Rebooting Development with a Rhythmic Motor Intervention

Research summary
Holistic Health Studies Masters Program
St Catherine University
Mary Gazca, May, 2012

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Rise in Developmental Disorders

17.8 % of US children have a developmental disorder (2008)
- ADHD 7-8 %
- Pervasive Developmental Disorder (Not Otherwise Specified)
- Autism Spectrum Disorder 1 in 88 (most recent)
- Developmental Coordination Disorder 5-6 %

17.8 out of 100 equals 4.5/25 or

4.5 children in every typical MN classroom

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Theories of Development

1953 - Piaget -- motor development is important to cognitive development

1960s - Ayers -- sensory integration is important to development
- motor development (primitive reflexes) is also important
- ascribes to hierarchical brain development theory

1980s - Dynamic Systems Theory of motor development
- Neuronal Group Selection Theory of development

2000, 2007 - Meta-analyses of sensory-motor interventions were inconclusive as to their effectiveness
Studies demonstrate: Early motor ability predicts later cognitive ability

Dopnfer et al (2004)- deficits in ability to modulate speed & force, to self-regulate and accurate timing were predictive of ADHD later in childhood

Piek et al (2007) gross motor ability predicts working memory and processing speed

Piek et al (2008) early motor deficits better predictor of later cognitive ability vs. previous measures of attention (eye gaze)

Bruggink et al (2008); Butcher (2009) motor abnormalities in 11-18 week old infants predict later cognitive function

Pan, Tsai, and Chu (2009)-significant deficit in motor and object control skills in children with ADHD and ASD

Hartman et al (2010)- motor deficits correlated to intellectual disabilities; children with ASD had difficulty in timing and coordination of body parts

Bhat et al (2011)- poorer balance and handwriting skills with ASD

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Theoretical Reasons for Relationship

Skill-building reasons:

- Wijnroks & van Veldoven (2003) - lack of postural control leads to reduced exploratory movement
- Gernsbacher et al (2008) - hand and mouth motor skills are needed for successful gesturing, speech, and writing
- Piek et al (2008) - locomotor experiences are an essential agent for development
- Bhat et al (2008) - “fight or flight” causes disruptive behavior in school preventing beneficial social interaction/skills
- Matson et al (2010) - early manual ability enables more complex fine and gross motor skills

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Theoretical Reasons for Relationship

Brain development reasons:

- Diamond (2000); Butcher et al (2009); Denckla (2005)-Motor pathways are the same or close to cognitive neural pathways
- Ayers (1960s); Geva & Feldman (2002); Bhat et al (2011)- role of ANS activities and sensory integration in self-regulation
- Friedman et al (2005)-role of basal ganglia in both motor and “adaptation of regulation of ongoing behavior, including attention”
- Zwicker et al (2009)- role of muscle tone (ANS), and dynamic and static balance (vestibular system) on motor ability
- Carlson (2011)-deficits in body reference maps (parietal lobes/proprioception) affect motor ability
- Leisman & Melillo (2011)- role of cerebellum with rhythmic activities improve coordination between sensory and motor systems via timing mechanisms
Hierarchical Brain Development (vs. Dynamic Systems and NGS Theories)

Brain stem—Survival and Orientation
Cerebellum—coordination
Basal Ganglia—motor development
Limbic system—emotional development
Frontal Cortex—attention, foresight

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Interaction of gravity, movement, and rhythm are present in utero.

At eight weeks, innate movement patterns begin (Hadders-Algra, 2010).

By 24 weeks, all babies repeat these movement patterns.

Now all sensory organs are functioning and maturing.

They prepare the baby for life outside the womb, and initiate network of neural connections important to brain organization. (Blomberg, 2011)
The Developing Infant Brain

Stimulation from the senses creates necessary neural connections, especially from the

- Tactile sense
- proprioceptive and kinesthetic senses
- balance sense (vestibular)

- **Passively**, from cuddling, rocking, swinging, etc.
- **Actively**, with the innate rhythmic, developmental movements babies automatically make (Blomberg, 2011)
Tactile and Proprioception

....is knowing where your body is with your eyes closed

- Develops through tactile input or movement
- It’s receptors are deep in the tissues and ligaments (especially in the joints)
- Allows the brain to create an internal map of the body (awareness of body parts, leads to body control)
- Gives child security and groundedness

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Vestibular Function

- Tilting of semi-circular canals gives brain orientation to gravity (like a compass or GPS)
- It coordinates this data with visual, auditory, and motor systems

Vestibular function is important to:
- Develop consciousness or awareness of space/orientation, left-right, up-down
- Postural control and balance, in various positions
- Control of eye movements (Blomberg, 2011)
Pre-programmed movements (Primitive Reflexes)

A **primitive reflex** is an automatic, unconscious *movement response* to a sensory stimulus.

http://youtu.be/gyVLD0hl0XY

**Rooting**: when you stroke the baby’s cheek, he turns his head to nurse.

Developmental movements babies make are stimulated by a variety of primitive reflexes.

Normally, primitive reflexes fade within the first few years of life as conscious motor control begins.

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Primitive Reflexes and Motor Control

- Approximately ten retained primitive reflexes are responsible for most learning and behavior difficulties (Goddard, 2004)
- 54 children with ADHD have significantly more retained reflexes than the control group (Taylor et al, 2004)

*Sensory-motor development “drives perceptual and cognitive development in infants”* (Butcher, 2009)
Conclusion to Literature Review

Researchers are now seeking novel motor interventions:

- with sound theoretical basis
- that address underlying sensory issues and motor deficits
- that can be used by age 2, to prevent further disruption to development; and for children ages 3-5 years
- that create self-generated repetitions for “copious amounts of practice”; can be done 3 to 5 times/week
- are cost effective
- can be done in small groups or for home practice
Rhythmic Movement Training

- Rhythmic, smooth... whole body rocking movements
- Done lying or on hands and knees
- Relaxing and pleasant
- Stimulate neural development
- Imitates infant reflex patterns

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Techniques

Rhythmic Movements
- 17 movements
- Done passively or actively
- Done daily for 6 months-2 yr
- Regulate the nervous system
- Integrates reflexes in children
- Increase motor coordination

Isometric Pressure
- For each reflex pattern
- Gentle oppositional pressure
- Integrates reflexes in adults
- ‘Turns on’ muscle program
- Releases muscle tensions
- Increases strength and coordination
Origins

Kerstin Linde, Swedish therapist, photographer

Modeled the movements after instinctual baby movements

Dr. Harald Blomberg, Swedish psychiatrist, developer of RMT

Used in psychiatric practice; approval of Medical Board

Studied with specialists:

Peter Blythe, Sally Goddard, INPP, England

Svetlana Masgatova, Univ. Moscow, Poland

Teaches worldwide (1990); USA, 2005

Moira Dempsey, Exec. Dir, RMT International, Australia

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Study: Reboot Development with a Rhythmic Motor Intervention

• **Purpose:** To evaluate the effectiveness of RMT to address facets of development, including motor deficits in children with developmental disorders.

• **Culture of Inquiry:** Evaluative

• **Method:** Online survey of 1695 people taking at least one class in RMT, worldwide, in Spanish, English, and French.

• **Dates:** January 30 to February 26, 2012

• **Participants:** Parents, educators, and therapists using RMT with children with developmental disorders at least 3 months

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Participants
Parents, educators, therapists, & lic’ed professionals

Australia-England-France-Indonesia-Spain-Sweden-US
Attention
distractibility -- ability to focus -- ability to complete tasks

In your experience, using RMT is effective in ....

- Reducing distractibility: 48.1% (37)
- Increasing ability to focus: 52.6% (40)
- Increasing ability to complete tasks: 34.2% (26)

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Level of activity
reduce impulsivity--reduce hyperactivity--reduce hypo-activity
Sensory sensitivities to sound—to touch—to motion—to food textures

In your experience, using RMT is effective in reducing sensitivity...

- 1.4% (1) to sound
- 1.3% (1) to touch
- 23.7% (18) to motion (e.g., carsickness, dizziness)
- 62.1% (41) to certain foods (or food textures)
- 42.5% (31)
- 45.3% (34)
- 21.3% (16)
- 36.8% (28)
- 31.5% (23)
- 32.0% (24)
- 24.7% (18)
- 39.5% (30)
- 22.7% (15)
- 10.6% (7)

Strongly disagree
Disagree
Not sure
Agree
Strongly agree

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Nervous System (ANS) sensitivities reduce muscle tension—reduce startle—reduce anxiety—reduce aggression

In your experience, using RMT is effective in...

- Relaxing muscle tension: 56.6% (43)
- Reducing the startle response: 41.3% (31)
- Reducing anxiety: 32.4% (22)
- Reducing aggression: 45.6% (31)

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Elements of Autism Spectrum Disorder
incr verbal—incre eye contact—incre empathy—reduce rep behavior

Autistic Behaviors (totals)

- Improve verbal: 23, 21, 29
- Increase eye contact: 28, 15, 30
- Increase empathy: 18, 2, 30
- Reduce rep behavior: 19, 1, 21

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Motor Development
balance—motor coordination—cross midline—integrate reflexes

In your experience, using RMT is effective in...

Improving balance: 51.9% (40)
Improving motor coordination: 56.4% (44)
Helping cross midline: 47.4% (36)
Integrating primitive reflexes: 58.9% (43)

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Enhancing other techniques
educational—behavioral—other

In your experience, using RMT enhances the effectiveness of other techniques you use, including...

- Educational techniques:
  - Strongly disagree: 45.7% (32)
  - Disagree: 42.9% (27)
  - Not sure: 11.4% (8)
  - Agree: 17.5% (11)
  - Strongly agree: 25.9% (15)

- Behavioral techniques:
  - Strongly disagree: 39.7% (23)
  - Disagree: 42.9% (27)
  - Not sure: 39.7% (25)
  - Agree: 39.7% (25)
  - Strongly agree: 25.9% (15)

- Other clinical techniques:
  - Strongly disagree: 34.5% (20)
  - Disagree: 39.7% (23)
  - Not sure: 39.7% (25)
  - Agree: 39.7% (25)
  - Strongly agree: 25.9% (15)

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Qualitative Data—Positive examples

- 88% gave one example of when RMT was particularly helpful; 66% gave a second

- **Themes:**
  - Motor coordination (n=30), balance, posture, muscle tone
  - ADHD (n=21) attention, concentration
  - reducing hyperactivity, impulsivity
  - Language, emotional and social development (n=19)
  - emotional development (18),
  - increase speech (10), eye contact (7), social / play (7)
  - Enhancing educational techniques (14)-reading, handwriting

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When RMT was helpful

Addressing motor ability:

- “Age 4, unable to walk or sit up. In 12 weeks, sits up straight and able to walk using walker.”

- “Eight year old with poor motor development and language problems, muscle tone has gotten better, better concentration, and has self-confidence.”

Addressing ADHD:

“My son (13 years old) had ADHD and we used RMT for only 10 months. We had previously worked with other approaches for 9 years, but it was launching into RMT that gave the desired normalcy.”

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When RMT was helpful

Language development from two therapists:

- “Child age 2.6 went from nonverbal to verbal with 2 weeks of RMT.”

- “Three year old child with communication problems, language and aggression...[tends] to hit other children. In two months [of RMT] stopped hitting his peers and often embraced them. He started playing with other children...at school and at the park.”
When RMT was helpful

From an educator-parent on emotional regulation:

- “10 year old girl; temper tantrums. [Went from] more than ten tantrums a day down to ten in three months, and those were when she’d neglected doing exercises.”

From licensed professional on various challenges:

- “Girl age 18 years diagnosed with anxiety disorder, ADHD, and SPD; difficulties with severe anxiety, poor visual tracking, inattention, inability to cross midline, coordination problems; saw significant improvements in all areas of functioning after 3 months of RMT.”
Qualitative Data—RMT Not helpful

31 examples given of when RMT was NOT helpful

Themes:

- Lack of continuous practice (15)
- Danger of over-stimulating sensitive children, too hyperactive (9)
- Unappealing to teenagers (6)
- A few had slow or insignificant results (5)
- Preference of parents to use medications, interaction with toxins (4)
When RMT was not helpful

Precautions from a therapist:

• “[I] have several children on the autism spectrum (5-10 years old) who become overstimulated with many of the passive movements - need to use in limited amounts.”

From Licensed professionals:

• “Boy 10 years old. Nighttime anxiety and bedwetting. Got better but not 100%.”

• “All of the failures are due to reactivity on the part of the parent or child, unwillingness to participate...not willing to rock their highly anxious [3 year old] child..”

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When RMT was not helpful

Observations reported from a therapist:

- “Medicated children do not improve emotionally.”
- “With bigger boys it often feels uncomfortable.”

Another therapist on importance of following recommendations:

- “I have only had positive results when children do it as recommended.”
Open comments

- 76% responded
- Used superlatives to praise its usefulness (11)
- Noted its ease of use, enjoyment (10)
- Noted challenges with applying it to their practice (8)
- Gave suggestions for addressing specific conditions (8)
- Listed common results seen (6)
Open comments

A parent enjoys them:

- “I love the movements because they are so simple, and so peaceful. My children enjoy doing RMT with me. I hope to see RMT spread to public schools and other places where there are so many hurting children.”

An educator recommends them:

- “Every person benefits - most to a marked degree. Common improvements are: no longer incontinent (bed wetting); respond immediately when name spoken, improve eating, eat a wider range of food, no longer sleep problems, better moods, and engage in imaginative play. Marvelous.”
Open comments

Praise from some therapists:

• “It’s simple to use, easy to combine with any other therapy or focus of work.”

• “RMT has been a very needed addition to our work in sensory integration as it helps work the brain at a deeper level.”

• “Nice addition to tool kit for young children.”
Reported developmental benefits

**BRAIN STEM**
- Calm stress response
- Release muscle tension
- Improve sensory integration
- Improve muscle tone

**LIMBIC SYSTEM**
- Emotional development
- Calm aggressions
- Improve social interaction
- Improve verbal communication

**BASAL GANGLIA/CEREBELLUM**
- Improve motor coordination
- Improve balance
- Integrate prim. reflexes
- Able to slow down

**FRONTAL CORTEX**
- Improve attention, focus
- Decrease impulsivity
- Improve ability to complete tasks

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Discussion

How this study contributes to the literature:

• Respondents recognize the high incidence of motor deficits with developmental disorders—even educators address them.

• Survey reports successful resolution of dysfunctional gait with RMT, when a direct motor intervention did not.

• Respondents agree that ANS sensitivity underlies emotional regulation

• Also, that addressing underlying sensory and motor deficits are reported to improve educational and behavioral performance.
Discussion

Unexpected findings:

- Importance of frequency of practice: those reporting less frequency (1-2 times/month), observed less effectiveness of RMT.

- There was increased conviction of effectiveness with practitioners’ increased experience and/or training, except for with aggression.

- Those working with babies-toddlers reported stronger effectiveness on reducing anxiety and startle response.
Implications

- RMT mimics innate movements: all babies with freedom to explore on the floor will have more opportunity to develop optimally, motorically and otherwise.

- Highlights the importance of informing parents and educators of the necessity to address sensory issues in order to improve behavior.

- RMT providers must use caution regarding sensitivities—start slow and gentle, watch for signs of overstimulation.

- Therapist community might consider expanding theoretical basis of development, and trying RMT for its ease of use and reported effectiveness.
Strengths and Limitations of the Study

Limitations:

- anonymity = no reminders sent; large email batches triggered spam warnings
- small response rate = inability to determine statistical significance
- potential bias of RMT colleagues in reporting observations

Strengths:

- triangulation of perspectives: parents, therapists, and educators
- online = access to wide geographical areas; fast responses
- children were observed in their natural settings

Future studies could track specific children’s rate of development several months before and after using RMT.
References*


*The complete list of references can be obtained from the original study: Rebooting Development with a Rhythmic Motor Intervention.