EFFECT OF TRAINING EYE HAND COORDINATION USING EMERGING USER INTERFACE TECHNOLOGIES TO IMPROVE HAND FUNCTION IN STROKE PATIENTS - A RANDOMIZED CONTROLLED STUDY

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Introduction

- Eye-hand coordination is an intricate and complex function of the central nervous system.
- A large portion of individuals who have sustained a stroke have upper extremity impairment ^(1, 2).
- Arm paresis in stroke survivors is a sensorimotor integration deficit.
- The stroke survivors have poorer eye-hand coordination when using their affected hand.
- A significant correlation exist between eye hand coordination performance and hand function scores ⁽³⁾.
- The aim of this study was to develop a low cost system for testing and training eye and hand coordination in an objective and fun way for improving hand function in chronic stroke survivors.

Methods

- 6 community-dwelling participants with chronic stroke were recruited for this study.
- This was a randomized, single-blind study.
- Participants were randomly allocated in a 1:1 ratio to the experimental & control group with n=3 each.
- All of them had stroke for a minimum of 1 year previously.
- Subjects in both group received standard upper limb intervention which included upper limb strengthening exercises, grasp and release activities, reaching activities and dexterity tasks once daily, 6 days a week for a total of 4 weeks.
- Subjects in the experimental group also played a customized eye and hand coordination training computer game called “HandEye” everyday for 3 sessions of 2 minute each with rest interval between sessions (Fig. 1).
- **Leap motion** sensor and **Tobii Eye X** were used for hand and eye tracking respectively.
- Box and block test (BBT) was used as primary outcome measure to evaluate pre and post hand function scores.

Figure 1. Subject playing HandEye game

Figure 2. Scoring system for HandEye game

Results

Figure 3. Average BBT score of hemiparetic arm before and after treatment in both the groups

Figure 4. Average change in BBT scores.

Figure 6. Average scores of BBT and HandEye in Hemiparetic arm.

Table 1. ANOVA table of control and experimental group

	Control	Experimental
df	1	1
f- value	85.099	234.244
p- value	<0.001	<0.001

Figure 5. Average change in HandEye score of hemiparetic arm from pre-to-post intervention in experimental group.

Figure 7. Average BBT and HandEye scores in nonparetic arm.

Conclusions

- The change in BBT scores were higher in experimental group (Fig.3).
- The average change in the BBT scores from pre to post intervention was **10.89±1.90** in the experimental group and **4.89±1.62** in the control group (Fig. 4).
- The average changes in the scores of HandEye game were highly significant and improved by **18.11±5.67** after 4 weeks of training in the experimental group (Fig. 5).
- Our results demonstrated that using emerging user interface technologies like eye and hand tracking can be a cost-effective way to train eye hand coordination in chronic stroke survivors to improve their hand function scores.

Bibliography

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