Cognitive Training Research in Older Adults

Ground Issues and Considerations

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Successful Ageing  What does it mean to you?

https://goo.gl/LYsi8c
Successful Ageing  What does it mean to you?

Avoiding disease & disability

Engagement with life

Maintain cognitive & physical function

Rowe & Kahn (1997)
Overview

- MindWorks games
  - Brain training Android application
  - Development journey

- Active Brain Learning (ABLE)
  - Pen-paper cognitive training programme
  - Development, implementation & evaluation
Living healthier longer

Compression of morbidity

Fries (1980, 2005)
Established principles as a starting point
Approach  

**Brain training tools**

“MindWorks”  
Computer-based

“Active Brain Learning (ABLE)”  
Pen-Paper based  
(Adapted from Learning Therapy)
MindWorks Games  Main menu

GAME SELECTION

GENERAL
Here are some general instructions that apply to all games

1. THERE IS A TIME LIMIT OF 2 MINTUES FOR EVERY GAME
2. ONLY AFTER 2 MINUTES WILL YOUR SCORE BE SAVED
3. SCORE REFERS TO THE TOTAL NUMBER OF CORRECT ANSWERS
4. STREAK REFERS TO THE NUMBER OF TIMES YOU HAVE ANSWERED CORRECTLY CONSECUTIVELY
5. YOUR HIGHEST STREAK IN THE CURRENT GAME SESSION WILL BE SHOWN IN BRACKETS

PLAY

BACK  ABOUT  CREDITS
MindWorks Games  Key features

50-70 years old

Brain activation
MindWorks Games  PFC activation
MindWorks Games  Key features

- 50-70 years old
- Brain activation
- Iterative user testing
MindWorks Games  

Iteration – user test 1
MindWorks Games  Iteration – user test 2

“This game not for old people, it makes you think!”
MindWorks Games  Iteration – user test 3

“Yes, I would play it again”
MindWorks Games  Key features

- 50-70 years old
- Brain activation
- Iterative user testing
- Adaptability
- Performance feedback
MindWorks Games  Normative dataset collection
MindWorks Games

Intervention study design

50-70 years old

Healthy participants

MindWorks n=30

Tetris n=30

Pre-test

Pre-test

4-week training

4-week training

Post-test

Post-test

Own Android device

Training protocol
15 mins/day, 5 days, 4 weeks

Outcome measures
General cognition
Specific cognitive domains
- working memory,
- mental speed
- mental flexibility,
- inhibitory control,
- attention
Mental wellbeing
- QOL
- Depression scale
Active Brain Learning (ABLE)  *Singapore context*

- Pen-paper intervention adapted from Learning Therapy
- Reading aloud* & simple arithmetic calculation
- Simple mental task to be done quickly
- Prefrontal activation
- 5 days a week, 20 minutes per day, 6 months

* Illiterate participants would focus on arithmetic only.
Learning Therapy

Reading Aloud and Arithmetic Calculation Improve Frontal Function of People With Dementia

Ryuta Kawashima, Katsu Okita, Ritsumi Yamazaki, Nobumoto Tajima, Hajime Yoshida, Masato Taira, Kazuki Iwata, Takao Sasaki, Katsujirou Maeyama, Nobuo Usui, and Koji Sagimoto

Reading and solving arithmetic problems improves cognitive functions of normal aged people: a randomized controlled study

Shinya Uchida · Ryuta Kawashima

Working Memory Training Using Mental Calculation Impacts Regional Gray Matter of the Frontal and Parietal Regions

Hikaru Takeuchi, Yasuyuki Taki, Yuko Sassa, Hiroshi Hashizume, Atsushi Sekiguchi, Ai Fukushima, Ryuta Kawashima

Reading Aloud and Solving Simple Arithmetic Calculation Intervention (Learning Therapy) Improves Inhibition, Verbal Episodic Memory, Focus Attention and Processing Speed in Healthy Elderly People: Evidence from a Randomized Controlled Trial

Rui Nouchi, Yasuyuki Taki, Hikaru Takeuchi, Hiroshi Hashizume, Takayuki Nozawa, Atsushi Sekiguchi, Haruka Nouchi, and Ryuta Kawashima

journal of gerontology: MENTAL SCIENCES
2013, Vol. 68A, No. 7, M86-96
Active Brain Learning (ABLE)  Progress till date

- Mild-moderate dementia
- Home-based intervention
- Mild-moderate dementia
- St Luke’s ElderCare (multiple centres)
- Mild cognitive impairment
- St Luke’s ElderCare (Yishun)

2018
2017
2015

Pilot completed
In progress
In the pipeline
Active Brain Learning (ABLE)  
*Mild-Moderate dementia*

Currently in progress

**Randomisation**

**Experimental**
- Assessment 1 Pre-Test
- Training Period 12 weeks
- Assessment 2 Mid Test
- Training Period 12 weeks
- Assessment 3 Post-Test

**Control**
- Assessment 1 Pre-Test
- No Training 12 weeks
- Assessment 2 Mid Test
- No Training 12 weeks
- Assessment 3 Post-Test

**St Luke’s ElderCare (Multi-centres)**

**Delayed Intervention**
- Training protocol
  - 15 mins/day, 5 days, 6 months

**Outcome measures**
- Global cognition
- Specific cognitive domains
  - mental speed
  - Executive functions
- Mental wellbeing
  - QOL
  - Depression scale
Active Brain Learning (ABLE)  Learning points

• Profile of cohort (educational & cultural)
# Changing profiles

*Education (as of 2016)*

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<thead>
<tr>
<th>Age group</th>
<th>Primary/Nil (%)</th>
<th>Tertiary (%)</th>
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<tr>
<td>65 &amp; above</td>
<td>70.2</td>
<td>10.3</td>
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<tr>
<td>50-54</td>
<td>32.3</td>
<td>33.6</td>
</tr>
<tr>
<td>25-29</td>
<td>3.4</td>
<td>70.4</td>
</tr>
</tbody>
</table>

Department of Statistics Singapore (2016)
Active Brain Learning (ABLE)  

Learning points

- Profile of cohort (educational & cultural)
- Localised training materials
Training materials  Importance of context

4 + 2 =

$4 + $2 =

$4  $2

$4  $2
Active Brain Learning (ABLE)  

*Learning points*

- Profile of cohort (educational & cultural)
- Localised training materials
- Attrition rate (cognitive impaired participants)
- Selection of test instruments (floor effects)
- Pilot study recommended
Researchers and Care staff  Considerations

- Research rigour and practicalities on the ground
- Training of care staff (test administration, intervention protocol)
Researchers and Care staff  Considerations

- Research rigour and practicalities on the ground
- Training of care staff (test administration, intervention protocol)
- Collaborate
- Coordinate
- Communicate
Active Brain Learning (ABLE)  

Next steps

- Home-based intervention for PWD
- Care-giver support & training
- Assessment concerns
- Modification of training material
- Exciting times ahead
Ongoing R&D  Localising content (current seniors)
Ongoing R&D  Localising content (future seniors)
What does this mean to you?

Be active

Eat well

Beauty sleep

CC Image Peter Jaena on Flickr
Thank You

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