Online Cognitive Stimulation Intervention (CSI) For Healthy Older Adults

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Cognitive Training (CT)

- A method for improving a broad range of psychological issues;
- Has been successfully utilized in the aging literature;
- Problem:

lab-based
unclear transfer gains
Research Questions

- Does the online cognitive stimulation intervention modify age-related cognitive declines in healthy older adults compared to the control groups?
- Does CSI effects retain over time?
Hypotheses

- The CSI group will have a reduced cognitive decline (inhibition and WM) compared to control groups;
- The CSI group gains will transfer to untrained cognitive domains;
- The training gains will remain 1 month after the training is over.

Participants

**Inclusion criteria**

- 180 healthy older adults
- Cohen’s d = .2, Power = .80, Alpha = .05
- 57 older adults recruited
- Age: above 60
- Adequate level of literacy
- Having smartphone and accessing the Internet
- A score of 21 or above in the MoCA
- English

**Exclusion criteria**

- Severe health-related conditions;
- Psychiatric or neurological disorders;
- Neurodegenerative disorder;
- Uncorrected verbal, auditory or visual impairments
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Groups

Random assignment

CSI

Active control group (ACG)

Passive control group (PCG)

Stages of The Study

Baseline

Pre-training (introductory sessions)

Training

Follow-up

Post-training
Online CSI

- Adaptive in nature;
- Targeting inhibition and WM-updating (independent variables);
- Three different levels of complexity as easy, medium, and difficult;
- 3 shopping applications.

CSI Procedure

1. Receive the task
2. Watch
3. Take screenshot
4. Send to examiner
Inhibition

- Based on go/no-go principles;
- Number of congruent trials are always more than incongruent trials.

General rule

- Given at the beginning of the session
- Congruent trials

Specific rule

- Given for a few tasks
  - Incongruent trials

Examples of Easy and Difficult Inhibition Tasks

**Easy/ Happy Fresh App**

- **General rule:** ONLY obtain information about the items WITH a promotion unless otherwise mentioned.
  - Take a screenshot of any brand of fruit yogurt (congruent).
  - Take a screenshot of any brand of milk (only consider items without a promotion) (incongruent).

**Difficult/ Happy Fresh App**

- **General Rule:** ONLY obtain information about the items WITH odd last decimal in their price unless otherwise mentioned.
  - Take screenshots of any brand of LOW-FAT fruit yogurt and any brand of FULL CREAM milk (congruent).
  - Take screenshots of TWO products WITH a PROMO and without an odd last decimal in their prices (incongruent).
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Working Memory-updating

- Based on the n-back principle

<table>
<thead>
<tr>
<th>Level</th>
<th>Number of incongruent trials/overall tasks ratio</th>
<th>Percentages of incongruent trials</th>
</tr>
</thead>
<tbody>
<tr>
<td>A (Easy)</td>
<td>0.16</td>
<td>20%</td>
</tr>
<tr>
<td>B (Medium)</td>
<td>0.16 (rounded)</td>
<td>21% (rounded)</td>
</tr>
<tr>
<td>C (Difficult)</td>
<td>0.16</td>
<td>25%</td>
</tr>
</tbody>
</table>

This ratio has been proposed according to Carter et al. (2000)
Examples of WM-updating Tasks

- Take screenshots of any canned product and tell Samira the price of it (0-back).
- Take a screenshot of any dairy product you prefer (2-back).
- Add any two brands of low-fat milk to your cart and take a screenshot of your cart (2-back).
- Take a screenshot of any product with the “farm fresh” brand (1-back).
  - Tell Samira how much was the price of the latest product you took screenshot from.
  - Tell Samira the brand names of the milk you took screenshot from previously.
  - Tell Samira the brand name of the dairy product you took screenshot from before.

Scoring Manual

<table>
<thead>
<tr>
<th>Inhibition levels</th>
<th>Score range</th>
<th>Cut off point</th>
<th>WM updating levels</th>
<th>Score range</th>
<th>Cut off point</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level A (easy)</td>
<td>0-10</td>
<td>5/10</td>
<td>Level A (easy)</td>
<td>0-10</td>
<td>5/10</td>
</tr>
<tr>
<td>Level B (medium)</td>
<td>0-23</td>
<td>12/24</td>
<td>Level B (medium)</td>
<td>0-24</td>
<td>12/24</td>
</tr>
<tr>
<td>Level C (difficult)</td>
<td>0-25</td>
<td>13/25</td>
<td>Level C (difficult)</td>
<td>0-27</td>
<td>15/27</td>
</tr>
</tbody>
</table>

Equal/ higher= proceed
Lower= regress
### Preliminary Analysis and Results

#### Sample Characteristics

<table>
<thead>
<tr>
<th></th>
<th>Percentage</th>
<th>N</th>
<th>Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>78.57%</td>
<td>44</td>
<td>-</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td>56</td>
<td>67.30 (5.55)</td>
</tr>
<tr>
<td>(range: 60-89)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SES-Malaysia</td>
<td>37.50% (6th rung)</td>
<td>55</td>
<td>6.27 (.97)</td>
</tr>
<tr>
<td>(subjective scale)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SES-Community</td>
<td>28.57% (5th rung)</td>
<td>55</td>
<td>6.18 (1.27)</td>
</tr>
<tr>
<td>(subjective scale)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Preliminary Analysis

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>Mean (SD) Pre-test</th>
<th>Mean (SD) Post-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Working Memory (Max score: 30)</td>
<td>40</td>
<td>16.95 (3.64)</td>
<td>19.10 (4.86)</td>
</tr>
<tr>
<td>Inhibition (Max score: 72)</td>
<td>40</td>
<td>66.45 (5.36)</td>
<td>67.32 (4.95)</td>
</tr>
<tr>
<td>Episodic Memory (Max score: 16)</td>
<td>40</td>
<td>11 (4.59)</td>
<td>13.90 (5.03)</td>
</tr>
<tr>
<td>Processing Speed (Max score:60)</td>
<td>40</td>
<td>48.77 (10.09)</td>
<td>49.23 (8.87)</td>
</tr>
</tbody>
</table>

Working Memory

Working memory \( (F = 7.80, p = .008, \eta^2 = .17) \)
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Backward Digits

Backward digits (subtest of WM) ($F=11.73$, $p=.002$, $\eta^2=.24$),

Episodic Memory

Episodic memory ($F=20.19$, $p=.000$, $\eta^2=.35$)

A marginal significant between-groups result ($F=3.17$, $p=.053$, $\eta^2=.14$)
Implication

• A novel CT protocol combining technology and daily life tasks;
• To understand how older adults respond to tech-based technique;
• Easy to administer.

Thank You For Your Attention