

# The Investigation of a Novel Video Game for Identifying Mild Cognitive Impairment in Individuals with Parkinsonism

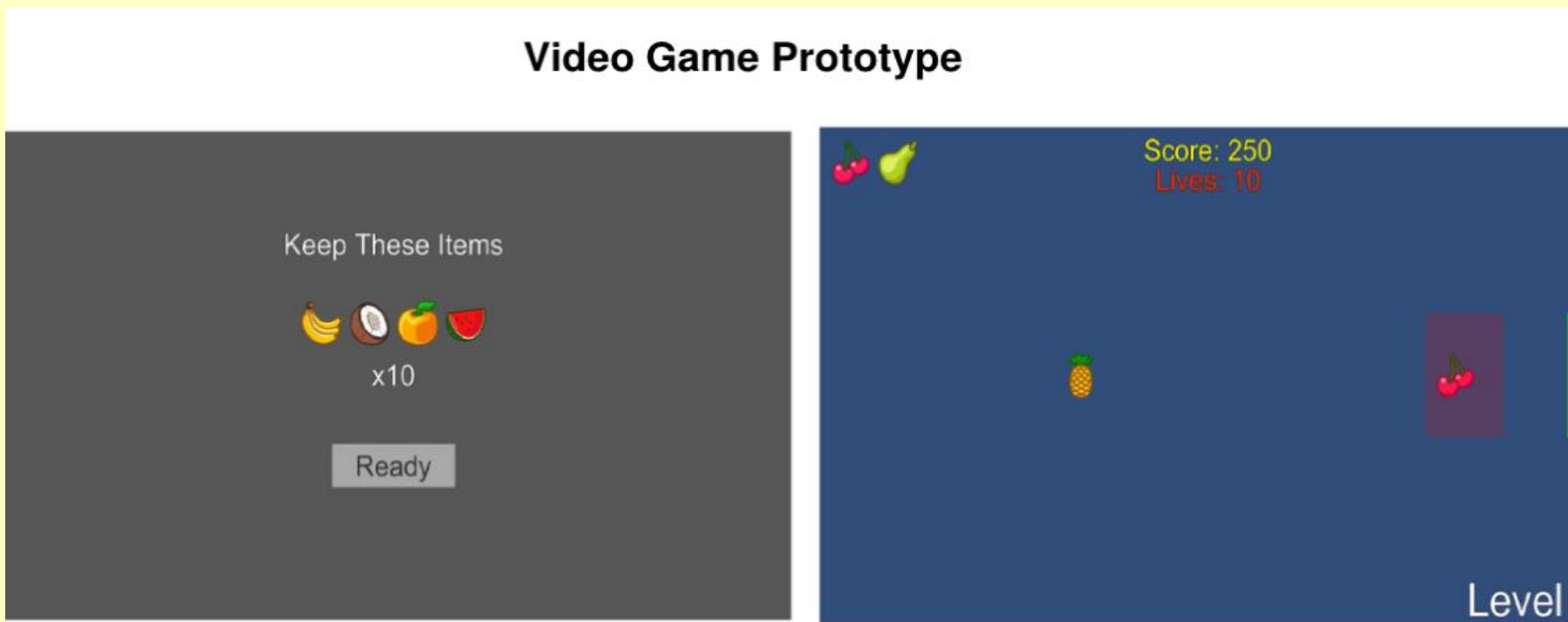
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## INTRODUCTION

- **OBJECTIVE:** This study aims to investigate the effects of videogaming and its ability in evaluating cognitive impairment in Parkinson’s Disease (PD)
- For people with Parkinson's disease (PD) and moderate cognitive impairment (MCI), illnesses that have a substantial impact on everyday functioning and quality of life, cognitive decline is a serious worry.
- Although they have demonstrated differing degrees of success, traditional cognitive rehabilitation techniques including medication and cognitive training exercises are frequently constrained by their long-term efficacy, accessibility, and engagement. Video games may offer a different, entertaining, and participatory way to improve cognitive performance in these people, according to recent research.
- This study's main goal is to ascertain whether video games may be a secure and useful cognitive training aid for people with PD and MCI. The specific goal of this study is to investigate how video game interventions affect important cognitive processes as processing speed, memory, attention, and executive function.
- This study is guided by the following research questions: (1) Do people with MCI and PD experience quantifiable cognitive benefits as a result of playing video games? (2) How does cognitive training through video games stack up against conventional rehabilitation techniques? (3) Which kinds of video games are best for improving these populations' cognitive abilities? The study assumes that, in contrast to traditional cognitive training activities, video game interventions will result in notable enhancements in cognitive function, based on the body of existing evidence.
- Cognitive training has been shown in previous studies to help people with PD and MCI reduce the rate of cognitive loss. Furthermore, research has shown that, in contrast to conventional cognitive workouts, interactive and interesting activities—like gaming—may increase motivation and adherence. Though gamified cognitive training is gaining popularity, there are still unanswered questions about the best kinds of video games, how long training should last, and the long-term impacts of video game interventions.
- By offering empirical proof of the efficacy of video game-based cognitive training, this study aims to close these gaps and further our understanding of non-pharmacological treatments for cognitive decline.

## METHODOLOGY

- A computerized videogame on a tablet was used to assess the participants cognitive ability
- The video game contains parameters that are capable of scoring an individual’s cognitive ability within the 5 cognitive domains.
- The prototype build of the videogame consisted of a series of objects moving across the screen from left to right. Participants will be presented with a list of desired objects and tasked with cancelling out non-relevant objects. Letting desired objects reach the end of the screen and correctly eliminating undesired objects gains you points. Failing to do so deducts points or the individual “loses lives,” the game ends when “0” lives is reached
- The participants ability to correctly identify and keep/eliminate objects will test their attention and executive function
- The participants ability to correctly tap the screen will test their visuospatial function.
- . A participant’s satisfactory score with the game will be assessed post-study to determine if this application is more practical for identifying and monitoring an individual’s MCI.
- Participants in the study will be tested in 1 day for a total time of 2.5 hours. Participants will be cognitively tested using two sessions (20-minutes each).
- The session a participant completes first will be randomly assigned to limit confounding variables. A 30-minute break will also be provided between the first and second testing sessions to control for any potential fatigue.
- Along with this exam, 3 other evaluations will be administered to evaluate the individual’s quality-of-life: 39-Item Parkinson's Disease Questionnaire (PDQ39), Patient Health Questionnaire-9 (PHQ9) to screen for depression, and the Generalized Anxiety Disorder 7 (GAD7) to screen for anxiety.
- Prior to the start of the two sessions, for a participant in the healthy-control group (non-PD), only the latter two quality-of-life evaluations will be administered (PHQ9 and GAD7). After the questionnaires, Optical Coherence Tomography (OCT) will be performed to examine retinal structure, and contrast sensitivity and visual acuity will be evaluated using the Snellen Visual Acuity and Freiburg Contrast Test



## ABSTRACT

With their captivating and interactive experiences, video games have become a promising tool for cognitive rehabilitation, potentially improving cognitive function in people with Parkinson's disease (PD) and moderate cognitive impairment (MCI). This study examines how well video games work as a non-pharmacological intervention to enhance cognitive functions in people with MCI and PD, such as memory, attention, executive function, and processing speed. To evaluate the cognitive advantages of several gaming genres, including puzzle, action, and strategy-based games, a controlled experimental investigation and a thorough assessment of the body of current literature were carried out. Over the course of 12 weeks, participants participated in scheduled gaming sessions, and cognitive tests were given prior to, during, and following the intervention. According to preliminary findings, when compared to conventional cognitive training techniques, video game-based training produces quantifiable gains in cognitive function, especially in attention and executive function. Additionally, participants reported excellent levels of adherence and engagement, indicating that video games offer a fun and approachable method of cognitive rehabilitation. These results demonstrate the promise of video games as a fun, safe, and affordable tool for improving cognitive function in people with PD and MCI, which calls for more investigation into long-term impacts and the best possible game design for therapeutic use.

## DATA

Participant ID #: 1234567890											
Play Run #1	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Level 9	Level 10	Level 11
Score	500	500	500	400	500	400	400	25	1225(TOTAL)		
Chances Lost	0	0	0	4	0	2	3	LOST			
Time Spent (per level)	1:27	1:15	50	50	45	35	24	6			
Interval of Object (s)	4.0	3.5	3.0	2.5	2.0	1.5	1.0	0.8	0.6	0.4	
Speed of Object (m/s)	3.0	3.5	4.0	4.5	5.0	5.5	6.0	7.0	8.0	8.5	
END											
Play Run #2	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Level 9	Level 10	Level 11
Score	500	475	500	375	475	350	100	2725(TOTAL)			
Chances Lost	0	1	0	3	1	4	TOTAL				
Time Spent (per level)	1:04	55	45	35	25	19	9				
Interval of Object (s)	3.0	2.5	2.0	1.5	1.0	0.8	0.6				
Speed of Object (m/s)	4.0	4.5	5.0	5.5	6.0	7.0	8.0				

Figure 1: Data result of one test run of the videogame

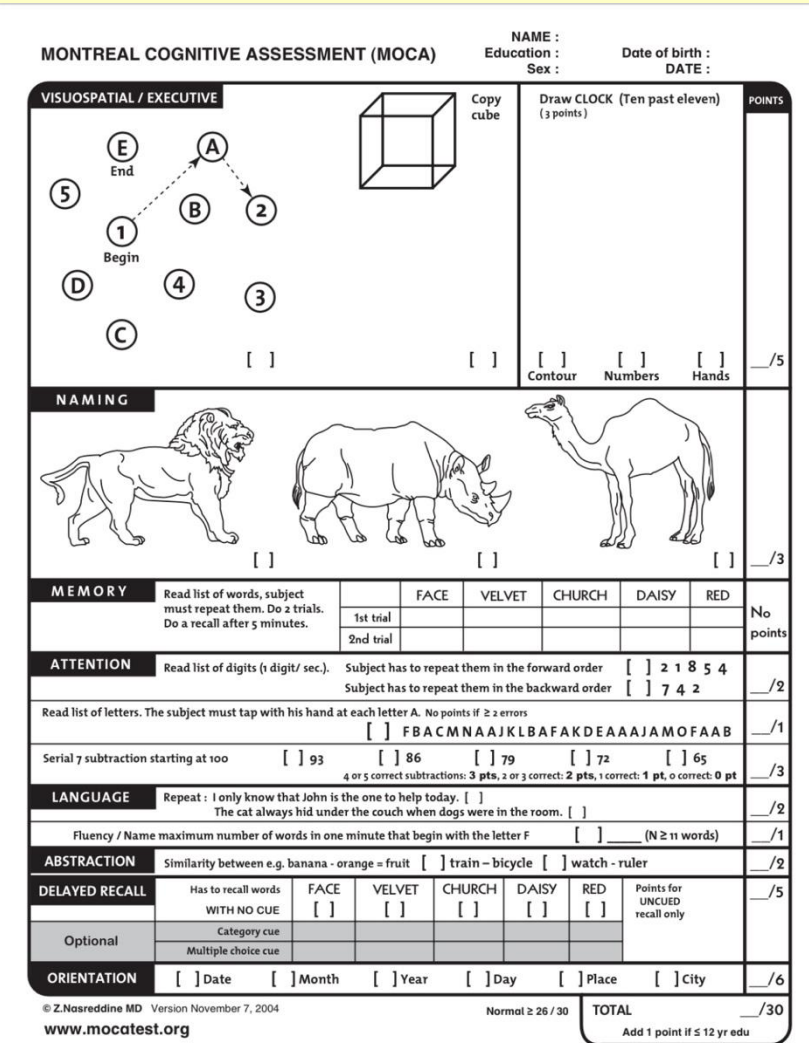


Figure 2: Montreal Cognitive Assessment (MoCA) designed as a rapid screening instrument for mild cognitive dysfunction

## CONCLUSION

- Although we have not concluded our results, we hypothesized that constant use of the videogame will improve mild cognitive impairments
- Our study is still currently on going therefore we will continue to find data in order to analyze if videogames can enhance a Parkinsonism patient’s quality of life
- There is still a copious amount of research to be done in regard to mild cognitive impairments in Parkinsonism patients

## REFERENCES

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