



INTERNATIONAL JOURNAL OF ADVANCE RESEARCH, IDEAS AND INNOVATIONS IN TECHNOLOGY

ISSN: 2454-132X

Impact factor: 4.295

(Volume 5, Issue 1)

Available online at: www.ijariit.com

Occupational therapy rehabilitation and video gaming for hand injury

Deepak Ganjiwale

ananddeep123@gmail.com

KM Patel Institute of Physiotherapy,
Karamsad, Anand, Gujarat

Ranjit Pathak

ranjitpathak1981@gmail.com

Post Graduate Institute of Medical
Education and Research, Chandigarh

Amitabh Dwivedi

akdwivedi123@yahoo.com

Jaipur Occupational Therapy College,
Jaipur, Khorameena, Rajasthan

ABSTRACT

Neurological and musculoskeletal injuries may cause impairment of the upper extremity functions. There is significant evidence that physical training improves skills and reduces disability. However, these approaches typically require extreme dedication and are often repetitive and boring. Several studies have provided preliminary descriptions of the benefits of virtual reality and video games in rehabilitation training but most have demonstrated this through high cost video game like Wii and others. The current study taken up to find if low cost, modified games. Objective: To document the improvement in the range of motion of hand and the make the patient functionally independent through use of the modified video gaming. Methodology: The participant in this study would be all adults and children above the age 3 years, with limited wrist movements. The participants will be randomly assigned to the two groups. The video gaming will be administered in the intervention group in addition to the conventional treatment while the control group will be getting only the conventional treatment. Result and conclusion: improvement in conventional and experimental group equally in their range of motion and functional independency level. Interesting way of the therapy methods is important for improving the patients faster. interactive methods or gamin would be the best methods for rehabilitation of hand injury patients low cost video gaming methods would be the good option in rural area where the costly therapy center would not possible to set.

Keywords— Video game, Occupational Therapy

1. INTRODUCTION

Neurological and musculoskeletal injuries may cause impairment of the upper extremity functions. There is significant evidence that physical training improves skills and reduces disability. However, these approaches typically require extreme dedication and are often repetitive and boring. Several studies have provided preliminary descriptions of the benefits of virtual reality and video games in rehabilitation training but most have demonstrated this through high cost video game like Wii and others. The current study taken up to find if low cost, modified games. [1,2,3]

2. MATERIALS AND METHODS

All (adult and children above age 5 years) patients visiting in occupational therapy unit with limited shoulder, elbow and wrist movement will be included in the study.

Inclusion and exclusion criteria: Patients with total paralysis will be excluded from the study. Patients with severe pain in shoulder/ elbow/ wrist joints will be excluded.

The participant fulfilling inclusion-exclusion criteria were explained about the study. Written informed consent was obtained from the participants. All the participants were taken for the conventional therapy for first 15 minutes and then were made to play video game for next 15 minutes every day, 6 days a week for 2 weeks. All the participants were given the same video game with the use of the modified joy stick. The game used for therapy was 'CARS'. As the game's rating is E 10+, it is non-violence, interesting and animated game such that it can be used by all the patients without any problems.

The participant in this study was all adults with limited wrist and hand function.

The range of motion and hand power were checked by the use of Goniometer and JAMER hand dynamometer. The entire participant was given the same video game with the use of the modified joy stick. All the participants received 15 half-hour therapy sessions,

3 sessions a week, along with the physiotherapy and occupational therapy sessions. Configurable difficulty level parameters were included in the system, which allowed participants to remain competitive by matching game. After 15 sessions of their respective treatment regime, again the assessment was done to compare the changes.

3. RESULTS

There were 32 participants in the study. Majority of the participants were males. Majority of the cases were for tendon repair and the others included plating, conservative management and one case of ligament repair. There were 3 cases that did not need any surgical intervention. They were managed conservatively. Most of the people had their right hand affected and also most had right hand dominant. There were about 80% cases where the affected hand was dominant.

All the patients showed remarkable improvement in the gross and fine grip strengths at the end of the study. (Table 1)

Table 1: Improvement in gross and fine grip strength across the two visits

	Participants	
Gross grip	Baseline	Endline
Poor	32	0
Fair	1	15
Good	0	18
Fine grip		
Poor	32	0
Fair	1	16
Good	0	17

There was very good improvement observed in the dynamometer, Pincho- Meter and wrist functions independently. (Table 2).

Table 2: Before-After Mean (SD) comparison of dynamometer, Pincho- Meter and wrist range of motion

	Participants		P value exp.
	Baseline	Endline	
Dynamometer	5.97(6.04)	15.36(7.16)	<0.0001
Pincho- Meter	5.45(4.74)	12.94(4.13)	<0.0001
Wrist ext	9.97(5.45)	23.03(7.98)	<0.0001
Wrist flex	11.18(5.73)	24.70(8.93)	<0.0001

4. DISCUSSION

The effect of intervention by video game has much more interesting and involving compared to the monotonous conventional therapy. In conventional therapy the patients get bored in some time as it is monotonous and repetitive. On the contrary, video game show the very interesting way of treatment. The excitement and satisfaction in the participants has been observed much more.

There are several studies that have used WII games for the same purpose in adult and paediatric neuro and musculoskeletal cases [4]. These games are very costly and are not so easily affordable and available at general settings or settings where occupational therapy services are rendered. [5]

India being a developing country with majority of the population none affording, Therefore, there was a need to implement some innovative and locally modified – affordable and relatively easily available game that did not need much efforts and investment and to apply in service for settings like small clinics or hospitals for improvement and rehabilitation of different hand injury cases. This method was devised keeping the above points in mind. This was a simple attempt with low difficulty level of the game and not very challenging or competitive in nature in the experimental group with video gaming. The cost of the game is hardly about Rs 400 that includes the cost of the software for the game in a CD and the joystick. This amount is affordable and can be easily invested for the cause by any setting for the benefit of the patients. There is no recurring cost except of some repair that might be needed sometimes. The current game playing is innovated by modifying the joystick to make the wrist move to its maximum functional positions.

The previous studies have shown the effectiveness of these WII games in neuro patients with different levels of functional independence [6] while in the current study only hand injury cases were selected for the experiment. In a study be had concluded that the Robot suite has potential for stroke rehabilitation. And another study also shows that the Wii or any other video game would be beneficial for the stroke patients [7]. All the studies involving stroke patients show effectiveness of video gaming in neurological cases while in current study we found that the video game is effective in improving the functional abilities in musculoskeletal injury cases too to make then independent in their work and life.

In a study the participants’ personalities roughly predicted which mode they would prefer, which was especially evident in a poorly-matched impaired pair that preferred the single-player mode. [8] In current study the gaming was restricted to single person a time and the individual had to cross the different levels of the game progressively. The effect on range of motion, grip strengths and functional independence during their routine activities was observed to have improved significantly.

In a study they found significantly greater improvement in upper limb motor function in the higher-intensity robot-assisted training group than in the control treatment group. In contrast, upper limb motor recovery did not differ significantly between the lower-intensity training group and the control group. These findings suggest that the intensity is the most important parameter of robot-

assisted therapy for upper limb motor recovery in patients with chronic stroke. [9] The current study has used only a single intensity 'Cars' racing game and still found significant improvement in the motor performances of the participants. This leaves the question of effectiveness of different intensities in the improvement in performances unanswered. Possible that if there were games developed with these features to modify intensities, the said association could be explored better.

In a study done by. Levac D, they found that due to video gaming the patients gained more and became more independent in their daily activities than conventional [9]. This is said to have happened due to the much more fast movements required in those video games like Wii. But the current study does not support this finding as we found that the both group got comparable level of motor and functional independency in their daily activities. [10]

In current study we observed that the wrist extension and flexion ranges of motion showed more improvement than the experimental group; however this difference was not statistically significant after adjusting for the multiple comparisons involved in the study. This marginal difference still could be due to the long stretching or sustain stretching in the conventional group that was not given in the experimental group. So for the maximum benefit of the patient, we recommend the use of Video games for improving the range of motion and functional independence along with long stretching.

The point for further research could be doing the same study with increased duration of video gaming per session and also increasing the number of sessions for each patient along with long stretching given to them based on this study finding.

5. CONCLUSION

Interesting way of the therapy methods is important for improving the patients faster. interactive methods or gamin would be the best methods for rehabilitation of hand injury patients low cost video gaming methods would be the good option in rural area where the costly therapy centre would not possible to set.

6. REFERENCES

- [1] O'Mahony PG, Thomson RG, Dobson R, Rodgers H, James OF. The prevalence of stroke and associated disability. *J Public Health Med* 1999; 21:166-71.
- [2] Tarkka IM, Pitkanen K, Sivenius J. Paretic hand rehabilitation with constraint-induced movement therapy after stroke. *Am J Phys Med Rehabil* 2005; 84:501-5.
- [3] Liepert J. Motor cortex excitability in stroke before and after constraint-induced movement therapy. *Cogn Behav Neurol* 2006; 19:41-7.
- [4] Da Silva Cameirão M, Bermúdez i Badia S, Duarte E, Verschure PF. Virtual reality based rehabilitation speeds up functional recovery of the upper extremities after stroke: a randomized controlled pilot study in the acute phase of stroke using the rehabilitation gaming system. *Restorative neurology and neuroscience*. 2011; 29 (5):287-98.
- [5] Gauthier LV, Kane C, Borstad A, Strahl N, Uswatte G, Taub E, Morris D, Hall A, Arakelian M, Mark V. Video Game Rehabilitation for Outpatient Stroke (Vigorous): protocol for a multi-center comparative effectiveness trial of in-home gamified constraint-induced movement therapy for rehabilitation of chronic upper extremity hemiparesis. *BMC neurology*. 2017; 17 (1):109.
- [6] Hsieh YW, Wu CY, Lin KC, Yao G, Wu KY, Chang YJ. Dose-response relationship of robot-assisted stroke motor rehabilitation: the impact of initial motor status. *Stroke*. 2012; 43(10):2729-34.
- [7] Hootman JM, Macera CA, Ainsworth BE, Addy CL, Martin M, Blair SN. Epidemiology of musculoskeletal injuries among sedentary and physically active adults. *Medicine and science in sports and exercise*. 2002; 34(5):838-44.
- [8] Howes SC, Charles DK, Marley J, Pedlow K, McDonough SM. Gaming for Health: Systematic Review and Meta-analysis of the Physical and Cognitive Effects of Active Computer Gaming in Older Adults. *Physical therapy*. 2017; 97(12):1122-37.
- [9] Levac D, McCormick A, Levin MF, Brien M, Mills R, Miller E., Sveistrup H. Active video gaming for children with cerebral palsy: does a clinic-based virtual reality component offer an additive benefit? A pilot study. *Physical & occupational therapy in pediatrics*. 2018; 38(1):74-87.
- [10] Novak D, Nagle A, Keller U, Riener R. Increasing motivation in robot-aided arm rehabilitation with competitive and cooperative gameplay. *Journal of neuroengineering and rehabilitation*. 2014; 11(1):64.