Appendix 1. Analyze of Four Activities by Using Upper Limb Taxonomy							
Activity	Activity Subset	Type of Activity	Common Fingers Involved in Activity	How to Make the Activity Harder			
Activity: Get Dressed							
Top, under shirts or T-shirts	1-grabbing the top, 2-folding, 3-raising it in order to wear it, 4-putting the sleeves in the sleeves, 5-pulling the top down, 6-grabbing the clothes, 7-pulling the clothes up, 8-taking off the clothes, 9-putting clothes in place	all in the form of a power grip (1-9)	palm abduct 5-2 (1 to 9)	position of the person in relation to clothes and vice versa, speed of activity, position of clothes, other items (shape, material, weight), environment (lighting, heating, gloves), dual tasks			
Sweater	l-taking clothes, 2-gathering, 3-lifting in order to wear, 4-pulling clothes down, 5-taking clothes, 6-pulling clothes up, 7-taking clothes, 8-putting clothes in place	all in the form of a power grip (1-8)	palm abduct 5- 2 (1 to 9)	like the activity of wearing a top or under a shirt or T-shirt			
Shirt	1-take off the clothes, 2-put your hands on the sleeves, 3-close the buttons, 4-arrange the sleeves, 5-open the button or zipper, 6- pull out the sleeves, 7-take off the clothes, 8-put the clothes on.	power grip (1,7,8); intermediate grip (2,4,6); precision (3,5)	palm adduct 5-2 (1); side adduct 2 (2,4,6); pad abduct 5-2 (3); palm abduct 5-2 (5,7,8)	like the activity of wearing a top or under a shirt or T-shirt (except for the figure)			
Under pants / pants	1-take the pants, 2-pull the pants up, 3-open the button / zipper, 4-take off the pants, 5-put the pants in place.	power grip (1,5); intermediate grip (2,4); precision (3)	palm abduct 5-2 (1,5); side adduct 2 (2,4); pad abduct 5-2 (3)	like the activity of wearing a top or under a shirt or T-shirt (except for the figure)			
Socks	1-grasing the edges of the sock, 2-gathering the edges, 3-putting the toe and heel, 4-pulling the sock up, 5-gathering the top of the sock, 6-removing the sock	intermediate grip (1,4); power grip (2,3); precision (5,6)	side adduct 2 (1,4); palm abduct 5-2 (2,3); pad abduct 3-2 (5,6)	like the activity of wearing a top or under a shirt or T-shirt (except for the shape and material)			
Scarf	1-picking, 2-carrying on the head, 3-taking two heads, 4-tying, 5-opening the knot, 6-removing, 7-putting on the table	intermediate grip (1,2,3,6); precision (4,5)	side adduct 2 (1,2,3,6); pad abduct 3-2 (4,5)	like the activity of wearing a top or under a shirt or T-shirt (except for the shape and material)			
Hat	1-removing the hat, 2-putting it on the head, 3-taking off the hat	power grip (1 to 3)	palm abduct 5-2 (1 to 3)	like the activity of wearing a top or under a shirt or T-shirt (except for the shape and material)			
Shoe	1-getting the back of the shoe, 2-putting the foot inside the shoe, 3-taking the shoelaces, 4-tying	intermediate grip (1,2); precision (3,4)	side adduct 2 (1,2); pad abduct 3-2 (3); pad abduct 2 (4)	like the activity of wearing a top or under a shirt or T-shirt (except for the shape and material)			
	Activ	ity: Conversation					
Phone	1-hold the handle of the phone, 2-press the buttons with your finger	power grip (1); precision (2)	palm adduct 5-2 (1); pad abduct (2) 2-3	position of the person in relation to the phone and vice versa, speed, activity, position of the phone, other items (size, material, weight), environment (brightness), dual tasks			
Mobile	1-holding the mobile phone with one hand, 2-pressing or touching the buttons with the other hand or holding the phone with one hand and pressing or touching the buttons with the same hand	power grip (1,3); precision (2)	palm adduct 5-2 (1,3); pad abduct 2 (2)	like the activity of conversation by phone			
		Activity: Exercise					
Volleyball	1-catching the ball with both hands, 2-throwing the ball with both hands, 3-hitting the ball with both hands to hit the forearm, 4-hitting the waterfall or spike service, 5-hitting the ball with one hand and punching the other hand to hit the service	power grip (1,2,4,5); Intermediate grip (3)	pad abduct 4-2 (1,2); side adduct 2 (3); palm abduct 5-2 (4,5)	ball weight, speed, one or two-hand, ball size, with / without net, distance between people, net height			
Ping pong	1-catching the ball with one hand, 2-catching the rocket handle with one hand, 3-catching the rocket handle to hit the back hand, 4-catching the ball with one hand and the handle with the other handle, 5-hitting the ball in the forehand, 6-hitting the ball with the back hand	precision (1,4); power grip (2,3,5,6)	pad abduct 4-2 (1); palm abduct 5-2 (2 to 6)	position of the person in relation to the table, speed, position of the person, environment, dual tasks, type of shoes, heating			
		Activity: Eating					
Eat	1-taking different tools (spoon, fork, knife, mug), 2-taking salt shaker and spices and glass of water and pitcher, 3-pouring salt shaker and spices and glass of water and pitcher	intermediate grip (1,2); power grip (3)	side adduct 2 (1,2); palm adduct 5-2 (3)	status of person and food in relation to, speed of performance, plate mode, type of food, type of device, environment, dual tasks			

	Appendix 2. Classification of Four Activities Using the Gentile Motor Learning Theory
Activity	Activity components, hardness levels of each component and how it is change
Get dressed	Top, under shirts or T-shirts • grabbing the top (1B, 2B, 3B, 4B) • folding (1B, 2B, 3B, 4B) • raising it in order to wear it (1B, 2B, 3B, 4B) • putting the sleeves in the sleeves (1B, 2B, 3B, 4B) • pulling the top down (1B, 2B, 3B, 4B) • grabbing the clothes (1B, 2B, 3B, 4B) • pulling the clothes up (1B, 2B, 3B, 4B) • pulling the clothes (1B, 2B, 3B, 4B) • taking off the clothes (1B, 2B, 3B, 4B) • putting clothes in place (1B, 2B, 3B, 4B) Under pants / pants. • take the pants (1B, 2B, 3B, 4B) • pull the pants up (1D, 2D, 3D, 4D)
Conversation	 open the button / zipper (1B, 2B, 3B, 4B) take off the pants (1D, 2D, 3D, 4D) put the pants in place (1B, 2B, 3B, 4B) Mobile getting mobile by one hand (1B, 2B, 3D, 4D) pushing or touching the button with other hand (1B, 2B, 3D, 4D) getting mobile by one hand and pushing or touching the button with the same hand (1B, 2B, 3D, 4D) getting mobile by one hand and pushing or touching the button with the same hand (1B, 2B, 3D, 4D)
Exercise	Ping-Pong • getting a ball with one hand (1B, 2B, 3B, 4B) • getting rocket handle with on hand (less affected hand) (1B, 2B, 3B, 4B) • getting rocket handle for hitting (1B, 2B, 3B, 4B) • getting ball with one hand and rocket handle with the other one (1B, 2B, 3B, 4B) • hit the rocket ball (1D, 2D, 3D, 4D)
Eating	 Eating taking different tools (spoon, fork, knife, mug) (1B, 2B, 3B, 4B) taking salt shaker and spices and glass of water and pitcher (1B, 2B, 3B, 4B) pouring salt shaker and spices and glass of water and pitcher (1B, 2B, 3B, 4B)

^{*}How to measure:

- 1B: In a sitting or standing state, how to do pre-defined action, the fixed environment
- 2B: In a sitting or standing state, how to perform activity with different methods, the static environment with variable conditions
- 3B: In a sitting or standing state, how to do pre-defined action, variable environment
- 4B: In a sitting or standing state, how to perform activity with different methods, variable environment with variable conditions
- 1D: In a moving position, how to do pre-defined action, the fixed environment
- 2D: In a moving position, how to perform activity with different methods, the static environment with variable conditions
- 3D: In a moving position, how to do pre-defined action, variable environment
- 4D: In a moving position, how to perform activity with different methods, variable environment with variable conditions

	Appendix 3. Motivational Tactics of Model of Human Occupation and Experts Advice on How to Apply Them to Clients with Parkinson's Disease				
Row	Stages	Strategy	Purpose and related functions	How to use	
1	Creating a link between environmental factors and individual conditions and capabilities Sincere treatment	environmental factors and individual conditions and	represent the individual's interests are used.	 Pay attention to the interests and choices of the individual. Bring the required tools from home to complete your assignment if you are interested or in need. Each treatment session's homework approach is chosen by the person. 	
2		Respect the individual's personality and what is essential to him / her while communicating with clients, and create trust via consistency and consistency in conduct.	Used as a general communication technique with clients.		
3		Facilitate involvement in activities that the individual is interested in.	Accompanying clients on basic activities in their fields of interest.	 The tasks are simple and short-term at first, and therapist help is essential if the procedure is to be effective. Pay attention to how well you performed in the first few sessions. 	
4		Create interaction with the person	Further efforts to facilitate individual participation by asking different questions and asserting comment on the activity.	interventions were made and how they affected their performance.	
5		Transfer functional rolls to new environment	The new environment is introduced to the person and he / she is asked to search and be active in the environment.	 Allow the user to explore the treatment area during the first session. Changes in the process of executing the activity should be described to the person when the difficulty level of the activity is changed. 	
6	Exploration	See other people	Clients should be placed with other individuals who are active in activities that are significant and familiar to them in order to encourage engagement and interest.	people can be seen. The therapist should also be involved in the process of activities.	
7	Expl	Invite to participate in different tasks	The person participates in some activities either automatically or at the invitation of the therapist.	 Make a plan for the stage before starting the activity. The person is informed about the interventions of the next session so that the clients can think about the process of the next session. 	
8		Increase diversity in activities (type of activity or environment of activity)	Encourage clients to decide to participate in familiar or new activities for longer. Begin to facilitate one's interactions with others.	 After a few sessions, ask the person whether they have any new operational priorities. ▶ Define an initial time for treatment sessions and gradually increase the session time. 	
9		Facilitate participation in group activities	Facilitate a sense of social belonging by providing opportunities to participate in group activities	In the final sessions, work in groups with a common goal (people in the group have the same level based on Hoen and Yar). This can be done after 5 sessions.	
10		Give feedback	Start a very simple evaluation process based on the individual's experience of participating in the activities.	 Give general feedback at the end of the session Use motivational feedback during each activity and gradually reduce it (excellent, very good, good, try harder). Reduce the number of feedbacks in different repetitions for a performance and use variable feedbacks 	
11		Creating a connection between current experiences and capabilities	Creating a connection and integration between experiences by having a simple interpretation of performance and anticipating participation in future activities	Use an assessment such as the visual analog scale after an activity or end of session by the individual and the therapist and compare them to increase awareness and improve judgment about individual abilities. Charting individual performance changes	
12	pet y	Performing in more challenging situations	Improve capability and increase confidence by increasing difficulty levels	Perform interventions in a stratified manner	
13	Compet ency	Facilitate training	Facilitate a sense of responsibility for individual and group actions	In the first sessions, we offer solutions to the person to solve problems, and in the last sessions, we ask the person to provide more solutions. Problem solving skills training if needed	
14	Succe	Review the challenge experience	Informing the person to perform challenging activities and examining the person's inner feelings about the activity	At the beginning of each session, ask about the individual's experience with performing the interventions at home.	
15	15 8	Take a step back	Let the person start working automatically.	In the process of interventions to reduce the amount of feedback, the level of activity or performance should be considered more difficult.	

Appendix 4. Kinematic Assessment

Motion data of symmetric and asymmetric functional bimanual activities will recorded with a 6-camera motion analysis system (Vicon 2.5, sampling rate of 250 Hz).

Participants pick-up the box $(33\times37\times11.5 \text{ cm}, 0.6\text{-lb box})$ to shoulder level in the symmetrical functional bimanual activity.

Participants will requested to open a drawer $(35\times28\times11.5 \text{ cm})$ using the more affected hand and press a push button $(7.5\times7.5 \text{ cm})$ inside the drawer with the other hand in the asymmetric functional bimanual task.

After receiving the "start" signal, participants will instructed to perform both symmetrical and asymmetric bimanual activities as quickly as possible. After completing five practice exams (both symmetrical and asymmetric), participants conducted the main tests for each binomial. The number of times the test should be performed was decided by the pilot research.

The motion data will filtered using a fourth-order LOW-pass Butterworth filter with a cut-off frequency of 10 Hz and analyzed using MATLAB code that calculated the kinematic parameters (coordination) for each activity.

The symmetric functional bimanual task was divided into two phases (transfer and removal phases), with two coordination indices (Transfer Coordination (TC) and Reach to Pick Up Time (RTP time) for each phase. The closer it is to zero, the greater the participative coordination. TC is the absolute time interval between Two-handed PV periods, denoted as Movement Time (MT). The time between the end of the transfer phase and the PV time during the removal phase, normalized to MT, will used as a participative coordination index. The greater the value, the inefficient or slow bimanual participatory coordination becomes. The drawer is pulled back to open it in the asymmetric movement coordination task of one hand (one hand opener), while the other hand (pushing hand) is stretched forward to press the push button within the drawer. For this challenge, three coordination indices will calculated: start coordination (OS), drag-to-push time (PTP), and target coordination (GS). The OS will the time gap between the start of a hand movement and the start of the next hand movement, which will allocated to MT, and the higher the value, the less coordination between the two hands.

RTP time will determined as the time interval between hand opening PV and hand pushing PV, and it will standardized to the MT task.

A larger number suggests a longer time delay between performances, implying that asymmetric coordination is inefficient.³ The time gap between the start of normalized hand movement and the MT task will used to calculate GS.¹

- 1. Nieuwboer A, Rochester L, Herman T, et al. Reliability of the new freezing of gait questionnaire: agreement between patients with Parkinson's disease and their carers. *Gait & posture*. 2009;30(4):459-463.
- 2. Nieuwboer A, Vercruysse S, Feys P, Levin O, Spildooren J, Swinnen S. Upper limb movement interruptions are correlated to freezing of gait in Parkinson's disease. *European Journal of Neuroscience*, 2009;29(7):1422-1430.
- 3. Nutt JG, Bloem BR, Giladi N, Hallett M, Horak FB, Nieuwboer A. Freezing of gait: moving forward on a mysterious clinical phenomenon. *The Lancet Neurology*. 2011;10(8):734-744.