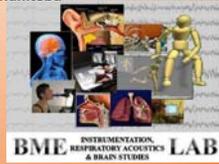


A Novel Cognitive Program for Individuals with Dementia

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How to age with a healthy brain?

❖ Use it or lose it! Exercise your Brain regularly (daily).

Fiction or Fact?!



➤ A recent study [Stojanoski B, et al, 2018] says there is no benefit of doing brain exercises in general.

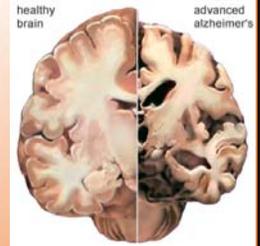
Fiction or Fact?!



Why happens in the Brain of a person with Alzheimer's?

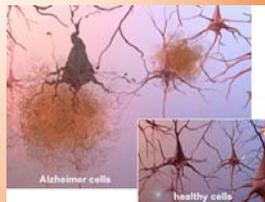
Alzheimer's brain

- ❖ The cortex shrivels up, damaging areas involved in thinking, planning and remembering.
- ❖ Shrinkage is especially severe in the hippocampus, an area that plays a key role in formation of new memories.
- ❖ Ventricles (fluid-filled spaces within the brain) grow larger.

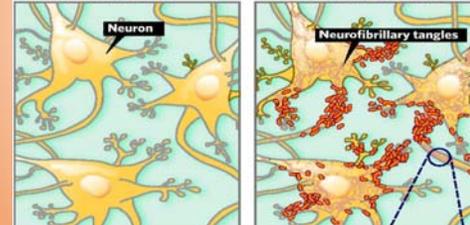


Alzheimer's brain

- many fewer nerve cells and synapses
- Plaques, abnormal clusters of protein fragments, build up between nerve cells.
- Dead and dying nerve cells contain *tangles*, which are made up of twisted strands of another protein.

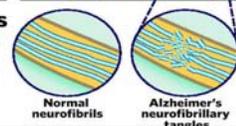


NORMAL BRAIN CELLS ALZHEIMER'S BRAIN CELLS



Alzheimer's tangles

Neurofibrillary tangles, also known as Alzheimer's tangles, form when dying neurons bunch together and infect other cells with a distorted protein called tau.



SOURCE: www.medicalise.com
RIZAN HIGGINS/STONINGTON STAR

- ❖ The Tau protein accumulation in the brain causes neurofibrillary tangles and thus, profound synapse degeneration.
- ❖ Synapses are the channels of communication between the neurons.
- ❖ The abnormalities in terms of β -amyloid plaques and neurofibrillary tangles disrupts the fronto-parietal function connectivity.
- ❖ Cholinesterase inhibitor medications try to suppress the Tau protein but not very effectively.
- ❖ Brain Exercises, on the other hand, try to use brain plasticity.

We developed a new series of Brain Exercises

- 7 different types of exercises

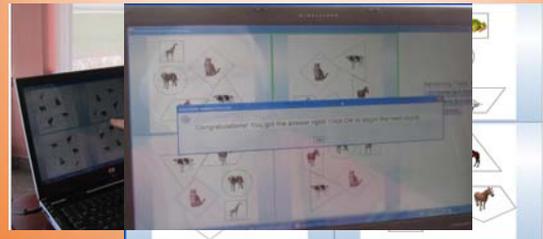


We developed a new series of Brain Exercises

- 7 different types of exercises
- Focusing on Spatial Memory, Visual Memory, Delayed Recall, Categorization and Left-Right Brain Connectivity,



Focusing on Visual Memory, Delayed Recall, Left-Right Connectivity



Focusing on connectivity between visual and verbal cognition



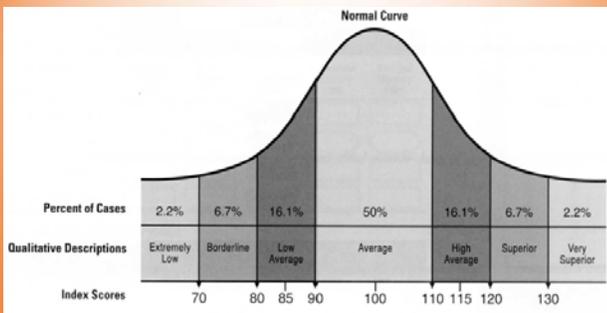
Video of our Brain Exercises

Protocol of the Study

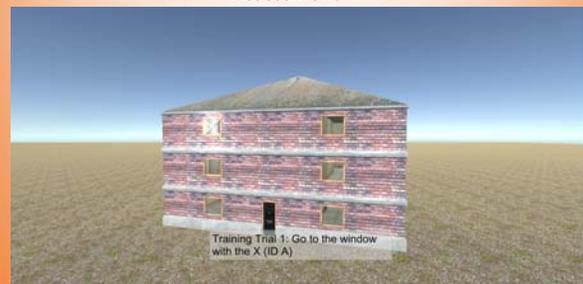
- 4 Weeks of using brain exercises everyday (5 days/week) twice/day, each 30 minutes (one hour apart).
- Two Modes of Operation:
 - At home at their own pace
 - At our center with a tutor (trainer)
- Assessments at Baseline, Post-Intervention and Follow up (a month after)
- Assessments: MoCA (only at baseline), WMS-IV, Spatial Orientation
- Participants:
 - 23 cognitively healthy individuals (69.8±5.9 years) – all used the App on their own.
 - 16 individuals with Mild Cognitive Impairment (MCI) or early stage Alzheimer's (68.9±8.2 years) – 11 of them used the App with a tutor at our center (4 with tACS).

Primary Outcome Measure: Wechsler Memory Scale (WMS-IV)

- ❖ Individually administered battery of learning, memory, and working memory measures.
- ❖ Composed of 11 subtests in 4 major categories:
 - Auditory Memory
 - Visual Memory
 - Immediate Memory
 - Delayed Memory
- ❖ Aside from raw scores it also provides qualitative grouping, i.e. low, average, high, etc. based on a large cohort study of seniors.



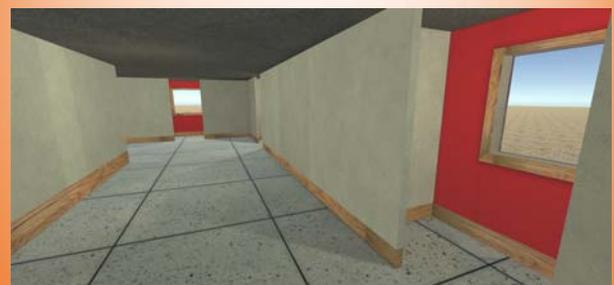
Secondary Outcome Measure: Virtual Reality Navigational (VRN) Assessment



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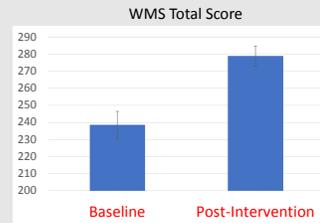
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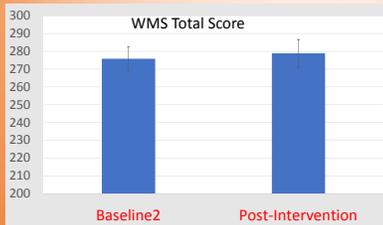


Results – Healthy Group, exercising at home at their own pace – Memory Test with WMS



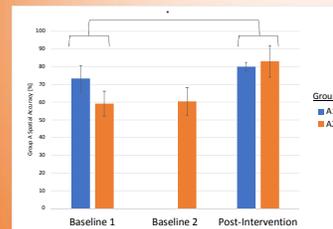
Significant improvement but is there any practice effect of WMS after 4 weeks?

Results – Healthy Group, exercising at home at their own pace – Memory Test with WMS



No significant improvement when considering practice effect of WMS!

Results – Healthy Group, exercising at home at their own pace – Spatial Test with VRN building

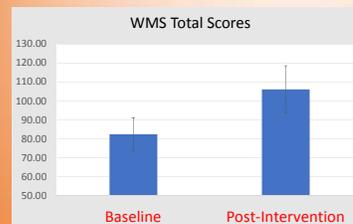


- No practice effect
- Noticeable improvement post-intervention

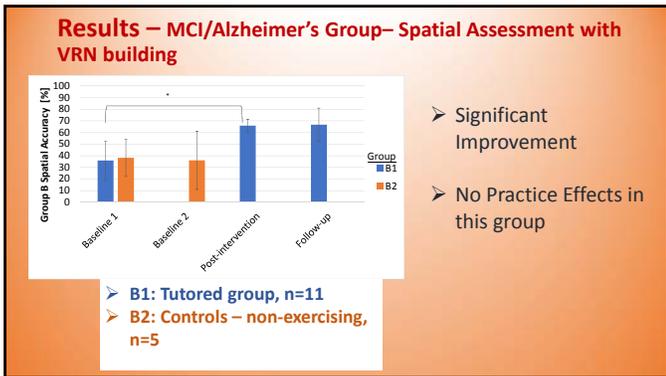
Summary of the Results - Healthy Group Exercising at Home

- ❖ showed memory improvement after the intervention but most likely due to practice effect of WMS than the brain exercises.
- ❖ However, some of them who were very keen in doing the exercises improved much beyond the practice effect.
- ❖ Many healthy individuals had a ceiling effect at baseline 2 → WMS could not measure the plausible improvement.
- ❖ However, they did improve in spatial orientation beyond the practice effect of the assessment.

Results – MCI/Alzheimer’s Group, exercising at our center with a tutor – Memory Assessment (WMS)



- Significant Improvement
- No Practice Effects in this group



Summary of Results – MCI/Alzheimer's Group

- ❖ 9 out of 11 individuals with MCI/Alzheimer's, who received tutored daily sessions of brain exercises, improved significantly; the other two remained almost the same.
- ❖ The MCI/Alzheimer's individuals practicing at home (not regularly) did not show much improvement (remained almost the same → no practice effect of the assessments either).

Brain Cognitive Training + Transcranial Alternative Current Stimulation (tACS)

- **Protocol:** The same Brain Exercises protocol but simultaneously with tACS at 40 Hz was applied to 4 mild Alzheimer's patients.
- **Results:** These 4 people improved similarly to those without tACS after the end of trial but kept improving even a month after the end of Trial.

Main Conclusion

- ❖ **The Key for Brain Exercises to be effective and helpful in cognitive function can be its delivery.**
- ❖ **FACT: Use it or lose it! Exercise your Brain regularly (daily).**
 - The key point is to keep a **dynamic and challenging** choice of exercises and challenge yourself for higher scores.



Thank you for your attention!

Questions?