

## ABSTRACT

The purpose of this pre-test, post-test, quasi-experimental study was to examine the relationship between the Interactive Metronome® (IM) protocol and cognitive plasticity, cognitive retention, and fine motor skills of older adults in southeastern North Carolina. The IM protocol was carried out in various settings with an occupational therapist and/or graduate occupational therapy students present for motivation and guidance. All participants underwent pre- and post-test assessments in order to track cognitive and motor function as they moved through the protocol. The assessments used were 1) for cognitive assessment d2 Test of Attention (d2) and 2) for fine motor assessments included the Nine Hole Peg Test (NHPT). In addition the participants scores on the IM's Long Form Assessment Test were also run to identify overall change of the client. The participants' scoring and progress within the IM program was also tracked and examined for trends and indicators. This pre-test, post-test, quasi-experimental design was used to compare the differences between the assessment scores before and after intervention with the IM protocol. In all, a relationship was delineated between positive percentage of change on IM performance and positive percentage of change on the cognitive and motor assessments. There were two groups of clients that were also a result of the study process and those who completed the entire study and those that only completed the initial phase. These groups will be compared as far as final outcomes.

## INTRODUCTION

The IM program is comprised of computer software, the IM station, wireless button triggers, a wireless tap mat trigger, USB cable, headphones, large hand glove, and small hand glove. In addition to Training Sessions the IM system provides two assessments when administering the IM protocol: the Short Form Assessment (SFA), and the Long Form Assessment (LFA). The IM is an assessment and training tool backed by evidence that improves timing, rhythm, and synchronization in the brain. The three goals of the tool that the company lists include the following: (1) improve neural timing and decrease neural timing variability (jitter) that impacts speech, language, cognitive, motor, and academic performance; (2) build more efficient and synchronized connections between neural networks; and (3) increase the brain's efficiency, performance, and ability to benefit more from other rehabilitation and academic interventions. Engaging in the IM system includes the participant hitting a trigger to correspond to an auditory beat elicited by the program and provides early cognitive engagement, repetitive practice, practice of specific functional motor skills, and feedback for millisecond timing to facilitate motor learning. The ability to tap consistently to an auditory beat is correlated to the following: consistency of auditory brainstem response to sound, ability to read, and phonological awareness; as well as less trouble synchronizing and thus, less neural jitter.

## METHODS

The population was a group of healthy aging adults living in a higher socio economic transitional living center over the age of 60 with the mean age of 74 for both groups.

This study focused on improving both cognitive and motor skills. There were three phases to the study.

**Phase I:** consisted of Pre and Post Test with 10 IM Treatment sessions in between.

**Phase II:** 6- 8 weeks where no IM or other treatment interventions were given.

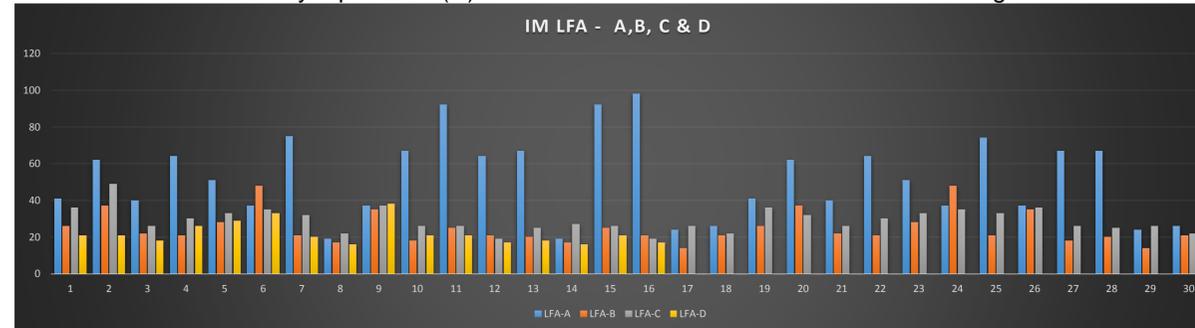
**Phase III :** A repeat of Phase I, but only 6 treatment sessions given.

33 clients were enrolled with 30 of them completing Phase II and III with the Initial evaluation for Phase III; but only 16 completed the full Phase III. Three (3) of them dropping out 2ndary to scheduling or dis-interest in completing the study.

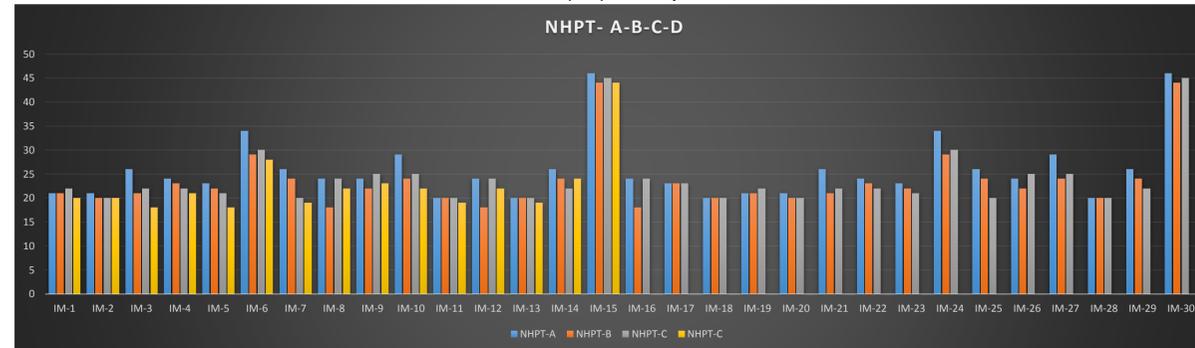
The results compare the outcomes of those clients who completed all 3 phases as well comparing those with the group that only completed the partial study. The significance of this is that all 30 were able to be evaluated for the 6-8 weeks of lasting effects of the IM changes from Phase I.

## RESULTS

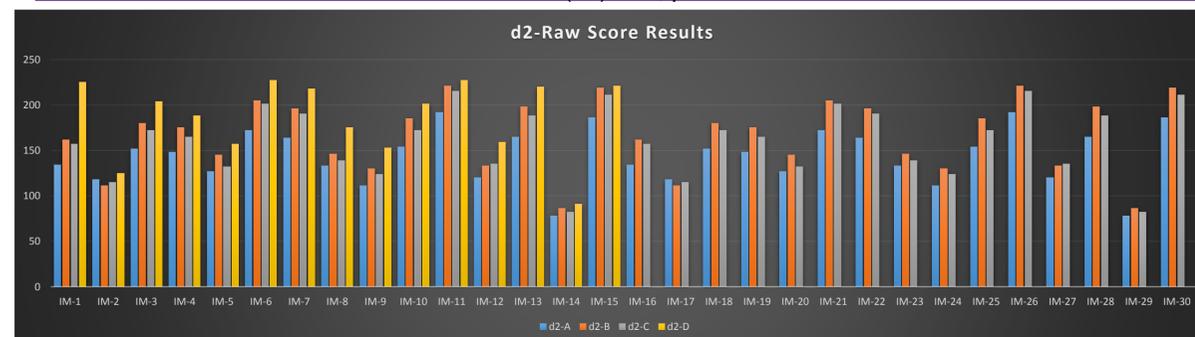
Participants agreed to participate in the study where they received a baseline pre test evaluation (A), then received 10 IM Treatment Sessions; Completed post-test (B). Then went for 4-6 weeks without any intervention, then completed pre-test 2 (C) with 6 IM Treatment Sessions followed by a post test (D) of the evaluations. Below are raw score changes



Data analysis was run on the LFA Data and changes demonstrated significance in outcomes changes between A=>B  $t(30)=6.1, p=.0001$  between A=>C  $t(30)=5.3, p=.0001$  between A=>D  $t(15)=5.4, p=.001$



Data analysis was run on the NHPT Data and changes demonstrated significance in outcomes changes between A=>B  $t(30)=5.9, p=.0001$  between A=>C  $t(30)=4.4, p=.0001$  between A=>D  $t(15)=4.9, p=.001$



Data analysis was run on the d2 Data and changes demonstrated significance in outcomes changes between A=>B  $t(30)= -10.7, p=.0001$  between A=>C  $t(30)=-9.5, p=.0001$  between A=>D  $t(15)= -8.4, p=.001$

## DISCUSSION

In addition to the Paired tTest analysis that was run, which have indicated a clear significance in change both in cognitive changes for attention and attention to detail as well as improved fine motor skills a repeated measures analysis was run. This was possible due to the four different measurements acquired during the 3 Phases of the study. As anticipated from the results of the t Tests run the related measures analysis provided significance at the  $p=.001$  level at each of the outcomes measurement level with each of the 3 different measurements. The NHPT was lower in its output change, but as one is familiar with the raw measurements of performance on the NHPT its is typically less than 3 seconds of change that make a normative change for evaluation purposes.

Of notable importance is that these were all clients who identified themselves as living healthy normal status' within their aging process. A number had pre-morbid conditions that they were living with, as part of their normal life style. Yet, we see notable, significant change on both the IMLFA and the standardized evaluation tools used in this study.

A final comparison was run between the group that completed just the first session of training to the group that completed both the Phase I and Phase III treatment interventions. In the analysis there was a much small indication in significance in change between final outcomes indicating that clients did make minor improvements  $p=.049$  as compared to the  $p=.001$  value change from Pre-Test A => B or A => D. The change from B => D was much less substantial.

Indications are that participants reached a positive change in status and were able to maintain that level with little statistical change of a 6-8 week break, regained their original improves and made a measureable change in their new level of performance, though not substantial in comparison.

## REFERENCES

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