

# Monitoring Moderate Dementia with a Computer Game: The Western Ottawa Whack-a-Mole Pilot Study

Frank Knoefel<sup>1,2,4,5</sup> Brianna Allard<sup>1</sup> Victor Guana<sup>3</sup> Bruce Wallace<sup>2</sup> Eleni Stroulia<sup>3</sup> Caroline Gaudet<sup>1</sup> Rafik Goubran<sup>1,2</sup>

<sup>1</sup>Bruyère Research Institute <sup>2</sup>Carleton University <sup>3</sup>University of Alberta <sup>4</sup>Bruyère Continuing Care <sup>5</sup>University of Ottawa

## BACKGROUND

- Computer games are gaining popularity as a tool for health assessment.
- They are a pleasant alternative to paper tests known to cause patient stress.<sup>1</sup>
- Computer games provide daily/weekly monitoring versus bi-annual/annual clinical assessments, offering more insight and information into health status.<sup>2</sup>
- To date, few games have been developed for people with moderate dementia.

## OBJECTIVES

- Enhance a whack-a-mole game to monitor people with moderate dementia.
- Collect data and monitor how scores change.
- Determine correlation between baseline cognitive testing and baseline game play.

## METHODS

### WHO

- 12-16 participants from an adult dementia day program in Kanata.
- Exclusions included: vision problems, hearing problems, attention deficits, and arthritis.

### WHAT

- A whack-a-mole game designed to measure processing speed and inhibition.
- Pre-Game testing: MMSE, Trails A and Ramparts.
- 9-month period; 15 minutes of game play per week for the study's duration.

### WHEN

- Recruitment began in June 2016; game play started in July 2016.

### HOW

- University of Alberta designed original game; Ottawa team adapted it.
- Carleton developed algorithms to analyze the game data.
- Overall game play results will be compared to the cognitive scores.

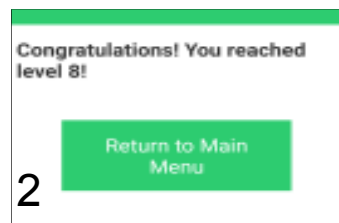
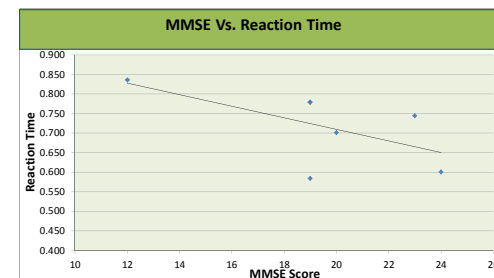


Figure 1. Shows how the screen looks during game play. (However two animals never appear on the screen at the same time).  
Figure 2. Shows what the screen looks like after the participant completes the game session

## RESULTS

- Preliminary results are based on participants' baseline data from the first session.

Descriptive Statistics n=7	
	Mean (low-high)
Age	77.6 (69-95)
Education	12.0 (7-15)
Yrs. Since DX	4.29 (0-10)
MMSE Score	19.4 (12-24)



	Group Statistics	
	Low MMSE Score (0-19) Mean (Std. Deviation)	High MMSE Score (20-30) Mean (Std. Deviation)
# of People in Group	4	3
Max Level Reached	4.25 (3.40)	5.33 (1.16)
Avg. Reaction Time (S)	0.74 (0.11)	0.66 (0.07)
Avg. # of Moles Hit (%)	55.8% (16.4)	65.7% (7.89)
Avg. # of Bunnies Missed (%)	98.1% (3.89)	99.0% (1.70)

- Group with high MMSE scores reached a higher level, hit more moles and had a faster reaction time than those with a low MMSE score.
- There is a trend showing the higher the MMSE score, the faster the reaction time.

## DISCUSSION

- Early findings suggest there may be a relationship between MMSE scores and game play ability in people with moderate dementia.
- We were able to teach 7 participants to play the game in their first session.
- **Next Steps:** Analysis with Trails A and Ramparts tests, long term game play results.

### ACKNOWLEDGEMENTS

This project is generously funded by AGE-WELL NCE Inc. Thank you to Jodie Taylor for her management support for the project. Thank you also to the staff members at the WOCRC Adult Day Program, the participants and their families.

### REFERENCES

1. Tong, T., Guana, V., Jovanovic, A., Tran, F., Mozafari, G., Chignell, M., & Stroulia, E. (2015). Rapid Deployment and Evaluation of Mobile Serious Games: A Cognitive Assessment Case Study. *Procedia Computer Science*, 69, 96-1
2. Parati, G., Stergiou, G. S., Asmar, R., Bilo, G., de Leeuw, P., Imai, Y. & O'Brien, E. (2008). European Society of Hypertension guidelines for blood pressure monitoring at home: a summary report of the Second International Consensus Conference on Home Blood Pressure Monitoring. *Journal of hypertension*, 26(8), 1505-1526.