

Virtual Reality Gaming Applications Installed with Mobile Devices to Improve Body Responsiveness and Movement Performance for Parkinson's Disease Patients "The Guardian of Watcharapri"

From: Phetchaburi Vocational College, Thailand

456/3 Ratchawithi Rd., Khlong Krachang, Mueang, Phetchaburi 76000

Phone +6632-425557 Fax +6632-427021

E-Mail : sarabun@pbpvc.ac.th Website :: www.pbpvc.ac.th

The Innovation Authors

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|------------------------|--------------------------|-------------------------|
| 1. Mr.Sira Prasertsak | 2. Ms.Arunkamol Juntaros | 3. Ms.Suwapat Khamtawee |
| 4. Mr.Dhonlawat Sangpu | 5. Mr.Badin Nalsawang | 6. Mr.Pornchai Notsor |
| 7. Mr.Chanin Jusomchai | 8. Mr.Natchanon Panyamak | 9. Mr.Tula Kimthong |

I. Introduction

Thailand is stepping into an aging society and will become a complete aging society in the year 2025. From this situation, all parties are prepared to deal with changes that will occur in terms of health and welfare expenses. Many countries have accepted that the health and welfare expenses that the government has to provide services to the elderly requires a high budget. Due to the advancement in medicine, modern technology, health care both physically and mentally, these cause the elderly population to increase in number every year. It is certain that the coming of the aging society one thing that often comes along with the elderly is sickness, one of them is Parkinson's disease.

Parkinson's disease is the second most common neurodegenerative disease after Alzheimer's disease, accounting for 1% of people over 65 years old. The disease is increasing every year. Parkinson's disease is a degenerative neurodegenerative disease in the Substantia nigra pars compacta (SNpc), resulting in movement-related disorders due to decreased dopamine neurotransmitter, which controls continuous movement of the body. The symptoms of Parkinson's disease are characterized by motor problems, including tremors, stiffness, slow movements, and unbalanced movement, there are also non-motor symptoms. Non-motor symptoms often do not respond to medication because it is caused by abnormalities of other neurotransmitters, such as serotonin, norepinephrine, etc., so the treatment does not consist of just treating movement disorders.

The advent of modern technology often plays a role in the treatment and exercise or physiotherapy. One of them is virtual reality or VR, a technology that displays 3D models through a display device. There are many devices that support virtual reality that allows users to use according to various purposes by now. The device that was created to allow users to enter a 3D simulated world is the Meta Quest. The highlight of the Meta Quest is to combine the advantages of both VR glasses together with wireless, has an internal tracking system, does not require external sensors to help track location. It gives

players complete freedom of movement. At the same time, it has processing power similar to a PC. It can play games on the Oculus Rift as well.

From the introduction mentioned above, the researcher has an idea to develop a Virtual Reality Gaming Applications Installed with Mobile Devices to Improve Body Responsiveness and Movement Performance for Parkinson's Disease Patients "The Guardian of Watcharapri", the game is inspired by whack-a-mole games combined with story binding that allows players to take on the role of a character who has a rice field for harvesting rice in a village named "Watcharapri". However, the arrival of various pests has caused damage to the rice fields. It is the player's duty to protect their rice fields from being disturbed by various pests. In which the player will have to do various missions, assigned and must use motor skills to respond to the game and use the response ability to check and follow the commands within the game within the specified time. As a result, players with Parkinson's disease can exercise and develop motor skills to maintain their performance without deterioration and wit, which affects the development of motor skills and response. And affects the prevention of the severity of Parkinson's disease from becoming more serious than it is.

II. Purpose

To develop a mobile virtual reality gaming application to improve body responsiveness and movement performance for Parkinson's disease patients "The Guardian of Watcharapri"

To determine the quality of an expert on a mobile virtual reality gaming application to improve body responsiveness and movement performance for Parkinson's disease patients "The Guardian of Watcharapri"

To compare the differences in motor power before and after the trial of a mobile virtual reality gaming application to improve body responsiveness and movement performance for Parkinson's disease patients "The Guardian of Watcharapri" between the experimental group and the control group.

To determine the satisfaction of the sample with a mobile virtual reality gaming application to improve body responsiveness and movement performance for Parkinson's disease patients "The Guardian of Watcharapri"

III. Design/Methodology/Approach

Developing Virtual Reality Gaming Applications Installed with Mobile Devices to Improve Body Responsiveness and Movement Performance for Parkinson's Disease Patients "The Guardian of Watcharapri", the researcher has a method for conducting research through a sample group. The samples used in this study were people aged between 40 to 70 years old and had primary education or higher with Parkinson's disease at level 3-4, which is the level of patients with arm or the leg can lift but cannot withstand the pressure being pressed (pass the criteria for Motor Power Response of the arms and legs from all 5 levels). All sample groups must pass the screening for Parkinson's disease. The samples were divided into 2 groups consisting of

Group 1, or experimental group, is a group that experiments with Virtual Reality Gaming Applications Installed with Mobile Devices to Improve Body Responsiveness and Movement Performance for Parkinson's Disease Patients "The Guardian of Watcharapri" for 5 days, 30 minutes a day. After completing each play, response performance data will be collected from in-game scores and motor performance through the Motor Power assessment. The power of detection examines all 4 appendages divided into 5 levels. Each group was tested by 10 people using a simple random sampling method.

Group 2, or control group, was a group similar to the experimental group and were also screened Parkinson's disease patients, but continued their daily lives without trying the Virtual Reality Gaming Applications Installed with Mobile Devices to Improve Body Responsiveness and Movement Performance for Parkinson's Disease Patients "The Guardian of Watcharapri" and test reflex performance from in-game scores and motor performance through the Motor Power assessment as well as the experimental group of 10 people by using a simple random sampling method, a total of 2 groups of 20 people. In addition, before the experiment, the innovation has been tested and evaluated by experts. The experts used to assess the quality are medical professionals who specialize in neurology and brain, geriatric specialist nurses, and the scholars in the field of geriatrics and internal medicine with more than 10 years of work experience, in the amount of 5 persons, using a specific random sampling method.

In the experiment of Group 1, if use the program, supervision and advice from a doctor is required. For people with complications such as the eye and vision systems, If the player has side effects such as Muscle spasms, dizziness, nausea, vomiting, or pain during play, they must stop playing immediately.

In the game, the player takes on the role of a farm owner in the village of "Watcharapri" and there are many pests attacking the farm. The player must complete all pest extermination missions. This game has the following methods of playing;

1. When entering the game, the game will finish loading. Use the joystick points to the game start button by using the red light point to the button and press the "Trigger" button of the joystick on the right.
2. After pressing the "Start Playing" button, you will be taken to the game difficulty level selection page. Divided into 7 levels depending on the availability of the players
3. After selecting a level, The game method screen and playing conditions of that level will be displayed for players to study until they understand. After that, press the "Trigger" button of the right joystick to start the game.
4. At the start of the game stage, pests will attack players at different speeds (Depending on the difficulty of each level), the player must use the joystick to slash or smash as many pests as possible until the life points run out (the number of points is according to the difficulty of the level).
5. When the game is over, the system will show the score level for each level to provide feedback on the results of the game to the players. After that, use the joystick to point at the "Back" button by using the red light point to the button and press the "Trigger" button of the joystick on the right to go back to the stage selection page.



Figure 1-2 Image within a Virtual Reality Gaming Applications Installed with Mobile Devices to Improve Body Responsiveness and Movement Performance for Parkinson's Disease Patients "The Guardian of Watcharapri"

IV. Findings/Results

From the development of innovation, Adobe Illustrator has been used to create 2D images and Unity 3D to develop the program. The researcher took the innovation to evaluate with experts to find the quality of the innovation with a total score of 4.13 with a standard deviation of 0.21, which is considered good.

From the study of the comparison results of the differences in limb power (Motor Power) before and after the trial using the innovative app between the experimental group and the control group, it was found that there was a statistically significant difference of .05 both 4 appendages and found that the motor power of the experimental group was more developed than the control group.

From the study of evaluation of innovation efficiency through comparison of response performance, after the experiment was higher than before the experiment every day. The difference was statistically significant at .05.

From the study of satisfaction assessment results towards this innovative application, it was found that the total score was 4.61 with a standard deviation of 0.51, which was in the highest criteria.

V. Practical applications

This innovation is practical. It has a distinctive feature that is different from other existing applications in that this application is specifically designed for Parkinson's disease patients. Compared to most of the gaming software industry, which tends to target players more towards teenagers but this application has been designed with content, stories, and images to fit the main audience of players by showing a story that understands the feelings of Parkinson's patients.

In addition, this innovation can be applied to use in various sectors such as public health agencies, health service establishments, hospitals or private sector/manufacturing to health service establishments, clinics, or program distribution companies.

VI. Originality/Value

This innovation is the starting point to create benefits and value through being part of physical activity and improving motor performance and response in people with Parkinson's disease. It is also a guideline for research in the development of game programs for medical or physical use for patients with other diseases.

VII. Keywords (5)

Application, VR, Parkinson's Disease, Body Responsiveness, Movement Performance