's psychomotor development. The objective of the current study is to describe a new pattern of primitive reflex, noticed in 52 of 81 randomly chosen newborns and young infants during pressing of the subcostal region. Some of them reacted by three-phase stereotypic movement as follows: phase 1: quick adduction of upper arm with flexion of the forearm, with elbow directed toward the site of stimuli, touching the stimulated area; phase 2: abduction and retroflexion of upper arm with the movement of removing the stimulus with the elbow; phase 3: extension and pronation of the forearm. The prevalence of this newly described reflex was 64.2%. The incidence of all three phases together was highest at Day 16 (63.5%); phase 1 was the most frequent at Day 30 (88.5%) in 52 children with positive reflex. At Day 86, only 18.4% of them retained the first phase of the movement and 2% retained the third phase. All reflexes appeared until Day 30. We believe that we have described a new primitive reflex, with all characteristics essential for primitive reflexes. It is definitely involuntary, complex, stereotypic, with decreased incidence over time. Because of the defensive purpose and peculiar manner of this reflex, we named it the "elbowing reflex."
Author	Credentials: M.D. PhD Position and Institution: School of Medicine, University of Split, Department of Pediatrics, Clinical Hospital Split, Split, Croatia. Publication History in Peer-Reviewed Journals: Extensive
Publication	Type of publication: Scholarly peer reviewed journal Pediatric neurology. Publisher: Elsevier
Date and Citation History	Date of publication: 2007 Google Scholar Cited by: 20
Stated Purpose or Research Question	"The objective of the current study is to describe a new pattern of primitive reflex, noticed in 52 of 81 randomly chosen newborns and young infants during pressing of the subcostal region." (abstract)

Author's Conclusion	“We believe that we have described a new primitive reflex, with all characteristics essential for primitive reflexes. It is definitely involuntary, complex, stereotypic, with decreased incidence over time.” (abstract)
Overall Relevance to PICO	Overall Relevance to PICO: Moderate Rationale: It has research evidence based on a possible new primitive reflex in newborns, elbowing.
Overall Quality of Article	Overall Quality of Article: Moderate Rationale: Would need much more evidence if this reflex is truly a new primitive reflex or just an idea. Author has many scholarly articles on Google scholar and PubMed.



Type of article	Overall Type: Primary research study Specific Type: Cross-sectional descriptive study
APA Reference	Sohn, M. M. (2011). Assessment of primitive reflexes in high-risk newborns. <i>Journal of Clinical Medicine Research</i> , 3(6), 285-290. doi:10.4021/jocmr706w
Abstract	<p>Background:</p> <p>Assessment of primitive reflexes is one of the earliest, simplest, and most frequently used assessment tools among health care providers for newborns and young infants. However, very few data exist for high-risk infants in this topic. Among the various primitive reflexes, this study was undertaken particularly to describe the sucking, Babinski and Moro reflexes in high-risk newborns and to explore their relationships with clinical variables.</p> <p>Methods:</p> <p>This study is a cross-sectional descriptive study. Sixty seven high-risk newborns including full-term infants required intensive care as well as premature infants were recruited in a neonatal intensive care unit using convenient sampling method. The sucking, Babinski and Moro reflexes were assessed and classified by normal, abnormal and absence. To explore their relationships with clinical variables, birth-related variables, brain sonogram results, and behavioral state (the Anderson Behavioral State Scale, ABSS) and mental status (the Infant Coma Scale, ICS) were assessed.</p> <p>Results:</p> <p>The sucking reflex presented a normal response most frequently (63.5%), followed by Babinski reflex (58.7%) and Moro reflex (42.9%). Newborns who presented normal sucking and Babinski reflex responses were more likely to have older gestational age, heavier birth and current weight, higher Apgar scores, shorter length of hospitalization, better respiratory conditions, and better mental status assessed by ICS, but not with Moro reflex.</p> <p>Conclusions:</p> <p>High risk newborns presented more frequent abnormal and absence responses of primitive reflex and the proportions of the responses varied by reflex. Further researches are necessary in exploring diverse aspects of primitive reflexes and revealing their clinical implication in the high-risk newborns that are unique and different to normal healthy newborns.</p>
Author	<p>Credentials: unidentified</p> <p>Position and Institution: Department of Nursing, Inha University, Incheon, South Korea.</p> <p>Publication History in Peer-Reviewed Journals: Extensive on PubMed but not Google Scholar</p>

Publication	Type of publication: scholarly peer-reviewed journal of Journal of clinical medicine research. Publisher: Elmer Press. Elmer Press are peer-reviewed and international, dedicated to the rapid academic exchange
Date and Citation History	Date of publication: 2011 Google Scholar Cited By: 0
Stated Purpose or Research Question	“This study was undertaken particularly to describe the sucking, Babinski and Moro reflexes in high-risk newborns and to explore their relationships with clinical variables.” (abstract)
Author’s Conclusion	“High risk newborns presented more frequent abnormal and absence responses of primitive reflex and the proportions of the responses varied by reflex.” (abstract)
Overall Relevance to PICO	Overall Relevance to PICO: Limited Rationale: “This does provide good research however, further researches are necessary in exploring diverse aspects of primitive reflexes and revealing their clinical implication in the high-risk newborns that are unique and different to normal health newborns.” (abstract/conclusions)
Overall Quality of Article	Overall Quality of Article: Poor Rationale: It's only providing us with one example not enough evidence.

Type of article	Overall Type: Primary research study Specific Type: Randomized Controlled Trial
APA Reference	McPhillips, M., Hepper, P. G., & Mulhern, G. (2000). Effects of replicating primary reflex movements on specific reading difficulties in children: a randomised, double blind, controlled trial. <i>The Lancet</i> , 335, 537–541.
Abstract	<p><b>BACKGROUND:</b> Children with specific reading difficulties have problems that extend beyond the range of underlying language-related deficits (eg, they have difficulties with balance and motor control). We investigated the role of persistent primary reflexes (which are closely linked in the earliest months of life to the balance system) in disrupting the development of reading skills.</p> <p><b>METHODS:</b> We assessed the efficacy of an intervention programme based on replicating the movements generated by the primary-reflex system during fetal and neonatal life. A randomised, individually matched, double-blind, placebo-controlled design was used and children (aged 8-11 years) with persistent primary reflexes and a poor standard of reading were enrolled into one of three treatment groups: experimental (children were given a specific movement sequence); placebo-control (children were given non-specific movements); and control (no movements).</p> <p><b>FINDINGS:</b> From an initial sample of 98 children, 60 children, 20 in each group were matched on age, sex, verbal intelligence quotient (IQ), reading ability, and persistent asymmetrical tonic neck reflex. For asymmetrical tonic neck-reflex levels there was a significant (group by time) interaction (<math>p &lt; 0.001</math>). The experimental group showed a significant decrease in the level of persistent reflex over the course of the study (mean change <math>-1.8</math> [95% CI <math>-2.4</math> to <math>-1.2</math>], <math>p &lt; 0.001</math>), whereas the changes in the placebo-control and control groups were not significant (<math>-0.2</math> [<math>-0.9</math> to <math>0.6</math>] and <math>-0.4</math> [<math>-0.9</math> to <math>0.2</math>]).</p> <p><b>INTERPRETATION:</b> This study provides further evidence of a link between reading difficulties and control of movement in children. In particular, our study highlights how the educational functioning of children may be linked to interference from an early neurodevelopmental system (the primary-reflex system). A new approach to the treatment of children with reading difficulties is proposed involving assessment of underlying neurological functioning, and appropriate remediation.</p>
Author	Credentials: PhD, BSc Position and Institution: School of Psychology, Queen's University of Belfast Publication History in Peer-Reviewed Journals: <i>extensive</i>
Publication	Type of publication: scholarly peer-reviewed journal

	Publisher: Elsevier Other: The Lancet
Date and Citation History	Date of publication: 2000 Cited by: Google Scholar Cited 117
Stated Purpose or Research Question	“We examined the effects of a specific- movement programme, which replicates the reflex movements of the primary-reflex system, on the inhibition of persistent primary reflexes, specifically the ATNR, and the educational performance of a clearly defined group of children with reading difficulties.” (p. 538)
Author’s Conclusion	“The results suggest that the repetition of primary-reflex movements plays a major part in the inhibition of primary reflexes and that inhibition can be brought about at a much later stage in development than is generally accepted. The results confirm previous work that the effects of persistent primary reflexes (in particular the ATNR) extend beyond the obvious disruption of motor development into cognitive areas. The reading gains achieved by the experimental group in this study are clinically significant.” (p. 540)
Overall Relevance to PICO	Overall Relevance to PICO: Moderate Rationale: P was somewhat related – it was specific to children with reading difficulties resulting in balance and motor problems. I was related to primitive reflexes, O was not directly related to occupational performance, but had implications for occupational performance through disrupted development. C used a placebo-control and control in addition to the experimental group.
Overall Quality of Article	Overall Quality of Article: Good Rationale: The author and journal are both reputable sources. The only limitation noted in this article would be that it is older than 10 years.

Type of article	Overall Type: Primary Research Study Specific Type: Quantitative Research Study
APA Reference	Smith, S. L., Gossman, M. R., & Canan, B. C. (1982). Selected Primitive Reflexes in Children with Cerebral Palsy. <i>Physical Therapy</i> , 62(8), 1115-1120.
Abstract	The purpose of this study was to determine the consistency of reflex responses of subjects in varying behavioral states. The following selected primitive reflexes were examined in children with spastic quadriplegic cerebral palsy: tonic labyrinthine, asymmetrical tonic neck, symmetrical tonic neck, crossed extension, and Moro. Our hypothesis was that a subject's reflex responses would vary as a function of his behavioral state. Ten children, ages 3 to 6 years, participated in the study. Reflex responses were elicited using a specified protocol. A behavioral-state scale was defined, and the subject's behavioral state was noted before each reflex stimulus was applied. Each subject completed eight test sessions. Test sessions were videotaped with portable video equipment. Reflex responses were scored from videotapes following the final test session. Results of the study indicated a significant inverse relationship between progression on the behavioral-state scale and consistency of reflex responses; the higher the numerical rating, the less the consistency of response. Findings of our study support those who recommend optimal states for testing and indicate that caution should be used when interpreting test results based on a single examination.
Author	Credentials: Unidentified Position and Institution: Department Head, Physical Therapist Assistant Program, Greenville Technical College Publication History in Peer-Reviewed Journals: <i>only this one</i>
Publication	Type of publication: scholarly journal Publisher: American Physical Therapy Association
Date and Citation History	Date of publication: 2008 Cited by: 5
Stated Purpose or Research Question	"The purpose of the present study was to examine the consistency of selected primitive reflex responses of subjects in varying behavioral states." (p. 1115)
Author's Conclusion	"These findings lend support to those who recommend optimal states for testing and indicate that caution should be used when interpreting results based on a single examination session." (p. 1120)

Overall Relevance to PICO	Overall Relevance to PICO: Limited/Moderate Rationale: P was related to children with disabilities, I was related to primitive reflexes, O was not directly related to occupational performance. No C group in this study.
Overall Quality of Article	Overall Quality of Article: Poor Rationale: Article is from a reputable journal, but is old and has not been cited in many other articles. The author is not established beyond this article.

Type of article	Overall Type: Primary Research Study Specific Type: Quantitative Research Study
APA Reference	Taylor, M., Houghton, S., & Chapman, E. (2004). Primitive reflexes and attention-deficit/hyperactivity disorder: Developmental origins of classroom dysfunction. <i>International Journal of Special Education</i> , 19(1), 23-37.
Abstract	The present research studied the symptomatologic overlap of AD/HD behaviours and retention of four primitive reflexes (Moro, Tonic Labyrinthine Reflex [TLR], Asymmetrical Tonic Neck Reflex [ATNR], Symmetrical Tonic Neck Reflex [STNR]) in 109 boys aged 7-10 years. Of these, 54 were diagnosed with AD/HD, 34 manifested sub-syndromal coordination, learning, emotional and/or behavioural symptoms of AD/HD, and 21 had no (or near to no) symptoms of AD/HD. Measures of AD/HD symptomatology and of the boys' academic performance were also obtained using the Conners' rating scale and the WRAT-3, respectively. Results indicated that, in general, boys diagnosed with AD/HD had significantly higher levels of reflex retention than non-diagnosed boys. Results also indicated both direct and indirect relationships between retention of the Moro, ATNR, STNR and TLR reflexes with AD/HD symptomatology and mathematics achievement. The pattern of relationships between these variables was also consistent with the notion of the Moro acting as a gateway for the inhibition of the other three reflexes.
Author	Credentials: PhD, MPhil Position and Institution: Research Fellow, Edith Cowan University, Joondalup Publication History in Peer-Reviewed Journals: fair
Publication	Type of publication: not scholarly/peer reviewed Publisher: unknown, journal may support self-archiving Other: International Journal of Special Education This is a RoMEO ungraded journal
Date and Citation History	Date of publication: 2004 Cited by: google scholar cited 21
Stated Purpose or Research Question	"The current research, therefore, sought to assess the relationship between reflex retention and AD/HD symptomatology and academic achievement." (p. 26)
Author's Conclusion	"Results indicated that, in general, boys diagnosed with AD/HD had significantly higher levels of reflex retention than non-diagnosed boys.

	<p>Results also indicated both direct and indirect relationships between retention of the Moro, ATNR, STNR and TLR reflexes with AD/HD symptomatology and mathematics achievement.” (p. 23)</p> <p>p. 35 specifies more in depth the outcomes for each of the goals the researcher studied. The above excerpt was the most concise.</p>
Overall Relevance to PICO	<p>Overall Relevance to PICO: Moderate</p> <p>Rationale: P was somewhat related – it was specific to children with ADHD. I was related to primitive reflexes, O was not directly related to occupational performance, but had implications for occupational performance through disrupted development and persistent reflexes. C used a control group and a group with some ADHD symptoms in addition to the group with ADHD diagnosis</p>
Overall Quality of Article	<p>Overall Quality of Article: Poor/Moderate</p> <p>Rationale: The journal publisher could not be identified. The other limitation noted in this article would be that it is older than 10 years.</p>



Type of article	Overall Type: Primary Research Study Specific Type: Summary of the experiences of seven families who have used RMT as an intervention for their child with retained primitive reflexes.
APA Reference	Grigg, T.M. (2016). The voice of parents who have used rhythmic movement training with their child. (Master's Thesis). Retrieved from <a href="http://rhythmicmovement.org/images/TessaGriggM-2016.pdf">http://rhythmicmovement.org/images/TessaGriggM-2016.pdf</a> .
Abstract	This study investigates the experiences of seven families who have used Rhythmic Movement Training (RMT) as an intervention with their child with retained primitive reflexes. The theoretical framework of phenomenology and interpretivism was the basis for a qualitative phenomenological research design used to gather and analyse data. Four RMT practitioners in New Zealand were invited to nominate families who were willing to participate in one semi-structured interview. The collective voice of 14 parents captured their reasons for seeking additional help with their child's development issues, finding RMT, using RMT within their family routine and their perceptions of the benefits they experienced and the costs, both financial and time, incurred. RMT is a programme which uses a series of movements to encourage the integration of retained primitive reflexes. While there is a small amount of research around movement programmes that target retained primitive reflexes, to-date there appears to be no empirical studies completed on RMT. The parents in this study found that RMT was relatively easy to manage within their family routine and that it was a low-impact, cost-effective intervention with a range of perceived benefits for the child who had completed RMT. Further study into the efficacy of RMT would be beneficial with the understanding from this study that the programme is perceived as manageable within a family routine by this group of families.
Author	Credentials: M Ed. Position and Institution: University of Canterbury: College of Education, Health and Human Development Publication History in Peer-Reviewed Journals: none
Publication	Type of publication: Master's Thesis Publisher: N/A Other: N/A
Date and Citation History	Date of publication: N/A Cited by: 0
Stated Purpose or Research	"What are the experiences of parents who have used Rhythmic Movement Training (RMT) with their child?" (p. 2)

Question	
Author's Conclusion	<p>“They were willing to try interventions that were not evidence-based if they believed they could be beneficial to their children. The parents typically found RMT by word of mouth. They all had a view that they needed to assume self-responsibility and take a self-funding approach to their child’s challenges. They appreciated that they were in a position to be able to fund additional assistance for their child. RMT was found by the mothers in the study to be easy to use within the family routine and through a range of creative solutions they were able to achieve high levels of compliance with their children. The parents described it as a cost-effective, low-impact intervention with a range of perceived physical, cognitive and social skill improvements for their children while they were using the RMT exercises. Additional benefits included an improvement in the relationship between the mother and child using the RMT. (p. 81-82)</p>
Overall Relevance to PICO	<p>Overall Relevance to PICO: Strong Rationale: “P,” “I” and “O” all directly related. No “C.”</p>
Overall Quality of Article	<p>Overall Quality of Article: Poor Rationale: Article was based on opinion, not a study or evidence-based. Language of article seemed bias at times. Article was not published in a journal.</p>

**Initial Appraisal: Conceptual or theoretical articles.**

Type of article	Overall Type: Conceptual or Theoretical Article Specific Type: Examines theoretical views regarding primitive reflexes
APA Reference	Pimentel, E. D. (1996). The disappearing reflex: A reevaluation of its role in normal and abnormal development. <i>Physical &amp; Occupational Therapy in Pediatrics</i> , 16(4), 19-42. doi:10.1080/J006v16n04_02.
Abstract	The objectives of this article are to examine theoretical views regarding the appearance and disappearance of primitive reflexes and to discuss their implications for therapeutic intervention. According to the traditional view, primitive reflexes are inhibited or integrated by higher central nervous system centers. After central nervous system (CNS) damage, these primitive reflexes are released from inhibition by higher centers. This view implies a model of CNS organization for motor control that is hierarchically organized. Alternatively, according to the more contemporary systems view, the development of reflexive and volitional behavior is the results of an interaction of central and external environmental influences. Research on primitive stepping indicates that such factors as decreased body mass and practice can contribute to the prolonged retention of this reflex. The systems view implies a distributed control model on CNS motor control in which peripheral and CNS factors participate in the control of movement. If environmental demands can alter reflexive as well as volitional movement, then the traditional view of the relationship between primitive and pathological reflexes is challenged. The systems view and implied distributed control of the CNS should lead therapists to reassess their treatment rationales.
Author	Credentials: MA, PT Position and Institution: Instructor of Neuroanatomy, College of Physicians and Surgeons, Columbia University Publication History in Peer-Reviewed Journals: limited
Publication	Type of publication: scholarly peer-reviewed Publisher: Taylor & Frances, Inc. Other: Delivers vital information to all therapists involved in developmental and physical rehabilitation of infants, children, and youth. Covers current clinical research and practical applications.
Date and Citation History	Date of publication: 1996 Cited by: 1
Stated Purpose or Research Question	“We need to understand if and how such reflexes affect functional performance and whether they should be part of treatment planning and goal setting. In considering these issues I will examine these disappearing primitive reflexes in terms of the functional role they serve in infancy and in the development of adult behaviors. I will explore various hypotheses of the mechanisms of reflex disappearance and reappearance and will also examine the relationship of these normal primitive reflexes to pathological reflexes.” (p. 21)
Author’s Conclusion	“The issue, therefore, is not whether therapists should inhibit or use the reflex, but how to get the most functional motor output by altering the input they give

	their patients. Therapists can control the channels of input by manipulating both the amounts of physical guidance their patients receive and the environments with which their patients interact, e.g., the size, shape, location and position of objects, and the frequency of that interaction.” (p. 36-37)
Overall Relevance to PICO	Overall Relevance to PICO: Limited Rationale: “P” is not relevant. No “I” or “C.” “O” is relevant as it related to functional independence and therapist support/intervention techniques.
Overall Quality of Article	Overall Quality of Article: Moderate Rationale: Article is older than 10 years. Published in scholarly journal.

Type of article	Overall Type: Conceptual or Theoretical Article Specific Type: Overview of reflex development in infants
APA Reference	Stern, F. M. (1971). The Reflex Development of the Infant. <i>The American Journal of Occupational Therapy</i> , (25)3, 155-158.
Abstract	In order to have a better understanding of the problems facing a child with brain damage, it is important to study normal, early human development. The evolution of normal mature postural tone is described. Transitory movement reactions and reflexes present at birth and later inhibited, are divided into the neonatal period and into the next ten-month period. Righting and equilibrium reactions that serve as an important foundation for later skilled learning, are included and the overlapping of these reactions is illustrated with an example of motor behavior. Tonic reflex activity which may retard or dominate the motor activity of a child with brain damage is outlined, so that teachers and educators of the brain-injured may be made more fully aware of these early movement patterns in order to better deal with the problems these children encounter.
Author	Credentials: BS, PT Position and Institution: Not found Publication History in Peer-Reviewed Journals: limited
Publication	Type of publication: Scholarly peer-reviewed journal Publisher: American Occupational Therapy Association Other: Focuses on research, practice, and health care issues in the field of occupational therapy. Official journal of AOTA.
Date and Citation History	Date of publication: 1971 Cited by: 6
Stated Purpose or Research Question	“In order to obtain a thorough understanding of the nature of the handicap of a child with brain damage, it is necessary to study development of the normal child. Emphasis in this study should be given to the “evolution” of automatic postural reactions that serve as the basis or background of posture and movement with which a child builds or adapts to perform skilled activity.” (p. 155)
Author’s Conclusion	“In all cases, however, the foundations, on which all finely developed skills rest are the movement patterns, adjustments to posture in space and balance. Patterns that are built and practiced in early childhood are the background needed for these skills. It follows, then, that therapists, teachers, and educators of all kinds who deal with brain-injured children, should have a thorough knowledge of normal and abnormal movement patterns, early development, and that foundation that is so vital for later, more complicated, learning tasks.” (p. 158)

Overall Relevance to PICO	Overall Relevance to PICO: Limited Rationale: "P" is not relevant. No "I," "C" or "O" included since article was essentially an overview of what the primitive reflexes are and at what age they are developed.
Overall Quality of Article	Overall Quality of Article: Moderate Rationale: Provided good background information however no basis for how that information was found or tested. Published in a scholarly journal. Article is older than 10 years.

Type of article	Overall Type: Conceptual or Theoretical Article Specific Type: Overview of Primitive Reflexes
APA Reference	Futagi, Y., Toribe, Y., & Suzuki, Y. (2012). The grasp reflex and Moro reflex in infants: Hierarchy of primitive reflex responses. <i>International Journal of Pediatrics</i> , 2012. doi:10.1155/2012/191562
Abstract	The plantar grasp reflex is of great clinical significance, especially in terms of the detection of spasticity. The palmar grasp reflex also has diagnostic significance. This grasp reflex of the hands and feet is mediated by a spinal reflex mechanism, which appears to be under the regulatory control of nonprimary motor areas through the spinal interneurons. This reflex in human infants can be regarded as a rudiment of phylogenetic function. The absence of the Moro reflex during the neonatal period and early infancy is highly diagnostic, indicating a variety of compromised conditions. The center of the reflex is probably in the lower region of the pons to the medulla. The phylogenetic meaning of the reflex remains unclear. However, the hierarchical interrelation among these primitive reflexes seems to be essential for the arboreal life of monkey newborns, and the possible role of the Moro reflex in these newborns was discussed in relation to the interrelationship.
Author	Credentials: unidentified Position and Institution: Department of Pediatric Neurology, Osaka Medical Center and Research Institute for Maternal and Child Health Publication History in Peer-Reviewed Journals: On PUBMED 74 other peer-reviewed articles came up. On Google scholar about 140 results came up but many of them he is one of many authors.
Publication	Type of publication: International Journal of Pediatrics. It is a peer-reviewed, open access journal that publishes original research articles, review articles, and clinical studies in all areas of pediatric research. Publisher: Hindawi Publishing Corporation Other: Found on PUBMED
Date and Citation History	Date of publication: 2012 Google Scholar Cited by: 141
Stated Purpose or Research Question	“The absence of the Moro reflex during the neonatal period and early infancy is highly diagnostic, indicating a variety of compromised conditions.” (abstract)
Author’s Conclusion	“The palmar grasp reflex in infants has diagnostic significance. The absence or a weak response of the reflex during early infancy may reflect peripheral nerve or spinal cord involvement or may predict the

	development of athetoid type CP, whereas the response may be hyperactive in children with spasticity in their upper limbs.” (p. 7)
Overall Relevance to PICO	Overall Relevance to PICO: Moderate Rationale: I feel Grasp Reflex and Moro Reflex could fall into the category of reflex based interventions. This article explains the importance of both.
Overall Quality of Article	Overall Quality of Article: Poor Rationale: Author has many other publications out. Publication was within last five years. Also, with it being a conceptual review there isn't a good study.



Type of article	Overall Type: Conceptual or Theoretical Article Specific Type: Overview of Primitive and Postural reflexes
APA Reference	Zafeiriou, D. I. (2004). Primitive reflexes and postural reactions in the neurodevelopmental examination. <i>Pediatric Neurology</i> , 31(1), 1 -8. doi:10.1016/j.pediatrneurol.2004.01.012
Abstract	The primitive reflexes and the postural reactions comprise one of the earliest, simplest, and most frequently used tools among child neurologists to assess the central nervous system integrity of infants and young children. Infants with cerebral palsy have been known to manifest persistence or delay in the disappearance of primitive reflexes and pathologic or absent postural reactions. The clinical significance of asymmetric tonic neck reflex, Moro, palmar grasp, plantar grasp, Galant, Babinski, Rossolimo, crossed extensor, suprapubic extensor, and heel reflex, alone or in combination, as well as their contribution to the early diagnosis and differential diagnosis of cerebral palsy, have been demonstrated in a number of studies. Moreover, infants with 5 or more abnormal postural reactions have developed either cerebral palsy or developmental retardation as reported in a number of studies. Although a comprehensive neurologic examination in the context of a motor assessment instrument is preferable to an informal list of items, the combined examination of primitive reflexes and postural reactions should be considered by the child neurologist, as a simple but predictive screening test for the early identification of infants at risk for cerebral palsy. It is quick and easy to perform, both in nonhospital environments and in underdeveloped countries, where time and specific recourses are limited. The combined examination is also useful in developed countries because many developmental disorders such as cerebral palsy appear in nonrisk groups whereas others are not detected by metabolic screening programs.
Author	Credentials: MD, PhD Position and Institution: Aristotle University of Thessaloniki – Department of Pediatrics 1- Greece, Greece Publication History in Peer-Reviewed Journals: Extensive on PubMed
Publication	Type of publication: Scholarly peer reviewed journal of Pediatric neurology Publisher: Elsevier
Date and Citation History	Date of publication: 2004 Google Scholar Cited By: Limited
Stated Purpose or Research Question	“Infants with cerebral palsy have been known to manifest persistence or delay in the disappearance of primitive reflexes and pathologic or absent postural reactions.” (abstract)

Author's Conclusion	“Although there are a considerable number of instruments dealing with the early diagnosis of motor abnormalities, the combined examination of primitive reflexes and postural reactions still has a place in the neurologic examination of the neonate or infant.” (p. 7)
Overall Relevance to PICO	Overall Relevance to PICO: Limited Rationale: Talks about primitive reflexes and postural reactions specifically with children with cerebral palsy.
Overall Quality of Article	Overall Quality of Article: Moderate Rationale: Since it only provides information on primitive reflexes and postural reactions only relating to one specific type of developmental disability. It doesn't include any other developmental disabilities.

Type of article	Overall Type: Conceptual and Theoretical Specific Type: Review of Primitive Reflexes in the Motor System
APA Reference	Kobesova, A. & Kolar, P. (2014). Developmental kinesiology: Three levels of motor control in the assessment and treatment of the motor system. <i>Journal of Bodywork and Movement Therapies</i> , 18(1), 23-33.
Abstract	Three levels of sensorimotor control within the central nervous system (CNS) can be distinguished. During the neonatal stage, general movements and primitive reflexes are controlled at the spinal and brain stem levels. Analysis of the newborn's spontaneous general movements and the assessment of primitive reflexes is crucial in the screening and early recognition of a risk for abnormal development. Following the newborn period, the subcortical level of the CNS motor control emerges and matures mainly during the first year of life. This allows for basic trunk stabilization, a prerequisite for any phasic movement and for the locomotor function of the extremities. At the subcortical level, orofacial muscles and afferent information are automatically integrated within postural-locomotor patterns. Finally, the cortical (the highest) level of motor control increasingly becomes activated. Cortical control is important for the individual qualities and characteristics of movement. It also allows for isolated segmental movement and relaxation. A child with impaired cortical motor control may be diagnosed with developmental dyspraxia or developmental coordination disorder. Human ontogenetic models, i.e., developmental motor patterns, can be used in both the diagnosis and treatment of locomotor system dysfunction.
Author	Credentials: MD, PhD Position and Institution: Department of Rehabilitation and Sports Medicine, Second Medical Faculty, University Hospital Motol, Charles University, Prague, Czech Republic Publication History in Peer-Reviewed Journals: <i>extensive</i>
Publication	Type of publication: Scholarly peer-reviewed Publisher: Elsevier Other: Journal of Bodywork and Movement Therapies
Date and Citation History	Date of publication: 2014 Cited by: Google Scholar cited by 7
Stated Purpose or Research Question	“The assessment of spontaneous complex motor behavior, primitive reflexes and seven postural tests as outlined by Vojta can be used to examine the infant’s developmental age. They can be used to determine

	whether the development is physiologically normal or whether there is a risk for an abnormal development.” (p. 24)
Author’s Conclusion	“General neurophysiological principles are presented, which may be utilized in both the functional diagnosis and the treatment of locomotor system dysfunctions, as well as in many other cases involving neurologic and/or orthopaedic diagnoses.”(p. 31)
Overall Relevance to PICO	Overall Relevance to PICO: Moderate Rationale: P was related to children with disabilities, I was related to primitive reflexes, O was not directly related to occupational performance, but had implications for future occupational performance. C compared typically developing children, atypical children, and children with CP.
Overall Quality of Article	Overall Quality of Article: Moderate Rationale: The author and journal are both reputable sources. It was published within 10 years. The limitation it presents is that it is not primary research and it is more so presenting information regarding developmental kinesiology.

Type of article	Overall Type: Conceptual and Theoretical Specific Type: Overview of Primitive Reflexes and Autism
APA Reference	Teitelbaum, P., Teitelbaum, O. B., Fryman, J., & Maurer, R. (2002). Reflexes gone astray in autism in infancy. <i>Journal of Developmental and Learning Disorders</i> , 6, 15-22.
Abstract	In the cases presented in this paper plus others we hypothesize that movement disturbances in infants can be interpreted as reflexes gone astray and may be early indicators for a diagnosis of autism. In the children reviewed some reflexes persist too long in infancy, whereas others first appear much later than they should. The asymmetrical tonic neck reflex is one reflex that may persist too long in autism. Head-verticalization in response to body tilt is a reflex that does not appear when it should in a subgroup of autistic-to-be infants. We suggest that it may be used by pediatricians to quickly screen for such autistic-to-be children, especially in families where there is a history of autism.
Author	Credentials: Ph.D Position and Institution: Department of Psychology, University of Florida Publication History in Peer-Reviewed Journals: <i>moderate</i>
Publication	Type of publication: Trade Literature (Other sources) Publisher: Interdisciplinary Council on Development and Learning Inc. Other: Journal of Developmental and Learning Disorders
Date and Citation History	Date of publication: 2002 Cited by: Google Scholar cited by 17
Stated Purpose or Research Question	“Through the cases presented plus others we suggest that the movement disturbances in infancy in autism can be understood as reflexes gone astray in infancy.” (p. 15)
Author’s Conclusion	“It is axiomatic that the earlier that therapy is applied, the better the outcome. Therefore, the fact that diagnosis of autism and Asperger’s syndrome may be possible so early in infancy suggests that earlier forms of therapy appropriate for autistic, and perhaps somewhat different therapies for Asperger’s infants, should be developed for infants who display such movement disturbances.” (p.21)
Overall Relevance to PICO	Overall Relevance to PICO: Moderate Rationale: P was related to children with autism, I was related to primitive reflexes, O was not directly related to occupational performance, and more so about catching these movement disturbances

	early on and implementing therapy early on . C compared typically developing children to children with autism.
Overall Quality of Article	Overall Quality of Article: Poor Rationale: Article is not within 10 years. Article has few references, and most of them are by the original author of this article. The Journal and publisher is not reputable.

**Critical Appraisals.**

McPhillips, M., Hepper, P. G., Mulhern, G. (1997). Effects of replicating primary-reflex movements on specific reading difficulties in children: A randomized double-blind, controlled trial. *The Lancet* (North American Ed.), 355(9203), 537-541.

doi:10.1016/S0140-6736(99)02179-0

Konicarova, J., Petr, B. (2012). Retained Primitive Reflexes and ADHD in Children. *Activitas Nervosa Superior*, 54(3-4), 135-138.

Taylor, M., Houghton, S., & Chapman, E. (2004). Primitive reflexes and attention-deficit/hyperactivity disorder: Developmental origins of classroom dysfunction. *International Journal of Special Education*, 19(1), 23-37.