NEUROCOGNITIVE DISORDERS: COGNITIVE ASSESSMENT IN THE ELDERLY AND A SYSTEMATIC REVIEW OF MOBILE CONCUSSION TECHNOLOGY

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BIOMEDICAL AND HEALTH INFORMATICS
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Agenda

- Internship overview
- Cognitive assessment in the elderly
- Systematic review of mobile concussion technology
Internship Overview

- Work with Lisa Vizer, PhD at the University of North Carolina at Chapel Hill
- Focus on Alzheimer’s disease and concussion
- Critically important due to prevalence and staggering financial burden
  - Concussion-related indirect costs $60 billion in 2000
  - Alzheimer’s disease (AD) and mild cognitive impairment due to Alzheimer’s disease (MCI-AD), accounted for $159 billion to $215 billion in 2010
Cognitive Assessment in the Elderly

Project Goals:

- Refine the CNS Screen
- Measure the usability of prototype
- Evaluate usability of the updated test
Cognitive Assessment in the Elderly

- Verbal Memory
- Visual Memory
- Stroop
- Symbol-Digit
- Shifting Attention
- Reasoning

Remember this word: teacher
Cognitive Assessment in the Elderly

- Verbal Memory
- Visual Memory
- Stroop
- Symbol-Digit
- Shifting Attention
- Reasoning

Remember this image
Cognitive Assessment in the Elderly

- Verbal Memory
- Visual Memory
- Stroop
- Symbol-Digit
- Shifting Attention
- Reasoning
Cognitive Assessment in the Elderly

- Verbal Memory
- Visual Memory
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**ANSWER GRID**

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**TEST GRID**

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Type in the numbers from the ANSWER GRID into the blank spaces in the TEST GRID.
Cognitive Assessment in the Elderly

- Verbal Memory
- Visual Memory
- Stroop
- Symbol-Digit
- Shifting Attention
- Reasoning

![Diagram showing cognitive assessment tasks]

- Left Arrow Key
- Match SHAPE
- Right Arrow Key
  - Press the Right Arrow Key
Cognitive Assessment in the Elderly

- Verbal Memory
- Visual Memory
- Stroop
- Symbol-Digit
- Shifting Attention
- Reasoning

Type in the number of the figure that best completes the pattern above.
Cognitive Assessment in the Elderly

Balsamiq wireframes
Visual Memory Test

In a moment you will be taking the Visual Memory Test.

The objective of this test is to remember images.

You will be shown a series of images one at a time. Try to remember them because later you will be asked to pick the image you saw.

You will now be shown 15 images to remember.

There will be a three second countdown.

Each image will be displayed for two seconds.

Press the Enter Key to continue
Cognitive Assessment in the Elderly

Reasoning Test
At the top of the screen will be the TEST GRID. One of the objects in the TEST GRID will be missing.
At the bottom of the screen will be the ANSWER GRID. Each object in the ANSWER GRID is numbered 1-5.
Using the keys numbered 1-5 on your keyboard select the object in the answer grid which identifies the missing object in the TEST GRID.
You will now practice the Reasoning Test.

Press the Enter Key to continue

- Black background, white text
- No timing on instructions
- Changed test screen timings
- Changed timing for countdowns
- Modifications to testing – count of words, images per round
Cognitive Assessment in the Elderly

Type in the number of the figure that best completes the pattern above.
Systematic Review of Mobile Concussion Technology

Project Goal:

➢ Perform a systematic review of mobile assessment and educational technology available related to concussions
Systematic Review of Mobile Concussion Technology

Articles related to concussion education and/or assessment mobile technology

Database search:

• ACM
• Cochrane
• Embase
• IEEE
• PubMed
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<tr>
<th>Author</th>
<th>Year</th>
<th>Title</th>
<th>Journal</th>
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<td>Activities and interim outcomes of a multi-site development project</td>
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<td>Dyson, E. W.</td>
<td>2014</td>
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<td>2003</td>
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<td>Williams, M.</td>
<td>2017</td>
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<td>Weaver, D.</td>
<td>2014</td>
<td>Development of a medical device for...</td>
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<td>Curaudens, D.</td>
<td>2011</td>
<td>Development of an iPhone applic...</td>
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<td>Madeen, C.</td>
<td>2015</td>
<td>Digitization of the trail-making test:</td>
<td>Clinical Jou...</td>
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<td>Bianchi, A.</td>
<td>2015</td>
<td>Dynamic lowlevel context for the de...</td>
<td>IEEE Transa...</td>
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<td>Journal Article</td>
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<td>Bergquist, T.</td>
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<td>Des Roches, E.</td>
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<td>Dowds, M.</td>
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<td>Electronic reminding technology follow...</td>
<td>J Head Trau...</td>
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<td>Smith, B. Ha</td>
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<td>Enhancing behavioral health treatment</td>
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<td>Figler, R. A.</td>
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<td>Groussard, P.</td>
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<td>Stirling, C. D.</td>
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Review Summary

Import references

Title and abstract screening

35 irrelevant
0 studies to screen

Full text screening

TEAM PROGRESS

0 DONE
0 ONE VOTE
0 CONFLICTS
57 NO VOTES

HOLLI, YOU CAN STILL

SCREEN

57

Continue

You've screened 0 studies so far

Extraction

0 extracted
0 studies to extract
PRISMA Flow Diagram

Preferred Reporting Items for Systematic Reviews and Meta-Analyses
Conclusion

- Deeper understanding of prevalence/importance of neurocognitive disorders
- Real-world experience in iterative usability design
- Exposure to research techniques and applications in systematic review
- Completing systematic review outside of internship