

Effectiveness of dual shock 3 controller on dexterity and grip strength in patients with Parkinson's disease at the end of 4 weeks: An experimental study

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Abstract

- **Purpose:** The study was conducted to find Effectiveness of Dual shock 3 controller on dexterity and grip strength in patients with Parkinson's Disease.
- **Objective:** To find effectiveness of Dual shock 3 controller on dexterity following a 4-week treatment on patients with Parkinson's Disease. To find effectiveness of Dual shock 3 controller on grip strength following a 4-week treatment on patients with Parkinson's Disease.
- **Method:** Ethical clearance was taken from ethical committee of Modern college of physiotherapy. Subjects were selected based on Inclusion and Exclusion criteria. Procedure was explained to the subject and consent was taken. Pre-treatment readings for dexterity and grip strength were taken using nine-hole peg board test and hand dynamometer. Group 1 was demonstrated with conventional exercises and Group 2 was demonstrated the games with Dual shock 3 controller along with conventional exercises for alternate days for 4 weeks. After 4 weeks post treatment readings for dexterity and grip strength were recorded
- **Study Design:** The study design is Experimental.
- **Result:** Dual shock 3 controllers along with conventional exercises is effective to improve dexterity, grip strength in patients with Parkinson's disease than only conventional and was found statistically significant with [p value <0.05]

Keywords: Parkinson's, Physiotherapy, Exclusion criteria

1. Introduction

Parkinson's disease is the second most common neurodegenerative disorder after Alzheimer's disease and affects approximately seven million people globally [1, 2]. The proportion in a population at a given time is about 0.3% in industrialized countries. PD is more common in the elderly and rates rise from 1% in those over 60 years of age to 4% of the population over 80 [2]. Parkinson's disease (PD) is a long-term degenerative disorder of the central nervous system that mainly affects the motor system [5]. The symptoms generally come on slowly over time [5]. Early in the disease, the most obvious are shaking, rigidity, slowness of movement, and difficulty with walking [5]. Thinking and behavioural problems may also occur [6]. Dementia becomes common in the advanced stages of the disease [6]. Depression and anxiety are also common, occurring in more than a third of people with PD [6]. Other symptoms include sensory, sleep, and emotional problems [5, 6]. The main motor symptoms are collectively called "parkinsonism", or a "parkinsonian syndrome" [4, 7].

The cause of Parkinson's disease is generally unknown, but believed to involve both genetic and environmental factors [4]. Those with a family member affected are more likely to get the disease themselves [4]. The motor symptoms of the disease result from the death of cells in the substantia nigra, a region of the midbrain [5]. This results in not enough dopamine in these areas [5]. The reason for this cell death is poorly understood, but involves the build-up of proteins into Lewy bodies in the neurons [4]. Diagnosis of

typical cases is mainly based on symptoms, with tests such as neuroimaging being used to rule out other diseases [5]. Four motor symptoms are considered cardinal in PD: tremor, slowness of movement (bradykinesia), rigidity, and postural instability [9]. The most common presenting sign is a coarse slow tremor of the hand at rest which disappears during voluntary movement of the affected arm and in the deeper stages of sleep [9]. It typically appears in only one hand, eventually affecting both hands as the disease progresses [9]. Frequency of PD tremor is between 4 and 6 hertz (cycles per second). A feature of tremor is pill-rolling, the tendency of the index finger and thumb to touch and perform together a circular movement [9, 10]. The term derives from the similarity between the movement of people with PD and the early pharmaceutical technique of manually making pills [10]. Bradykinesia (slowness of movement) is found in every case of PD, and is due to disturbances in motor planning of movement initiation, and associated with difficulties along the whole course of the movement process, from planning to initiation to execution of a movement. Rigidity is stiffness and resistance to limb movement caused by increased muscle tone, an excessive and continuous contraction of muscles [29]. In parkinsonism the rigidity can be uniform ("lead-pipe rigidity") or ratchety ("cogwheel rigidity") [3, 9, 12, 13]. Postural instability is typical in the later stages of the disease, leading to impaired balance and frequent falls [16], and secondarily to bone fractures, loss of confidence, and reduced mobility. Other recognized motor signs and symptoms include gait and posture disturbances such as festination (rapid shuffling steps and

a forward-flexed posture when walking with no flexed arm swing). Freezing of gait (brief arrests when the feet seem to get stuck to the floor, especially on turning or changing direction), a slurred monotonous quiet voice, mask-like facial expression, dexterity and handwriting that gets smaller and smaller are other common signs [19,21].

Studies of rehabilitation in Parkinson's disease are scarce and are of low quality [22, 23]. Partial evidence indicates speech or mobility problems can improve with rehabilitation [22, 23]. Regular physical exercise and/or therapy can be beneficial to maintain and improve mobility, flexibility, strength, gait speed, and quality of life. Visual, auditory, and somatosensory cuing devices have also been used [20] in conjunction with walking aids to improve gait in individuals with Parkinson's disease. These cuing strategies have been implemented in an 'app' called Parkinson Exercises [21]. Given the challenge that this clinical population may have with initiating motor movements during gait (e.g., freezing gait) [2], these devices provide external stimulation to cue for the next step to take place [24]. DualShock3 controller provides with pressure sensors in each action button and a motion sensing technology SIXAXISTM – which allows users to manoeuvre the controller itself, with this system sensors read when the user angles, tilts, thrusts, or pulls the controller in precision. Each crash, hit, and explosion in game and user feels the vibrations on the palm

2. Need of Study

In Parkinson's disease the major affections are tremor, slowness of movement (bradykinesia), rigidity, postural instability, dexterity, loss of grip strength and loss of equilibrium. Visual and auditory cues are available to improve gait and postural instability. Hence there is need to find such a modality that is cost effective, available easily to improve fine motor functions, dexterity in these patients. Dual shock 3 controllers easily available as most of the children use it for playing video games. This equipment might help in improving grip strength and dexterity patients with Parkinson's Disease.

3. Objectives

To find effectiveness of Dual shock 3 controller on dexterity following a 4-week treatment on patients with Parkinson's Disease.

To find effectiveness of Dual shock 3 controller on grip strength following a 4-week treatment on patients with Parkinson's Disease.

4. Hypothesis

Null hypothesis: There is no significant difference between Dual shock 3 controller along with conventional exercises and only conventional exercises on dexterity and grip strength in patients with Parkinson's Disease. Alternate hypothesis: Dual shock 3 controller along with conventional exercises is more effective than only conventional exercises to improve dexterity and grip strength in patients with Parkinson's disease.

5. Methodology

Study design- experimental

Sample size- 40

Sampling method- Convenient sampling

Study population: Patients with Parkinson's disease.

Study setting – Old age homes and OPD's in an around pune.

Duration of study: 3 months.

6. Inclusion Criteria

AGE 50-70.

Grade 3-4 on hoen-yahr scale

Mini mental score 21 or more

MMT- 3 or more

Patients are in ON period i.e. one hour after medication.

Patient having normal sensations

7. Exclusion Criteria

Patient having h/o recent fall

Patient having visual deficits

Non cooperative patients

8. Materials & Tools

Consent form

Dynamometer

Nine-hole peg board

Dual shock 3 controller

Laptop

9. Outcome Measures

Nine-hole peg board test

Dynamometer

10. Procedure

- Ethical clearance was taken from ethical committee of Modern college of physiotherapy
- Subjects were selected based on Inclusion and Exclusion criteria.
- Procedure was explained to the subject and consent was taken.
- Pre-treatment readings for dexterity and grip strength were taken using nine-hole peg board test and hand dynamometer
- Group 1 was demonstrated with conventional exercises and Group 2 was demonstrated the games with Dual shock 3 controller along with conventional exercises for alternate days for 4 weeks.
- After 4 weeks post treatment readings for dexterity and grip strength were recorded.
- Data analysis was done using 'paired t' test
- The conventional table top exercise consisting of passive ROM stretches, AROM exercises, isometric strengthening exercises and functional gripping exercises for the hand were taken.
- Grip strengthening exercises using grip strengtheners were taken.
- These exercises were taken for 25 mins.
- Patients in group 2 were asked to play the games using Dual shock 3 controller for minimum 30 mins thrice a week
- Simple games such as Tetris, snakes and car racing were chosen.
- The game progress of each week was collected and if there was no significant increase, patient was asked to again play under supervision and the mistakes were corrected.
- Along with this conventional exercise were taken.

11. Results

Table 1: Group A – Conventional + Experimental

Outcome	Mean pre Values	Mean post values	't' value	'p' value
9-hole peg board test	82.25 + 15.1	73.5 + 15.5	11.37	<0.05
Hand held dynamometer	18.92 + 1.61	20.58 + 1.6	15.37	<0.05

Table 2: Group B – Conventional

Outcome	Mean pre Values	Mean post values	't' value	'p' value
9-hole peg board test	83.5 + 12.02	78.45 + 12.85	9.182	<0.05
Hand held dynamometer	19.17 + 1.77	20.56 + 1.745	6.388	<0.05

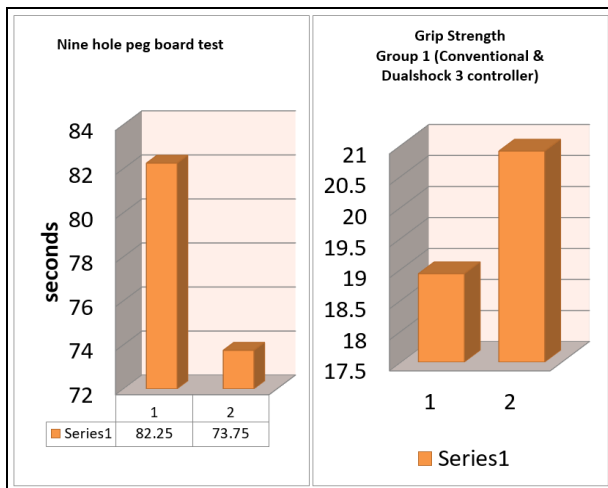


Fig 1: Group A – Conventional + Experimental

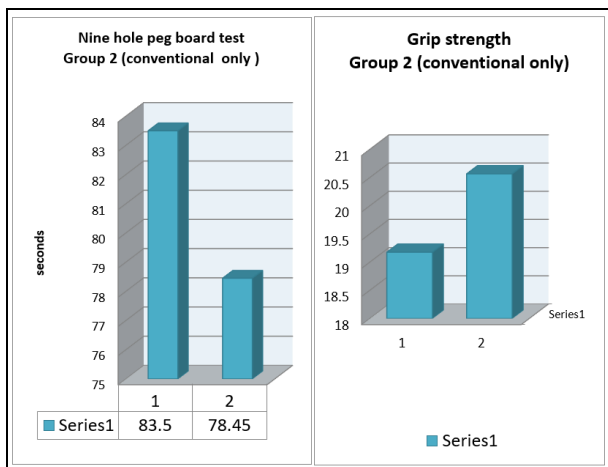


Fig 2: Group B – Conventional

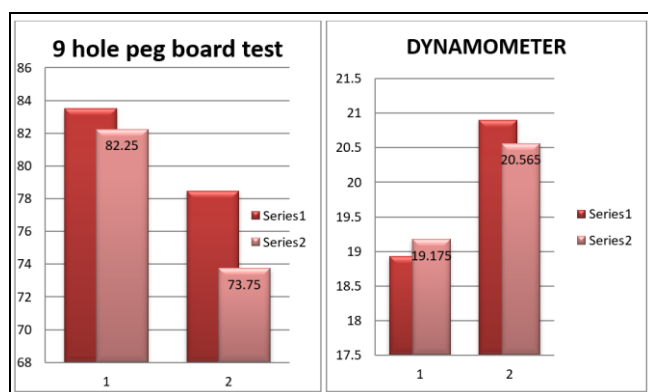


Fig 3: Difference (Group A & B)

12. Discussion

Dualshock3 controller provides with pressure sensors in each action button and a motion sensing technology sixaxism – which allows users to manoeuvre the controller itself, with this system sensors read when the user angles, tilts, thrusts, or pulls the controller in precision. Each crash, hit, and explosion in game and user feels the vibrations on the palm. This has been proved that vibration feedback helps in reducing tremors hence improving dexterity. The sixaxism sensory allow a huge range of motion involving the finger, wrists and the distal radioulnar joint which will improve equilibrium. The action buttons have pressure sensors which along with the vibrations and sixaxism will help in improving grip strength.

13. Conflicts of Interest: No conflicts of interests.

14. Funding: Self-funding.

15. Future Scope of Study

A device with similar properties can be made with several modifications specifically for parkinsons disease It can be studied on a larger group Cognitive development with the games can be studied.

16. Conclusion

Dual shock 3 controller is effective to improve dexterity, grip strength in patients with Parkinson’s Diseas

17. References

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