UNIVERSITY OF ALBERTA
FACULTY OF REHABILITATION MEDICINE
Department of Occupational Therapy

Effects of Computerized Games on Older Adults' Cognition

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Special Thanks

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Presentation Goals

- To describe how computer/mobile games have been used among older adults with typical aging, with dementia, and with cognitive impairment based on results of systematic literature reviews.

- To learn about the evidence for the benefits and challenges of using computer/mobile games as a rehabilitation approach with older adults.

- To review the results of two research studies about the effectiveness of mobile games with older adults with typical aging, with dementia, and with cognitive impairment.

Source: https://www.remediesforme.com/natural-remedies-improve-memory-focus-concentration/

Source: https://www.carehome.co.uk/news/article.cfm/id/1578909/Dementia-care-home-designed-without-mirrors-reduces-confusion-frustration-and-embarrassment

Introduction

- Mild cognitive impairment (MCI) is expected to affect 10-20% of older adults (Palmer et al., 2008) and many will progress to dementia

- **Computerized Cognitive Training (CCT):** repetitive and intensive practice of standardized exercise used to improve cognitive functioning, using any computer technology that targets a single or multiple cognitive domains

Research Question

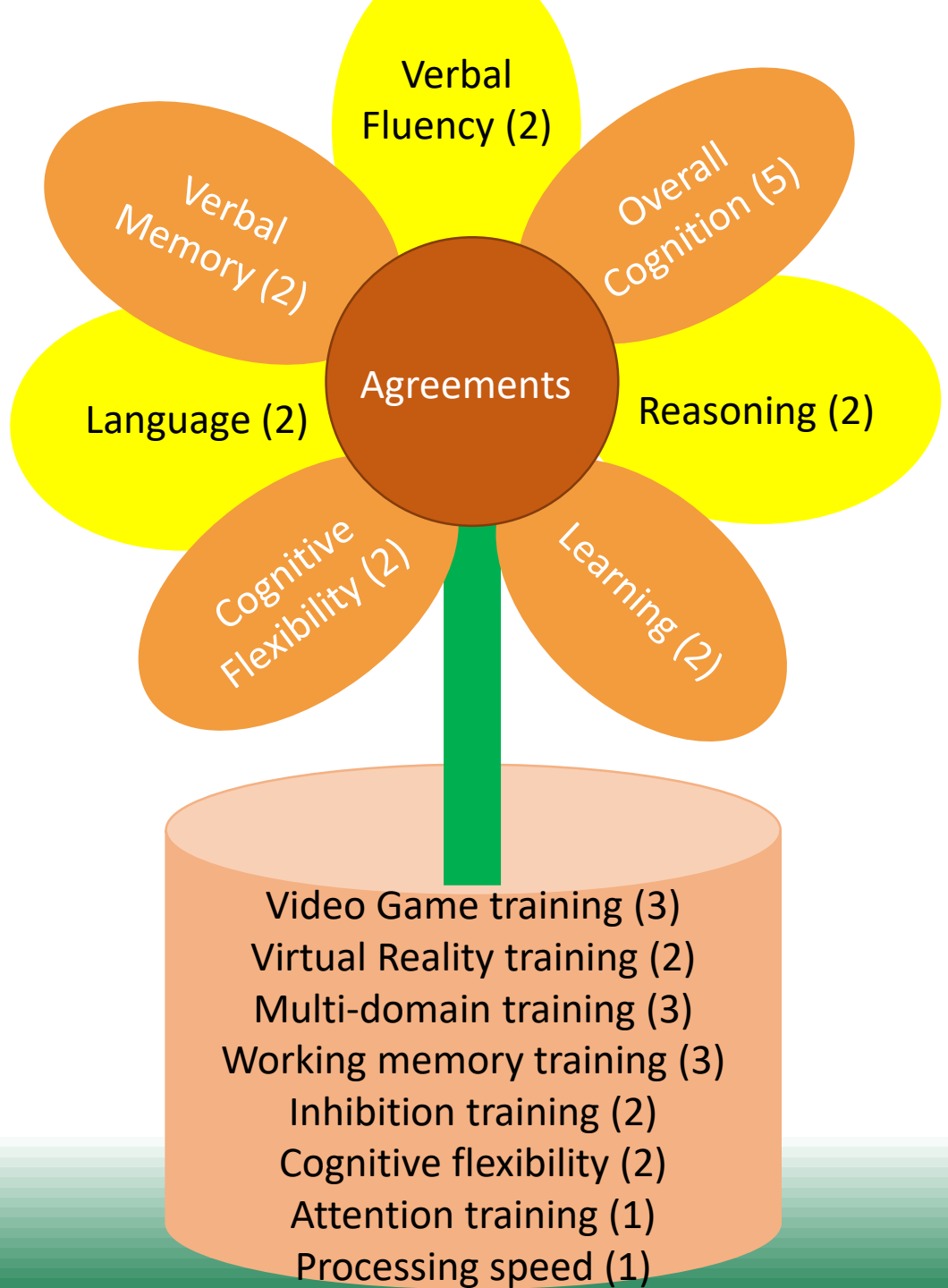
What are the effects of Computerized Cognitive Training (CCT) on cognitive domains of older adults with or without cognitive impairment or dementia?

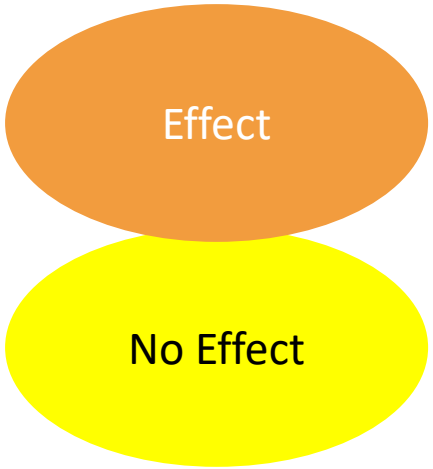
Approach

- Systematized search method was used to conduct a literature review
- Databases: CINAHL, Embase, Medline, PsycINFO, Scopus, and Cochrane Reviews
- Search terms: “video game” OR “computer-assisted instruction” OR “virtual reality” OR “games” OR “gaming” OR “brain-training” OR “cognitive-training” OR “wii” OR “Nintendo” OR “x-box” OR “playstation” OR “exergam*” OR “Kinect”

Findings

Effects of CCT on Cognitive Domains

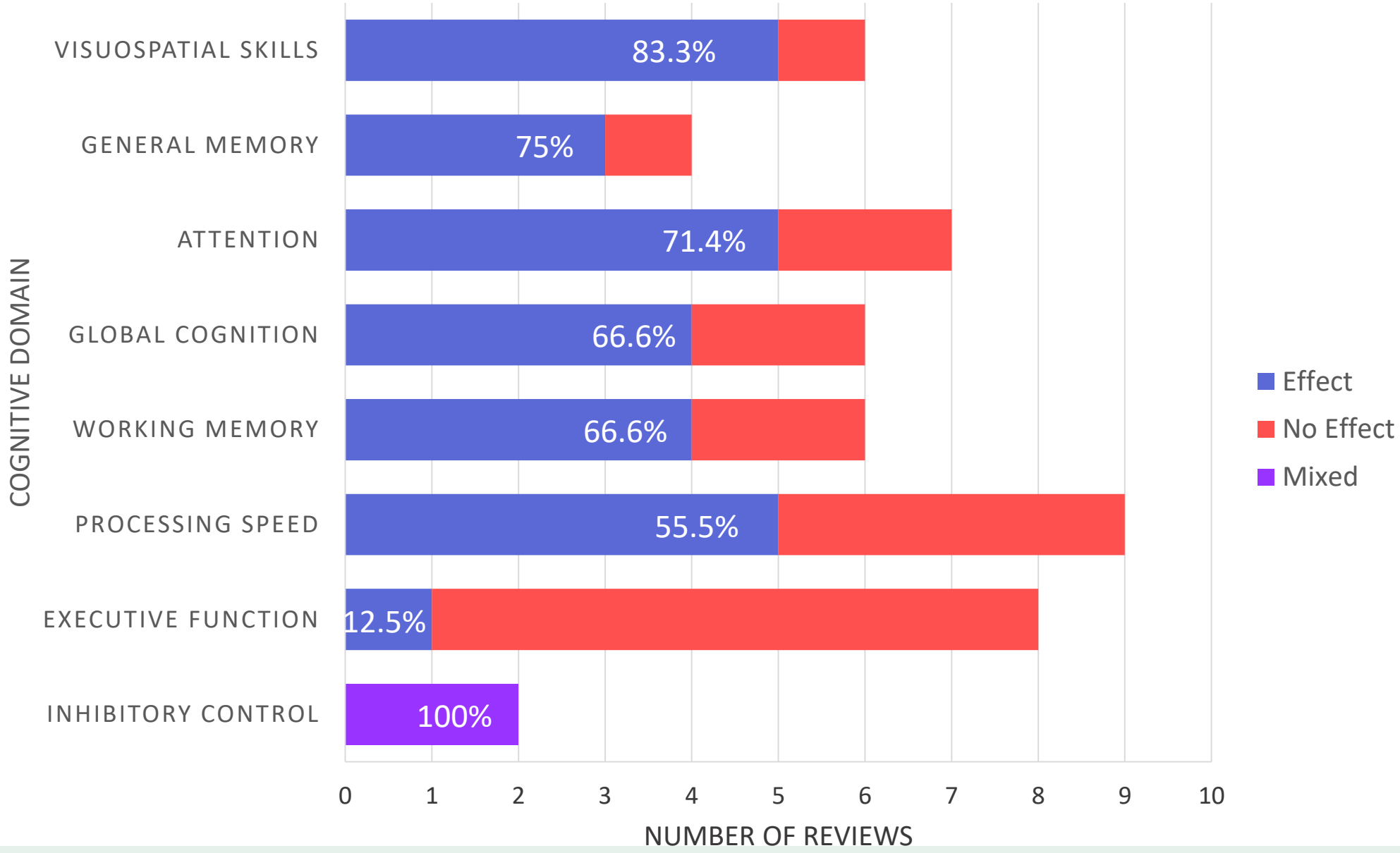




18,000+ participants

9 reviews (231 papers)

EFFECTS OF CCT ON COGNITIVE DOMAINS: MIXED RESULTS

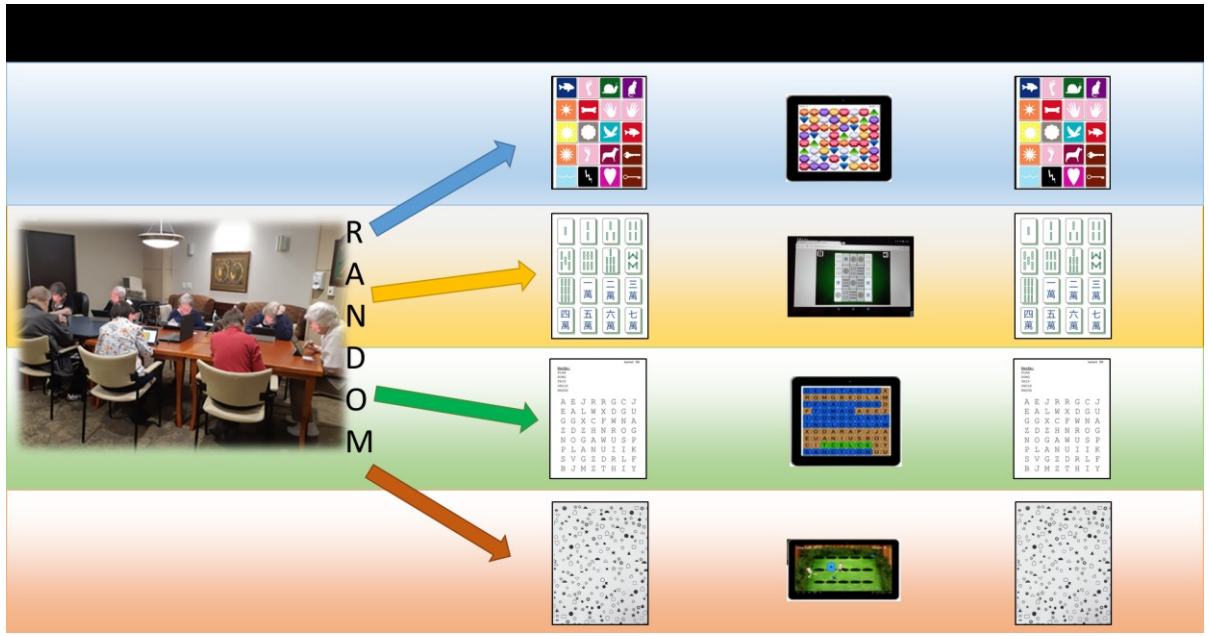


Factors of Effective Intervention

- Most effective schedule
  - Shorter duration of training (2) for single cognitive domains
  - More time is needed to have far transfer (untrained) effects (2)
  - 30+ minute sessions (2)
  - 1-3 sessions/week (1), and >12 sessions for far transfer effects (1)
- Most effective setting
  - Home-based intervention is not as effective (2)
- Most effective age group
  - Older group (70+ years) had larger effect (2)

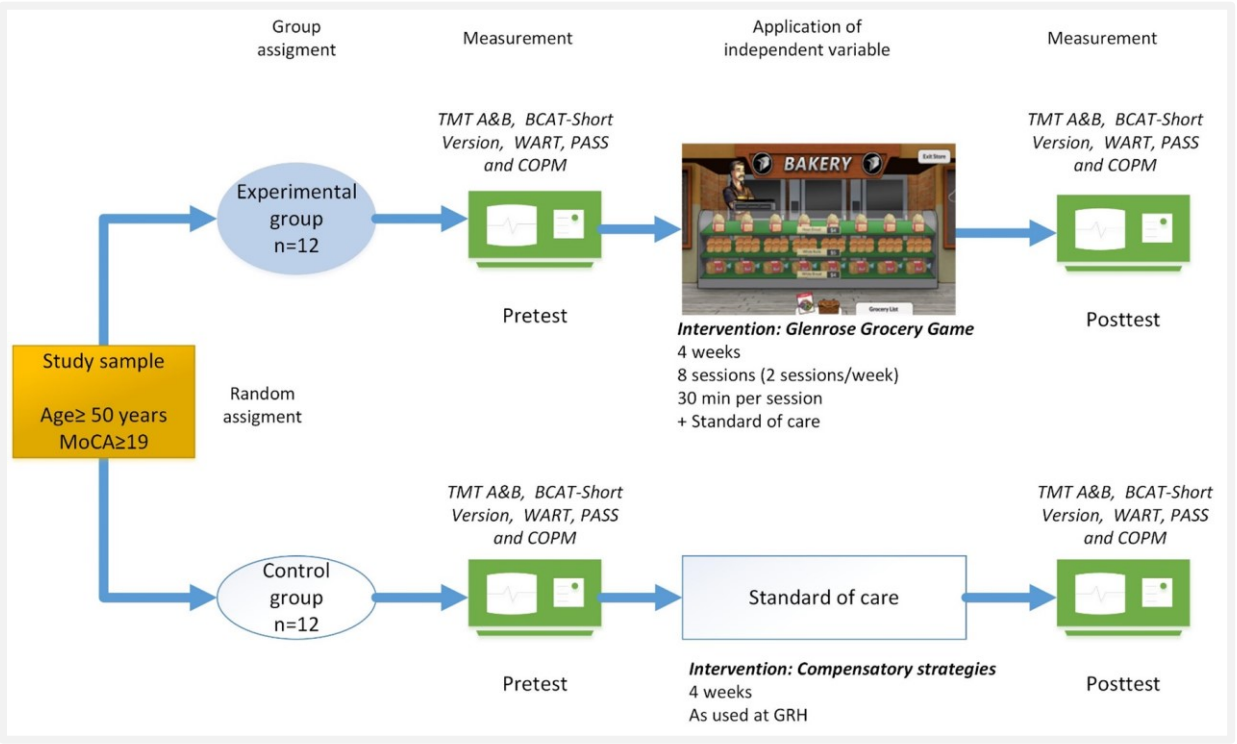
Implications For Practice

- CCT has many advantages over traditional pen-and-paper cognitive training
- Video game training has been found to be effective in impacting cognition
- CCT has been found to impact overall cognition.
- Higher level cognitive functioning such as executive functioning may need more targeted training
- Dosage, location and age may also matter



Vibrant Minds Study (SCD)

Alberta Health Services

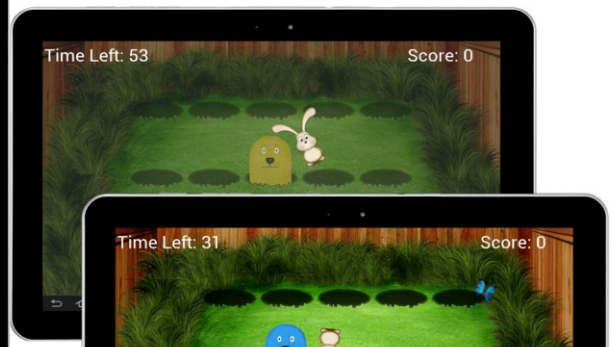


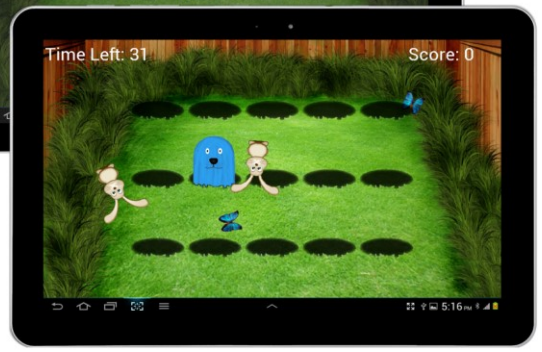
Glenrose Grocery Game(RCT-F)

The VibrantMinds

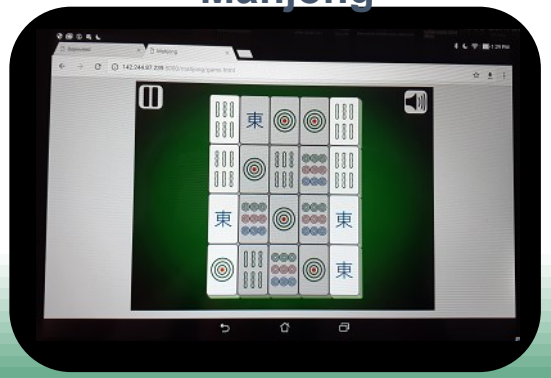
Bejeweled

Whack-a-Mole



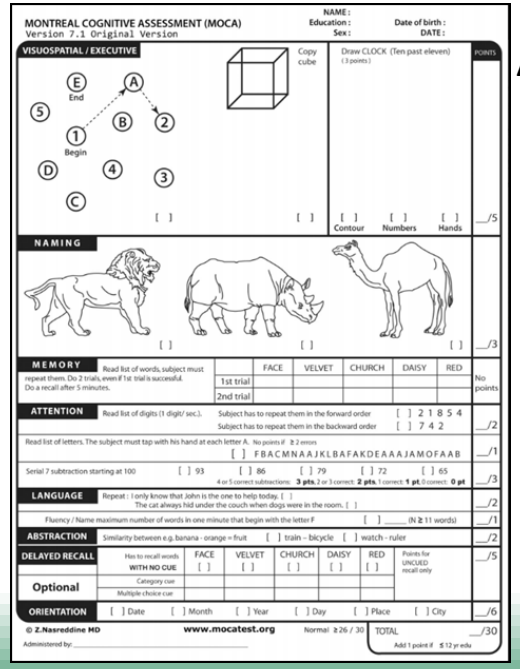


Mahjong

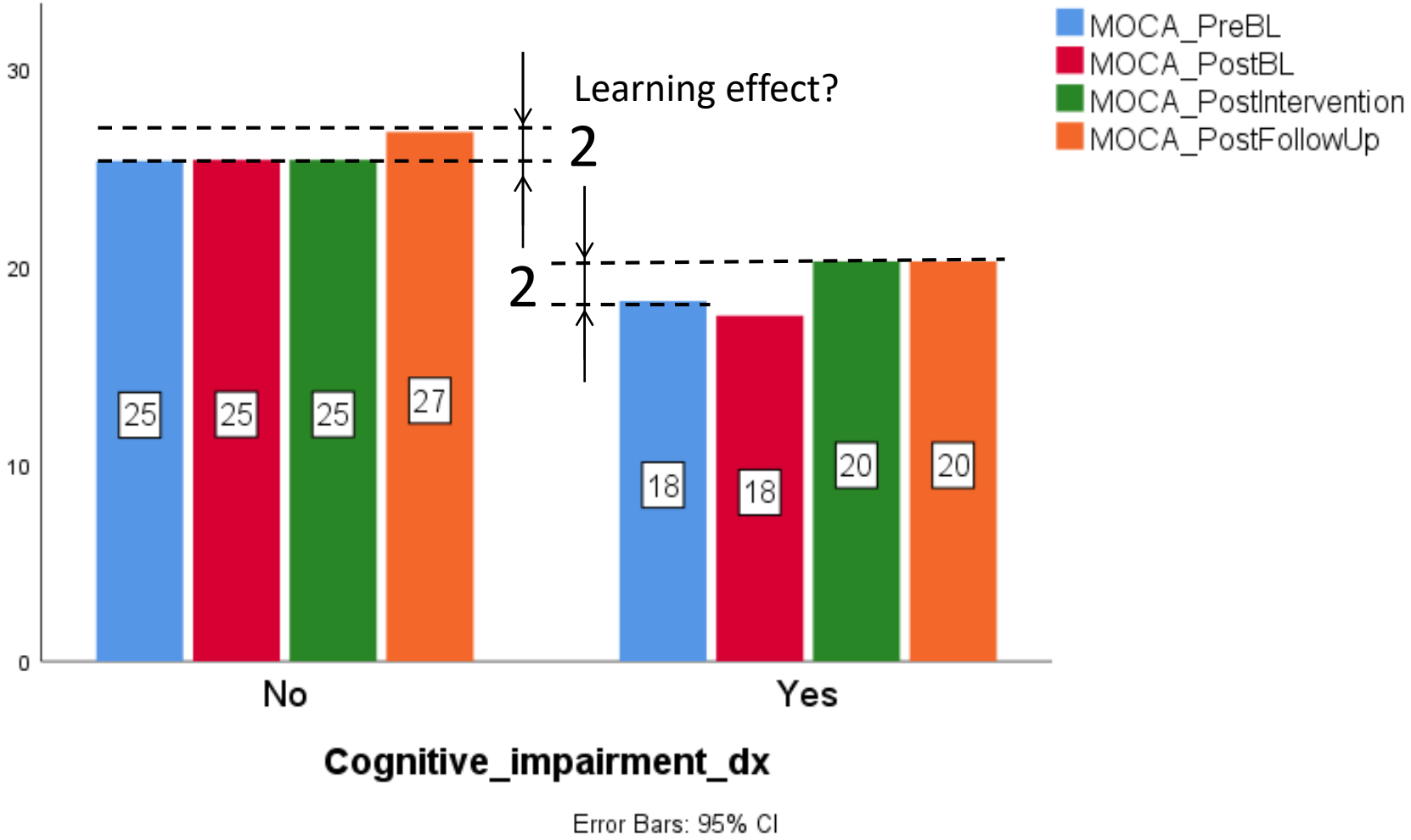


Word Search

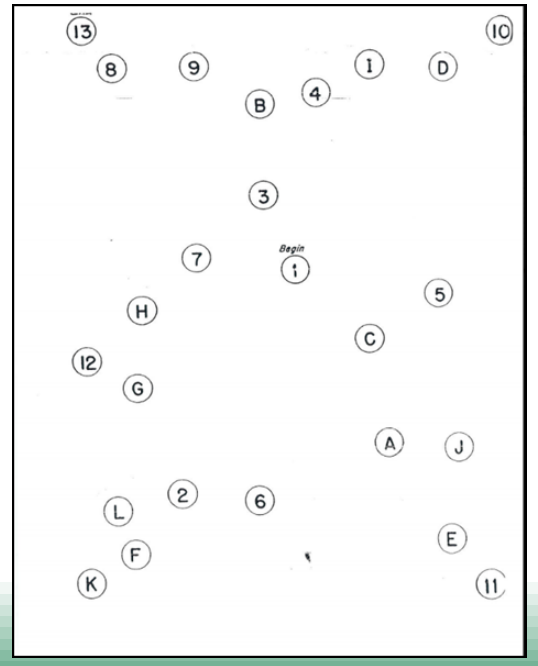
Attention, concentration, executive functions, memory, language, visuoconstructional skills, conceptual thinking, calculations, orientation



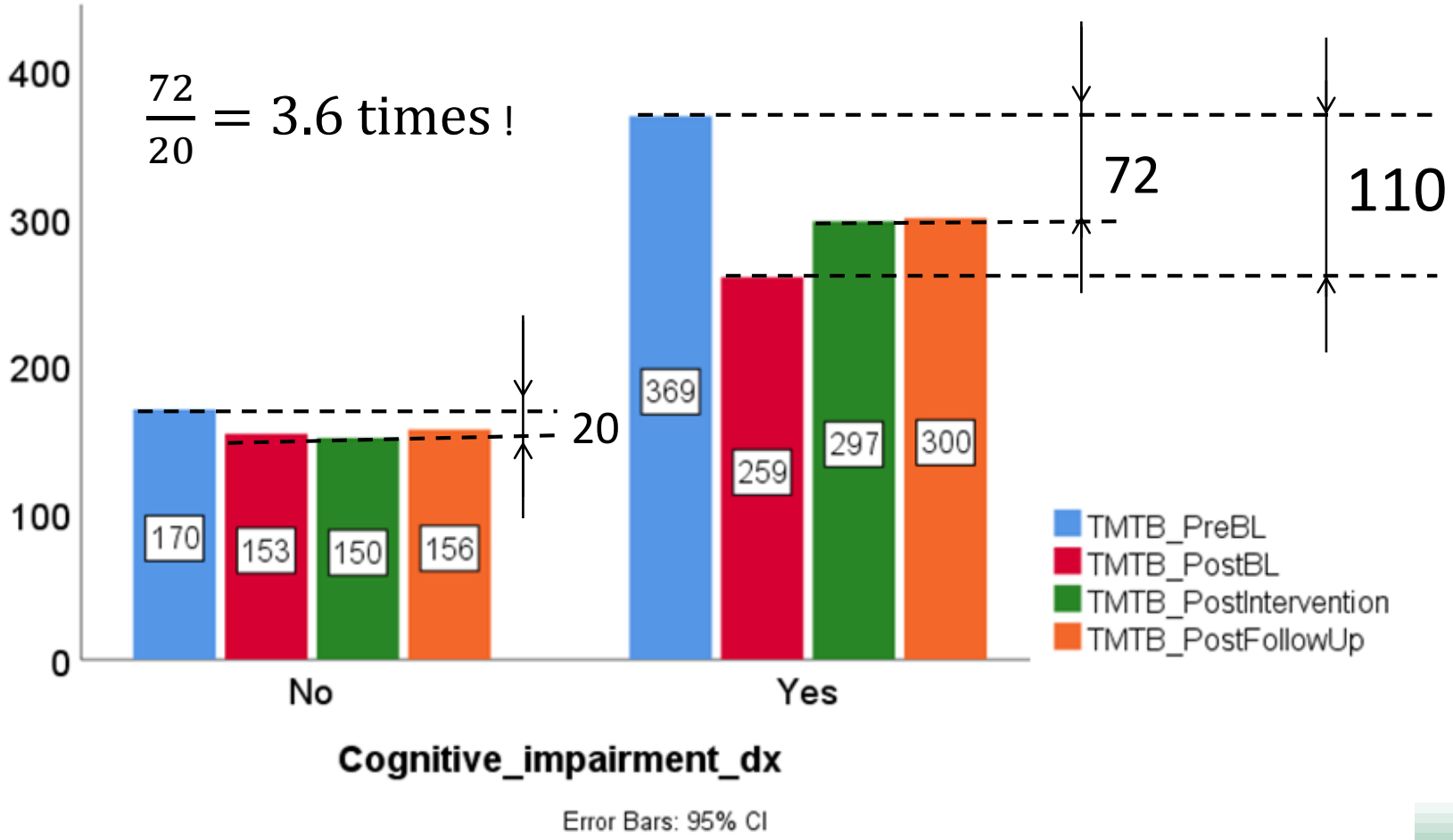
Montreal Cognitive Assessment (MoCA)

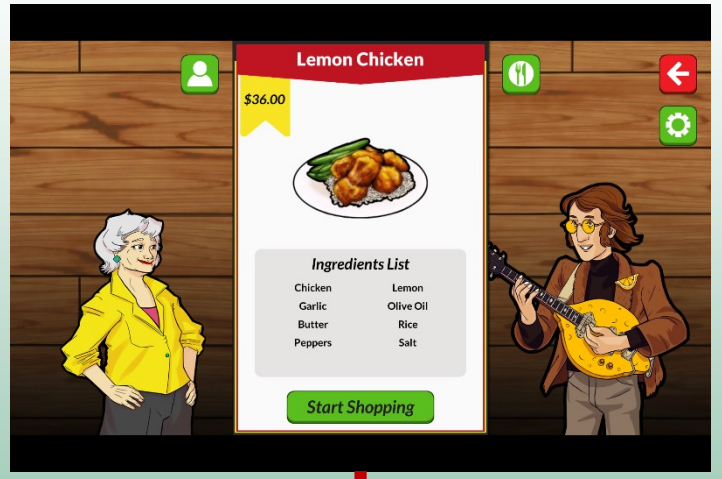


Visual search, scanning, speed of processing, mental flexibility, and executive functions



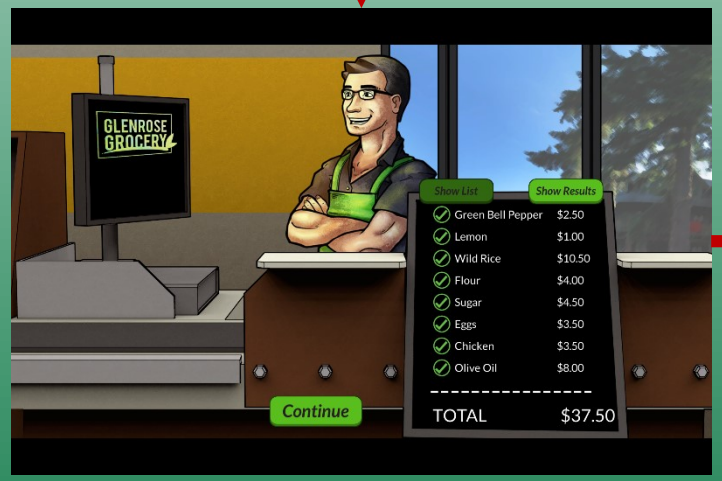
Trail Making Test - B




Lemon Chicken
$36.00
Ingredients List
Chicken
Garlic
Butter
Peppers
Lemon
Olive Oil
Rice
Salt
Start Shopping

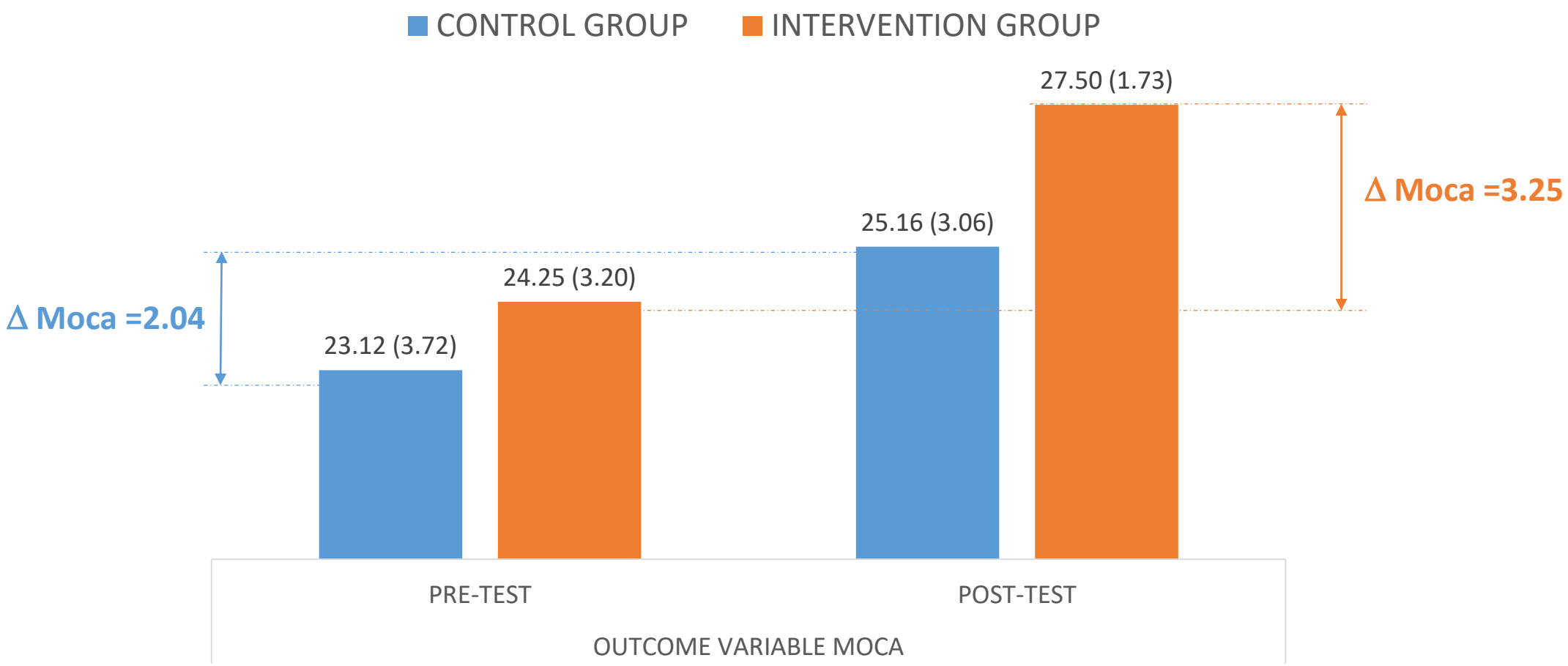

SPICES
John Lemon
I've got to get more greens in my life! Make sure the veggies are green and green only.


Quit Recipe
BAKERY
DAIRY
MEAT
SPICES
DRY GOODS
FRUITS
CANNED GOODS
VEGETABLES
CHECK OUT
Close Map
Checkout
Grocery List


GLENROSE GROCERY
Show List
Show Results
Green Bell Pepper $2.50
Lemon $1.00
Wild Rice $10.50
Flour $4.00
Sugar $4.50
Eggs $3.50
Chicken $3.50
Olive Oil $8.00
TOTAL $37.50
Continue

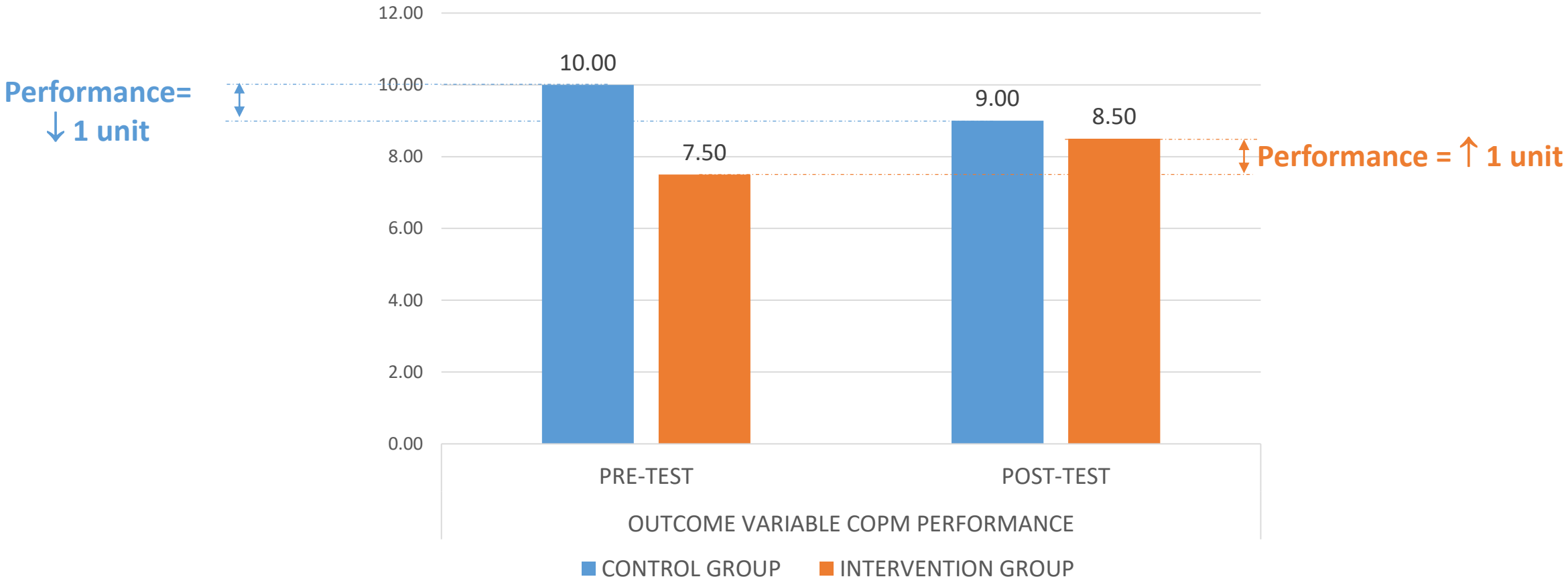

GLENROSE GROCERY
Show List
Show Results
Results
Correct 8
Repeat 0
Incorrect 0
Missing 0
Time 03:03 / 03:00
Budget $37.50 / $36.00
Accuracy 100%
Continue

MOCA increases 2.2 times more in the intervention group compared to the control group. Although, no statistical significance



MOCA = (Montreal Cognitive Assessment (Nasreddine, Phillips, & Chertkow, 2011).

COPM Performance improved in the intervention group 1 unit. Although, no statistical significance



COPM = Canadian Occupational Performance Measure (COPM) (Law, et al., 1998).

Future Directions

- Creation of more engaging CCT (videogames or VR)
- Creation of CCT related to daily functioning
- More consistent metrics for schedule of intervention
- More consistent information about the effectiveness of location of intervention

Contact information

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References

Gates, N.J., Rutjes, A.W.S., Di Nisio, M., Karim, S., Chong, L.Y., March, E., Martínez, G., Vernooij, R.W.M. (2019). Computerised cognitive training for maintaining cognitive function in cognitively healthy people in late life. *Cochrane Database of Systematic Reviews*, (3). 1-93. doi: 10.1002/14651858.CD012277.pub2.

Gates, N.J., Vernooij, R.W.M., Di Nisio, M., Karim, S., March, E., Martínez, G., Rutjes, A.W.S. (2019). Computerised cognitive training for preventing dementia in people withmild cognitive impairment. *Cochrane Database of Systematic Reviews,* (3). 1-95. doi: 10.1002/14651858.CD012279.pub2.

Hill, N. T., Mowszowski, L., Naismith, S. L., Chadwick, V. L., Valenzuela, M., & Lampit, A. (2017). Computerized Cognitive Training in Older Adults With Mild Cognitive Impairment or Dementia: A Systematic Review and Meta-Analysis. *American Journal of Psychiatry*, *174*(4), 329–340. doi: 10.1176/appi.ajp.2016.16030360

Lampit, A., Hallock, H., & Valenzuela, M. (2014). Computerized Cognitive Training in Cognitively Healthy Older Adults: A Systematic Review and Meta-Analysis of Effect Modifiers. *PLoS Medicine*, *11*(11). doi: 10.1371/journal.pmed.1001756

Nguyen, L., Murphy, K., & Andrews, G. (2019). Cognitive and neural plasticity in old age: A systematic review of evidence from executive functions cognitive training. *Ageing Research Reviews*, *53*, 100912. doi: 10.1016/j.arr.2019.100912

Nguyen, L., Murphy, K., & Andrews, G. (2019). Immediate and long-term efficacy of executive functions cognitive training in older adults: A systematic review and meta-analysis. *Psychological Bulletin*, *145*(7), 698–733. doi: 10.1037/bul0000196

Sood, P., Kletzel, S. L., Krishnan, S., Devos, H., Negm, A., Hoffecker, L., … Heyn, P. C. (2019). Nonimmersive Brain Gaming for Older Adults With Cognitive Impairment: A Scoping Review. *The Gerontologist*, *59*(6). doi: 10.1093/geront/gny164

Tetlow, A. M., & Edwards, J. D. (2017). Systematic Literature Review and Meta-Analysis of Commercially Available Computerized Cognitive Training Among Older Adults. *Journal of Cognitive Enhancement*, *1*(4), 559–575. doi: 10.1007/s41465-017-0051-2

Toril, P., Reales, J. M., & Ballesteros, S. (2014). Video game training enhances cognition of older adults: A meta-analytic study. *Psychology and Aging*, *29*(3), 706–716. doi: 10.1037/a0037507