CHAPTER VI
CONCLUSION

The present study was divided into 2 experiments. First experiment aimed to investigate the reach-to-grasp (RTG) impairments during performing RTG under barrier avoidance condition in the domain of planning, kinematics of both transport and grasp component and transport-grasp coordination in individuals with Parkinson's disease (PD). Then, second experiment aimed to determine the effect of action observation (AO) combined with motor training on motor learning of trained- and untrained-task. The trained-tasks were RTG 6 actions which are the 6 items of Wolf Motor Function Test (WMFT), whereas untrained-task was RTG under barrier avoidance condition as similar task to first experiment.

In first experiment, nineteen participants with PD and nine non-disabled aged-match adults were recruited. Then, all participants were test by RTG under barrier avoidance condition. The results demonstrate impairments in all domain of RTG actions in both spatial and temporal domains. The impaired temporal domain consisted of prolongation planning or reaction time, prolongation of movement time, absolute time to maximum velocity, absolute deceleration time, absolute time to maximum aperture, absolute aperture closure time and temporal transport-grasp coordination as measured by associated time lag. However, all relative values were not different when compare to non-disabled group. These findings reveal that PD individuals preserved their motor programming by prolonging all absolute time but maintain the percentage of each movement relative to total duration of movement. Considering spatial domain, PD individuals demonstrated the smaller amplitude of maximum wrist velocity and grasp aperture size. These 2 deficient spatial kinematics represent the bradykinesia and hypometria that commonly occur after suffering PD. However, aperture closure distance and spatial transport-grasp coordination as evidenced by maximum cross correlation coefficient were not different between PD and non-disabled groups. The possible reason might be explained by speed-accuracy trade-off in which PD patients slowed down their

movement for maintaining perfect spatial characteristics. Another explanation is task-constraint. Because the distance from barrier's location and the object's location was very short distance, thus aperture closure time is relatively short in both groups. These evaluations were done after patients took their normal medicine for 1 hour which represent ON-medication state of PD patients. Although patients received medicine, the RTG performance could not be regained to normal level when compare to non-disabled adults.

In second experiment focused to the training which might improve remained RTG impairments in PD patients. The training is AO combined with motor training. All PD individuals were divided into one of three groups; action observation (AO), placebo (P) and control (C) groups by stratified randomization with age, impairment level (Hoehn and Yarh stage) and more affected side. The participants in AO group trained by observing 6 minutes of hand actions video and alternate with physical training the same actions, until complete 4 blocks of physical training. For P group, participants trained similarly to AO group but they observed natural landscape instead of hand actions. While participants in C group were trained physically and resting for 6 minutes. The testing compose of trained- and untrained-task were done before training (Pretest), immediately post training (Posttest) and 45 minutes after training (Retention test). Investigation of motor learning compose of 3 aspects: improvement in acquisition phase (compared between Pretest and Posttest), retained capability (compared between Posttest and Retention test) and saving capability (compared between Pretest and Retention test). Moreover, the transferred capability was also determined by comparing all 3 aspects of motor learning when tested by untrained-task.

For trained-task, all participants in all groups improved their performance in posttest and could retained and save their capability in retention test. However, participant in AO group improved their performance until took over the performance in other groups in Posttest and Retention test.

For all variables which represent impairment in RTG action from first experiment were improved by all training except reaction time, maximum aperture size and aperture closure size at Posttest. In addition, they could retained their performance at Retention test. However, saving capability was shown only in AO groups for all aforementioned variables until found the different deceleration time and associated time

lag between AO and other groups at Retention test. This especially shorten deceleration time in AO group indicates that AO could minimize the dependence of visual feedback of PD individuals. Additionally, the lower associated time lag in AO group also demonstrate that AO protocol could improve not only single component of performance but also improve interjoint-coordination level.

The questionnaire in this study also represent the advantage of the training protocols. For AO group, participants express their opinion that this technique has advantage in promoting error detection and then they were able to protect the error during their own motor training.

In summary, the results suggest that physical training and observation can be combined in an interactive way in individuals with PD. It is practical protocol which can be trained at either rehabilitation center or patients' place. Therefore, action observation is a suggestive protocol and optimal training for these patients.