

Acquisition Of Complex Motor Skills in Non- Dominant Hand

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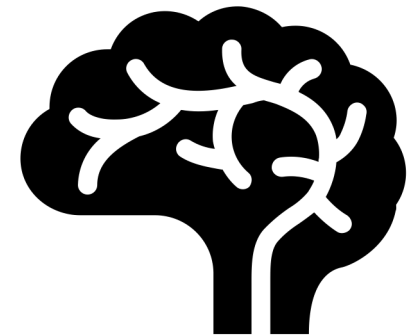
Background Information

- Disease, illness, or injury can cause a decline or loss in function of the dominant hand
 - Activities of daily living²
 - Increased use of non-dominant hand
 - Stroke, carpal tunnel, arthritis, and more



Background Information Cont.

- Physical or mental practice?
 - Physical practice in OT/PT settings
 - Mental practice shown to activate motor components within the brain¹
 - Combination of these practice methods



Purpose

- The purpose of this project was to:
 - Determine a difference between physical practice and physical with mental practice methods
 - Determine which practice method resulted in better acquisition
 - Analyze effect of practice duration on acquisition

Study Population:

Young Adults (18-25 years)

- 9 participants

Excluded populations:

- Past or current neurocognitive injury or illness
- Musculoskeletal pain in arms, hands, or fingers
- Musculoskeletal upper extremity surgeries within the last year
- Ambidextrous
- Visual impairment that cannot be corrected with glasses or contacts

Study Design

The focus of this research was to utilize physical practice, as well as mental practice, while constructing LEGO structures with the dominant/non-dominant hand.

- This study was designed to be a Randomized Controlled Study
- Eight and 16-day study
 - Various LEGO structures were built
 - Written instructions were prepared

Study Design continued...

Amount of time utilized to build structures and errors during construction were monitored and recorded

Considering time, error, and other factors, results were pulled together for the study in order to see which practice method resulted in better acquisition

Methods

- Randomly organized subjects into 1 of 8 different groups:
 - 8 Day Study
 - Physical Practice 1x per day
 - Physical Practice 2x per day
 - Mental/ Physical Practice 1x per day
 - Mental/ Physical Practice 2x per day
 - 16 Day Study
 - Physical Practice 1x per day
 - Physical Practice 2x per day
 - Mental/ Physical Practice 1x per day
 - Mental/ Physical Practice 2x per day



Structure #1



Structure #2

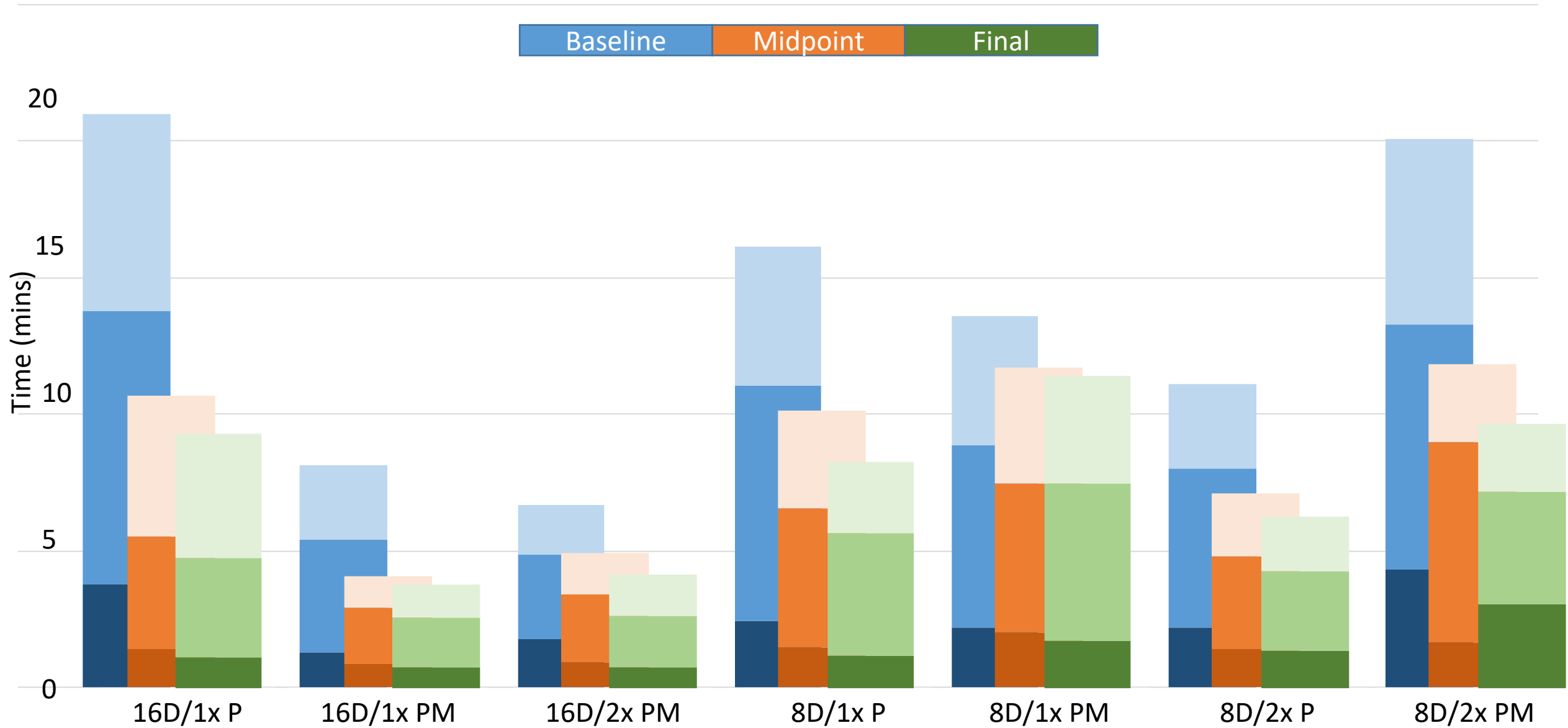


Structure #3

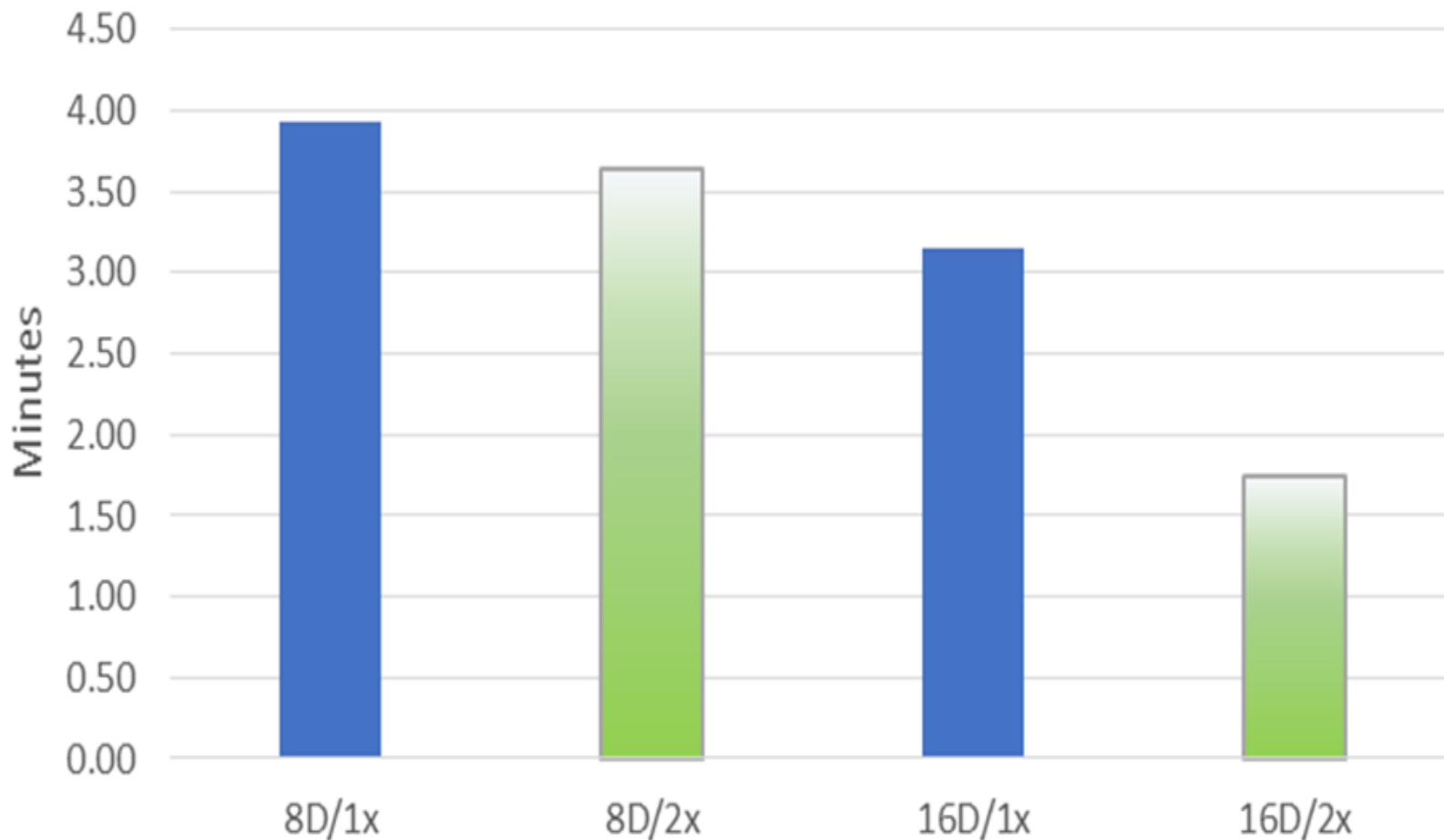
- Each participant was given a set of Lego's and instructions on how to build 3 different structures.
- Each participant completed an initial, midpoint, and a final test.
- Each test and practice session were timed
- Participants then recorded times and errors via surveys in Redcap
- Data was then collected and analyzed

Methods Cont.

Non-Dominant Hand



Completion Time by Practice Length and Sessions/Day

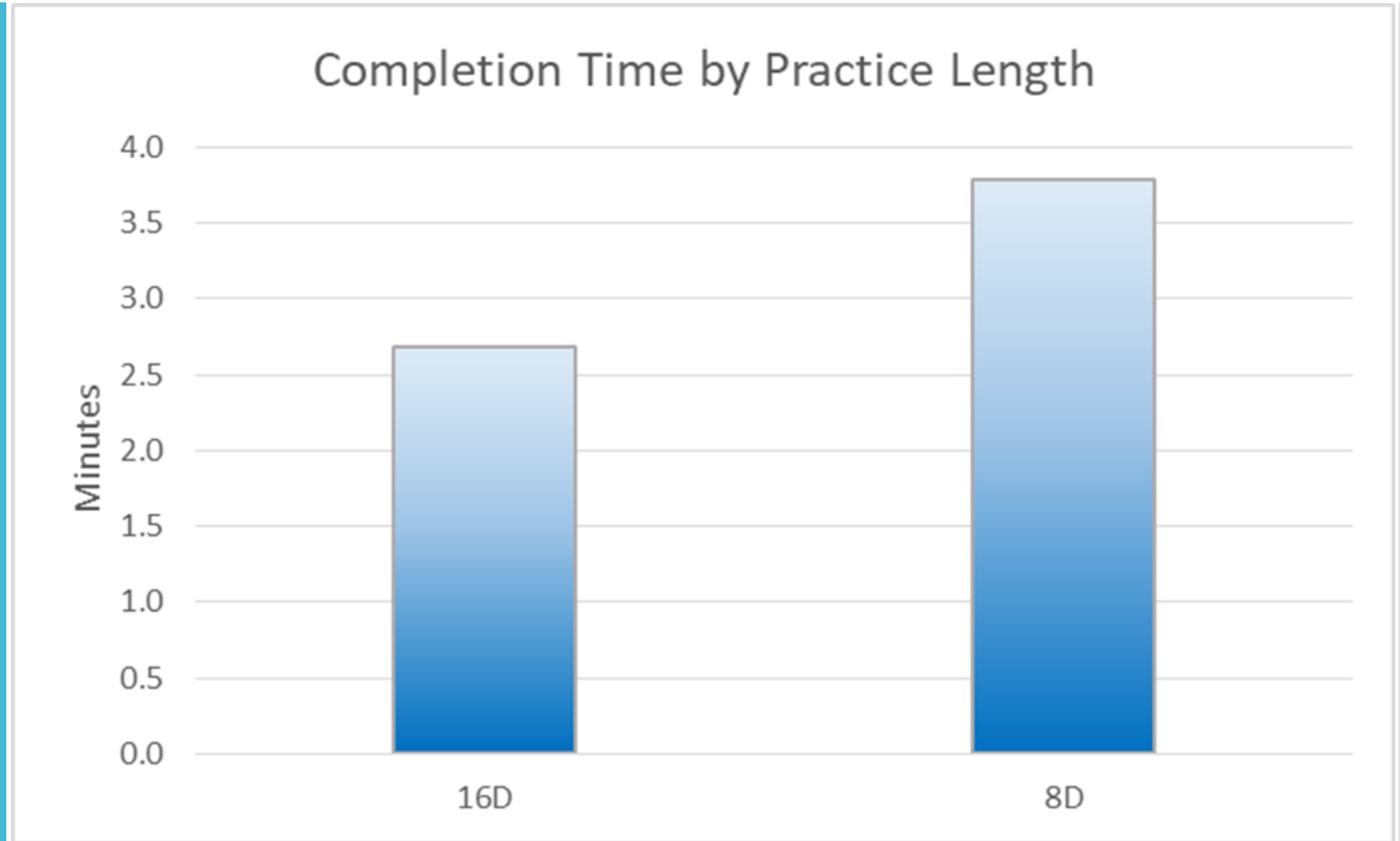


Results Cont.

There is a 7.1% decrease in time with the 8-day, 2 times a day practice schedule vs the 8-day, one time a day schedule.

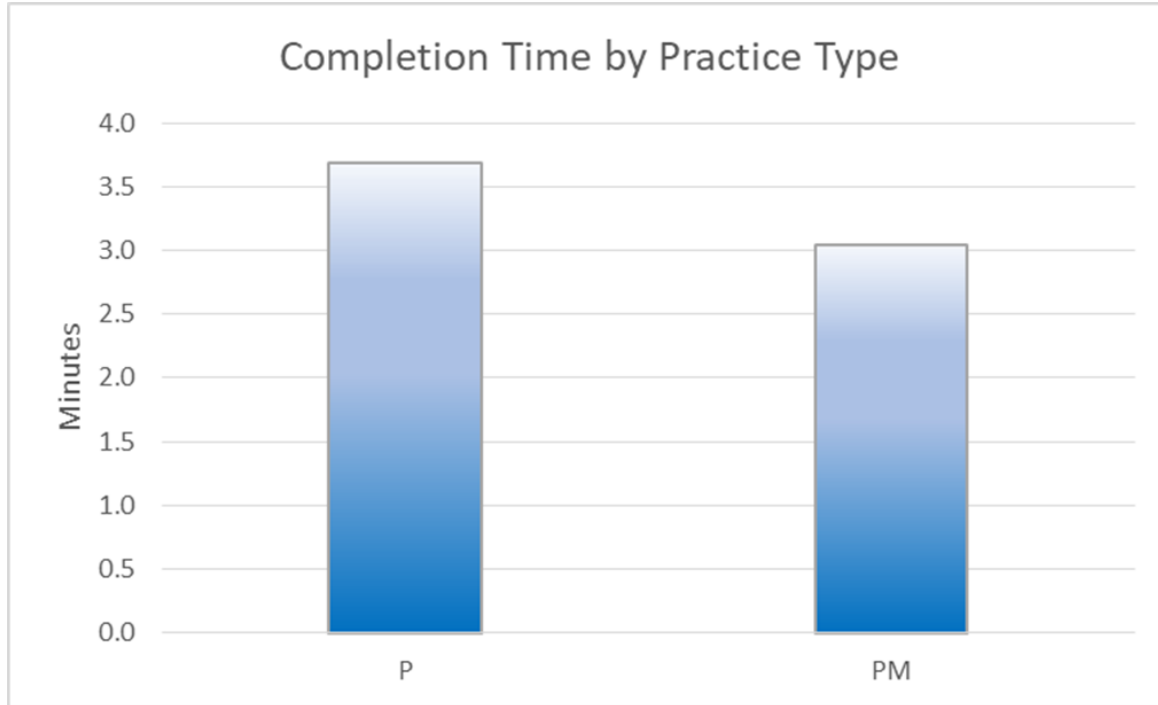
There is a 44.6% decrease in time with the 16-day, 2 times a day practice schedule vs the 16-day, one time a day schedule.

Results Cont.



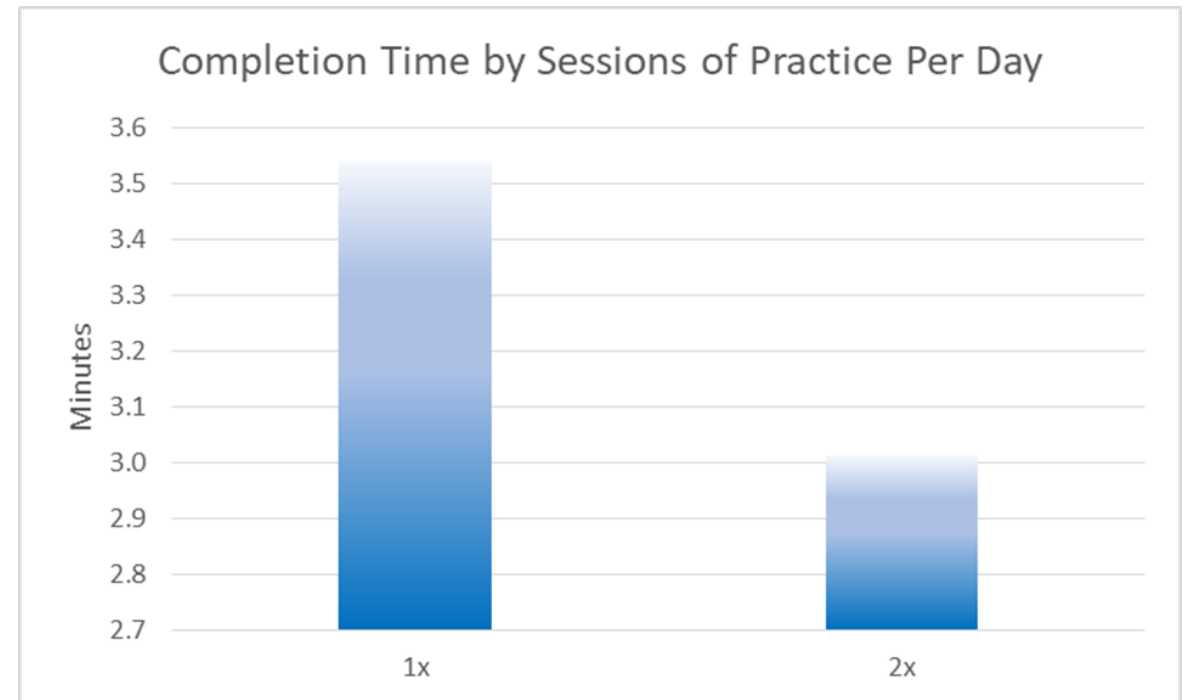
- 16-day practice schedule showed a 41.6% faster average completion time

Results



- Physical and mental practice decreased average time to build a structure by 17.5 %

- Twice a day practice decreased average time to build a structure by 14.8 %



Discussion

Research

- Much research indicates a combination of physical and mental practice is advantageous when learning, relearning, or performing a motor skill
- Our data neither supports or contradicts previous research done
- Future testing needed
 - Robert and Murre (1999) showed “cells that fire together, wire together”
 - Mental practice as a guided recovery

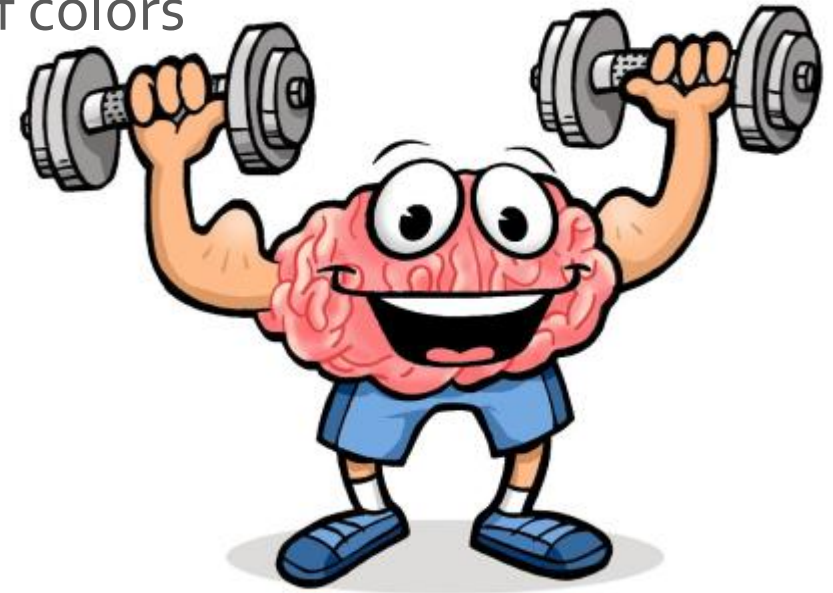
Unique Data

- Dominant hand had similar drop-offs as non-dominant hand
 - Further Testing

Discussion

Strengths/Weaknesses

- Method of testing
 - Convenience
 - Falsification of results?
- Directions in black and white
 - Colorblindness
 - Prevention of mix up of colors
- COVID-19
 - Numbers
 - Virtual Testing



Discussion

Challenges

- Method
 - Trusting people to fill out the survey after every practice session
- Directions
 - Ideally all sets will have the same color of Legos
- Covid-19
 - Always have a backup plan!

Conclusion

Purpose: See what type of training is best for learning motor skills of the non-dominant hand

Practice leads to more effective learning when...

- Practicing more than once a day
- Longer duration
- Combination of mental and physical practice

Could this information be applied to a more practical task?



Future Direction

- Building on our current design:
 - Elongating the practice schedule
 - Finding the timing plateau
 - Using consistent coloring with various Lego sizes and instruction imaging
 - Improving surveying techniques
 - Recruiting more participants
- Ideas for new study designs:
 - Mental practice only vs. physical practice only
 - Transference of skill
 - Exploring the use of a participant demographic who needs the skill



Questions?
Comments?

References

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4. Yancosek, K. E. (2012). Management of Dominant Upper Extremity Injuries: A Survey of Practice Patterns. *Journal of Hand Therapy*, 25(1), 79–88. doi: 10.1016/j.jht.2011.08.002
5. Stumbrys T, Erlacher D, Schredl M. Effectiveness of motor practice in lucid dreams: a comparison with physical and mental practice. *Journal of Sports Sciences*. 2016;34:27-34.