

Date: September 28, 2012

Title: The Use of Interactive Metronome in Improving Attention, Timing, Rhythm, Motor Planning and Sequencing

Clinical Question

- P (*Population/Problem*) In children ages 6 years and older demonstrating decreased occupational performance*,
- I (*Intervention*) does the Interactive Metronome (IM) program*
- C (*Comparison*) versus standard care
- O (*Outcome*) improve attention, timing, rhythm, motor planning and/or sequencing?

[Definitions for terms marked with * may be found in the Supporting Information section.](#)

Target Population for the Recommendation

Inclusions:

Child:

- presents with decreased occupational performance* related to attention, timing, rhythm, or motor and praxis skills*
- is at least 6 years of age
- is able to follow simple directions
- is able to tolerate participating in an one-hour therapy session at least three times a week
- is able to tolerate wearing equipment

Exclusion:

Child with atypical movement patterns and/or limited range of motion which render them incapable of approximating program exercises.

Recommendations (See [Dimensions for Judging the Strength of the Recommendation](#))

1. It is recommended that an IM program be considered as a treatment modality to improve the following skills:

- a. Motor control (*Shaffer 2001 [2b], Burpee 2001 [5b]*)
- b. Timing and rhythm (*Taub 2007 [2b], Burpee 2001 [5b]*)
- c. Visuomotor control (*Cosper 2009 [4b]*)
- d. Visual choice reaction time (*Cosper 2009 [4b]*)
- e. Attention (*Shaffer 2001 [2b]*)

(*Local Consensus 2012 [5]*).

2. It is recommended that the IM program be completed:

- a. 3 to 5 times per week (*Taub 2007 [2b], Shaffer 2001 [2b], Bartscherer 2005 [5a], Interactive Metronome 2003 [5b]*)
- b. Over 15 treatment sessions (*Shaffer 2001 [2b], Bartscherer 2005 [5a], Interactive Metronome 2003 [5b]*)
- c. With a session length of 1 hour (*Taub 2007 [2b], Shaffer 2001 [2b], Bartscherer 2005 [5a]*)

(*Local Consensus 2012 [5]*).

Discussion/Synthesis of Evidence Related to the Recommendation

The grade of the body of evidence for the use of the IM program to improve occupational performance is low and inconclusive. The literature provides preliminary support for the use of the IM program in improving varying aspects of motor and praxis skills (*Cosper 2009 [4b], Bartscherer 2005 [5a], Burpee 2001 [5b]*). In addition, low level evidence supports the use of the IM program to improve cognition, attention, phonological processing, aggression regulation (*Shaffer 2001 [2b]*), reading (*Shaffer 2001 [2b]*), time-dependent sight word recognition (*Taub 2007 [2b]*), and language and communication

(Sabado 2008 [5b], Jones 2004 [5b]). Limitations of these studies included lack of rigorous methodology, limited ability to generalize results, ambiguous statistical analysis, and lack of an appropriate follow-up period to determine lasting impacts of treatment using the IM program.

Reference List (Evidence Level in []; See [Table of Evidence Levels](#))

1. **American Occupational Therapy Association:** Occupational therapy practice framework: Domain and process, 2nd edition. *American Journal of Occupational Therapy*, 62: 625–683, 2008, [5a] 🗨️.
2. **Ayres, A. J.:** Sensory Integration and Praxis Tests Manual. 2007, [5a] 🗨️.
3. **Bartscherer, M., Dole R.:** Interactive metronome training for a 9-year-old boy with attention and motor coordination difficulties. *Physiotherapy Theory and Practice*, 21(4): 257-269, 2005, [5a] 🗨️.
4. **Burpee, J., DeJean V., Frick, S., Kwar, M., Koomar, M., Fischer, Murphy, D.:** Theoretical and clinical perspectives on the Interactive Metronome (IM): A view from a clinical occupational therapy practice. *American Journal of Occupational Therapy*, 55(2): 163-166, 2001, [5b] 🗨️.
5. **Cosper, S., Lee, G., Peters, S., Bishop E. :** Interactive Metronome training in children with attention deficit and developmental coordination disorders. *International Journal of Rehabilitation Research*, 32(4): 331-336, 2009, [4b] 🗨️.
6. **Interactive Metronome:** IM Certified Provider Training and Resource Binder. 2003, [5b] 🗨️.
7. **Interactive Metronome:** Interactive Metronome, 2012. Accessed from <https://www.interactivemetronome.com/> [5b] 🗨️.
8. **Jones, L.:** Improving motor planning and sequencing to improve outcomes in speech and language therapy. 83rd Annual American Speech and Hearing Association, New Orleans, LA., 2004, [5b] 🗨️.
9. **Law, M.; Baptiste, S.; Carswell, A.; McColl, M.; Polatajoko, H.; and Pollock, N.:** Canadian Occupational Performance Measure Manual. 2005, [5a] 🗨️.
10. **Local Consensus:** During BEST development timeframe. 2012, [5] 🗨️.
11. **Sabado, J., Fuller** A preliminary study of the effects of interactive metronome training on the language skills of an adolescent female with a language learning disorder., 2008, [5b] 🗨️.
12. **Shaffer, R., Jacokes, L., Cassily, J., Greenspan, S., Tuchman, R., Stemmer, P.:** Effect of interactive metronome training on children with ADHD. *American Journal of Occupational Therapy*, 22(2): 155-162, 2001, [2b] 🗨️.
13. **Taub, M., Gordon, Timothy** Improvements in interval time tracking and effects on reading achievement. *University of Central Florida, Institute for Applied Psychometrics, University of Texas. Psychology in the Schools*, 44(8): 849-863, 2007, [2b] 🗨️.

IMPLEMENTATION

Applicability Issues

Potential barriers to implementing these recommendations include:

- Cost (purchase of equipment and ongoing purchase of minutes)
- Provider needs to be certified by Interactive Metronome, Inc. in administering the Interactive Metronome Program
- Examiner needs to be certified by the University of Southern California and Western Psychological Services in administering the Sensory Integration and Praxis Tests.

Relevant CCHMC Tools for Implementation

Interactive Metronome Knowing Notes

Outcome or Process Measures

The IM program incorporates four tools that may be utilized to assess outcomes: the IM Training Survey, IM Short Form, IM Long Form, and the Attend Over Time Task. At this time there are no published articles in the literature providing information on the reliability and validity of these tools. The IM Training Survey is a brief questionnaire asking parents or children to rank their memory recall, organizational skills, focus, ability to multi-task, coping skills, and rhythm on a

scale of 1 to 10. The IM Short Form (administered at the beginning of each session), IM Long Form (administered three times throughout the program), and the Attend Over Time Task (administered at baseline and follow-up) measure performance of specific exercises utilizing the IM equipment.

While these assessments will measure improvements on specific IM activities, they do not provide information as to whether or not these improvements will transfer to other activities. In the literature, the IM program has been reported to produce changes in the areas of motor control, timing and rhythm, and visual-motor control (*Taub 2007 [2b]*, *Shaffer 2001 [2b]*, *Cosper 2009 [4b]*, *Burpee 2001 [5b]*). Specific subtests of the Sensory Integration and Praxis tests (*Ayres 2007 [5a]*) have the potential to objectively measure in these areas. These include standing and walking balance, postural praxis, bilateral motor coordination, sequencing praxis, and praxis on verbal command. Test-retest reliability for these subtests ranged from $r = .82 - .88$, inter-rater reliability ranged from $r = .96 - .99$, and both construct and criterion-related validity are supported (*Ayres 2007 [5a]*). To our knowledge, no other objective measure is currently available to assess these areas.

It is also suggested that the Canadian Occupational Performance Measure (*Law 2005 [5a]*) be administered at baseline and again at follow-up to provide a measure of change in a caregiver's (and/or child's) perception of occupational performance over time. This assessment is both reliable (test-retest reliability ranged from $.85 - .92$) and valid (literature supports content, criterion, and construct validity), and it can be tailored to measure functional changes specific to the individual.

SUPPORTING INFORMATION

Background/Purpose of BEST Development

The IM program is a computer-based intervention tool that combines auditory feedback and movement exercises to promote improved motor planning and sequencing. Individuals who have completed the IM program have reported improvements in their focus and attention, coordination, endurance and stamina, ability to filter internal and external distractions, and ability to monitor actions (*Interactive Metronome 2012 [5b]*). The IM program is stated to be effective for working with persons with a variety of diagnoses including: Sensory Integration Disorder, ADD/ADHD, Traumatic Brain Injury, Cerebral Vascular Accident, Autism Spectrum Disorder, Cerebral Palsy, Non-verbal Learning Disorder, Balance Disorders, Limb Amputation, Parkinson's Disease, and Multiple Sclerosis (*Interactive Metronome 2012 [5b]*). The IM program can be used in a variety of settings by persons who are certified trainers in using the method. Trainers are able to structure a program that is specific to the needs of the individual participant. The purpose of this evidence-based practice project was to appraise research evidence on interactive metronome and provide recommendations regarding use of the IM program.

Definitions

1. Interactive Metronome Program: Is a computer-based intervention tool that combines auditory feedback and movement exercises to promote improved motor planning and sequencing.
2. Occupational Performance: The accomplishment of a purposeful, functional, and meaningful activity resulting from the dynamic transaction among the person, the context and environment, and the activity (*American Occupational Therapy Association 2008 [5a]*).
3. Motor and Praxis skills: "Actions or behaviors a client uses to move and physically interact with tasks, objects, contexts, and environments. Includes planning, sequencing, and executing novel movements" (*American Occupational Therapy Association 2008 [5a]*).

Search Strategy

Databases: Medline, Cinahl, Cochrane Reviews, Pubmed, AOTA, AOTA, APTA's Hooked on Evidence, APTA Section of Pediatrics, Can Child, CATS, PEDro, Pediatric PT, SPD Foundation, Spiral Foundation, TRIP, IM Website

Search Terms: Interactive Metronome, Metronome, Motor Planning, ADHD, Coordination

Limits, Filters: English language only

Search Dates: Date ranges from 1980-2012

Date Search done: May 2012

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Conflicts of Interest were declared for each team member:

- No financial or intellectual conflicts of interest were found.
- No external funding was received for development of this BEST.
- The following conflicts of interest were disclosed:

Note: Full tables of the [LEGEND evidence evaluation system](#) are available in separate documents:

- [Table of Evidence Levels of Individual Studies by Domain, Study Design, & Quality](#) (abbreviated table below)
- [Grading a Body of Evidence to Answer a Clinical Question](#)
- [Judging the Strength of a Recommendation](#) (dimensions table below)

Table of Evidence Levels (see note above):

Quality level	Definition
1a ⁺ or 1b ⁺	Systematic review, meta-analysis, or meta-synthesis of multiple studies
2a or 2b	Best study design for domain
3a or 3b	Fair study design for domain
4a or 4b	Weak study design for domain
5a or 5b	General review, expert opinion, case report, consensus report, or guideline
5	Local Consensus

1a = good quality study; b = lesser quality study

Table of Language and Definitions for Recommendation Strength (*see note above*):

Language for Strength	Definition
It is strongly recommended that... It is strongly recommended that... not...	When the dimensions for judging the strength of the evidence are applied, there is high support that benefits clearly outweigh risks and burdens. (<i>or visa-versa for negative recommendations</i>)
It is recommended that... It is recommended that... not...	When the dimensions for judging the strength of the evidence are applied, there is moderate support that benefits are closely balanced with risks and burdens.
There is insufficient evidence and a lack of consensus to make a recommendation...	
<i>Given the dimensions below and that more answers to the left of the scales indicate support for a stronger recommendation, the recommendation statement above reflects the strength of the recommendation as judged by the development group. (Note that for negative recommendations, the left/right logic may be reversed for one or more dimensions.)</i>	
Rationale for judgment and selection of each dimension:	
1. Grade of the Body of Evidence	<input type="checkbox"/> High <input type="checkbox"/> Moderate <input checked="" type="checkbox"/> Low
<i>Rationale: Two level 2b articles, one level 4a, and one level 5a were included, giving the body of evidence a low grade per the CCHMC legend for grading a body of evidence.</i>	
2. Safety/Harm (Side Effects and Risks)	<input checked="" type="checkbox"/> Minimal <input type="checkbox"/> Moderate <input type="checkbox"/> Serious
<i>Rationale: There are no documented side effects or risks to participating in the IM program.</i>	
3. Health benefit to patient	<input type="checkbox"/> Significant <input type="checkbox"/> Moderate <input checked="" type="checkbox"/> Minimal
<i>Rationale: Health benefits may include improvements with attention, timing, rhythm, motor planning and/or sequencing which could improve the participant's ability to engage in functional life tasks.</i>	
4. Burden on patient to adhere to recommendation	<input type="checkbox"/> Low <input checked="" type="checkbox"/> Unable to determine <input type="checkbox"/> High
<i>Rationale: Patient may experience burden from scheduling challenges impacting typical daily routines secondary to the intense frequency of the program.</i>	
5. Cost-effectiveness to healthcare system	<input type="checkbox"/> Cost-effective <input checked="" type="checkbox"/> Inconclusive <input type="checkbox"/> Not cost-effective
<i>Rationale: Participants in the program may experience increased financial burden secondary to the quick use of allotted insurance visits.</i>	
6. Directness of the evidence for this target population	<input type="checkbox"/> Directly relates <input checked="" type="checkbox"/> Some concern of directness <input type="checkbox"/> Indirectly relates
<i>Rationale: The majority of the studies limited the sample to only children with a specific diagnosis. This BEST is intended to apply more globally to children with impaired occupational performance.</i>	
7. Impact on morbidity/mortality or quality of life	<input type="checkbox"/> High <input checked="" type="checkbox"/> Medium <input type="checkbox"/> Low
<i>Rationale: While the evidence suggests IM may improve performance skills such as rhythm and sequencing, there is a paucity of information related to functional skills and quality of life.</i>	

Copies of this Best Evidence Statement (BEST) and related tools (if applicable, e.g., screening tools, algorithms, etc.) are available online and may be distributed by any organization for the global purpose of improving child health outcomes.

Website address: <http://www.cincinnatichildrens.org/service/j/anderson-center/evidence-based-care/bests/>

Examples of approved uses of the BEST include the following:

- Copies may be provided to anyone involved in the organization's process for developing and implementing evidence based care;
 - Hyperlinks to the CCHMC website may be placed on the organization's website;
 - The BEST may be adopted or adapted for use within the organization, provided that CCHMC receives appropriate attribution on all written or electronic documents; and
 - Copies may be provided to patients and the clinicians who manage their care.
- Notification of CCHMC at EBDMinfo@cchmc.org for any BEST adopted, adapted, implemented, or hyperlinked by the organization is appreciated.

Please cite as: Brevoort K, Brennan A, McQuiddy V; Cincinnati Children's Hospital Medical Center: Best Evidence Statement The Use of Interactive Metronome in Improving Attention, Timing, Rhythm, Motor Planning and Sequencing, <http://www.cincinnatichildrens.org/svc/alpha/h/health-policy/best.htm>, BEST 141, pages 1-6, 9/28/12.

This Best Evidence Statement has been reviewed against quality criteria by two independent reviewers from the CCHMC Evidence Collaboration. Conflict of interest declaration forms are filed with the CCHMC EBDM group.

Once the BEST has been in place for five years, the development team reconvenes to explore the continued validity of the guideline. This phase can be initiated at any point that evidence indicates a critical change is needed. CCHMC EBDM staff perform a quarterly search for new evidence in an horizon scanning process. If new evidence arises related to this BEST, authors are contacted to evaluate and revise, if necessary.

For more information about CCHMC Best Evidence Statements and the development process, contact the Evidence Collaboration at EBDMinfo@cchmc.org.

Note

This Best Evidence Statement addresses only key points of care for the target population; it is not intended to be a comprehensive practice guideline. These recommendations result from review of literature and practices current at the time of their formulation. This Best Evidence Statement does not preclude using care modalities proven efficacious in studies published subsequent to the current revision of this document. This document is not intended to impose standards of care preventing selective variances from the recommendations to meet the specific and unique requirements of individual patients. Adherence to this Statement is voluntary. The clinician in light of the individual circumstances presented by the patient must make the ultimate judgment regarding the priority of any specific procedure.