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Effect of the cognitive strategy training protocol on task mastery and cognitive performance during the instrumental activity of daily living in stroke patients

Chutimon Vattanaphan[1] Anuchart Kaunnil[1] Michael Palapal Sy[2] Peeraya Munkhetvit[1]

[1]Department of Occupational Therapy, Faculty of Associated Medical Sciences, Chiang Mai University, Chiang Mai Province, Thailand
[2]Institute of Occupational Therapy, Zurich University of Applied Sciences, Switzerland

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ABSTRACT

Background: Stroke leads to decrease in physical, emotional, social function, and activities in daily living. Cognitive functions, either basic or higher-level, are fundamental factors in performing tasks and functional activities in daily life. Therefore, cognitive training to enhance functions in stroke patients is necessary. This study developed a cognitive strategy training protocol using the Perceive, Recall, Plan & Perform (PRPP) System of Intervention and the Multicontext Approach to improve cognitive function during performance in instrumental activities of daily living (IADL) tasks.

Objectives: This study aimed to examine the task mastery of stroke patients during the performance of IADL tasks and to examine the effects of the cognitive strategy training protocol on cognitive performance in stroke patients.

Materials and methods: The study was a quasi-experimental, one-group, pretest-posttest research design. Eight stroke patients with cognitive impairment aged between 18-70 years old participated in the study. The intervention called "cognitive strategy training protocol" included 12 sessions, 3 times a week across 4 consecutive weeks. Each session took approximately 60 minutes. An outcome measure was the PRPP System of Task Analysis-Thai version. Descriptive data obtained from Stage One of the PRPP System-Thai version were analyzed to determine for task mastery, and pre-and post-scores of Stage Two of the PRPP System-Thai version were computed using the Wilcoxon signed-rank test.

Results: After the cognitive strategy training protocol, all participants had higher percentage scores obtained from Stage One of the PRPP System-Thai version for at least 1 activity. Five out of eight participants showed higher percentage scores in both activities. Comparing the pre- and post-test scores from Stage Two of the PRPP System-Thai version using the Wilcoxon signed-rank test revealed no significant difference in all activities (p>0.05). However, the descriptive results of the posttest percentage scores of Stage Two of the PRPP System-Thai version showed that 4 out of 8 participants had higher scores for at least 1 activity and 2 participants showed higher scores in both activities.

Conclusion: The cognitive strategy training protocol was likely to be possible to improve task mastery and cognitive performance during the IADLs tasks in the participants despite no statistically significant difference.

∗ **Corresponding contributor.**
Author's Address: *Department of Occupational Therapy, Faculty of Associated Medical Sciences, Chiang Mai University, Chiang Mai Province, Thailand.*
E-mail address: peeraya.m@cmu.ac.th
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Introduction

Over 30 percent of the 15 million stroke patients in the world have remaining disabilities.[1] The term stroke is used to explain dysfunction or brain damage that causes an interruption in the blood flow to the brain, and a stroke

can occur in any area of the brain such as the cerebral hemispheres, the brainstem, or the cerebellum.[2] The effects of stroke can lead to decreasing in physical, social, emotional function, and occupational performance in daily living. Regarding cognitive impairments, both basic cognitive and higher-level cognitive functions such as memory, attention, and executive functions are affected as a consequence of stroke.[3] Cognitive functions are fundamental for performing activities in daily living. Therefore, many stroke patients may have difficulty in inhibiting automatic responses and choosing tasks while monitoring alternative plans of action while performing other functional tasks.[4] Stroke patients in any level of severity of cognitive impairment may have trouble performing a variety of life activities related to person, communities, and engagement, including basic activities of daily living (BADL), IADL, work, leisure, rest and sleep, education, play, and social participation.[3,5]

In general, there are two main approaches for cognitive rehabilitation: one is the bottom-up approach and the other one is the top-down approach. The bottom-up approach is impairment-based and focuses on performance components and cognitive and perceptual skills.[6] Conversely, the top-down approaches focuses on occupational performance despite cognitive impairment.[7] In the past, occupational therapists implemented bottom-up approach to improve abilities by retraining particular cognitive-perceptual functions through paper and pencil tasks, tabletop activities, computer-based tasks, and virtual reality. However, a limitation of the bottom-up approach is the generalization or transfer of learning skills in the training session to a person's context or environment. The results of interventions utilizing a bottom-up approach did not show how specific skills are related to task performance and cognitive processing.[8] Moreover, paper and pencil tasks, tabletop activities, computer-based tasks, and virtual reality were not considered occupation-based practices and thereby did not focus on facilitating meaningful occupations based on clients' desires. On the other hand, the top-down approaches focus on an individual's participation in occupation rather than improving function or performance components by providing internal and external strategies or adaptation of the activity demands or environment in order to use the patient's cognitive abilities to replace their limitation of cognitive function.[9]

There are models, intervention approaches, and techniques that contain information processing strategy training such as the Multicontext Approach[8], the Cognitive Orientation to Daily Occupational Performance (CO-OP) approach[10], and the PRPP System of Intervention.[11] The implementation of the top-down approach with acquired brain injury (ABI) tends to increase, especially in the PRPP System and the Multicontext Approach. Nagelkop *et al*.[12] were applied the Multicontext Approach with a 41-year-old ischemic stroke to increase online awareness of performance, strategy use, and functional performance. Recently, Jaywant *et al*.[13] used the Multicontext Approach in a single case series with ABI which provided guided questioning and self-generation of strategies practiced across everyday functional cognitive tasks. The results of these two studies showed a positive change in self-awareness and cognitive strategy uses.[12-13] Similarly, the study of White *et al*.[14] used the PRPP System of Task Analysis with stroke patients to measure occupational performance and figure out strengths and difficulties in cognitive strategy uses. In addition, Lindstad *et al*.[15] applied nine sessions of the PRPP System of intervention for application in community-based rehabilitation with older adults with cognitive impairment following stroke to increase performance in everyday tasks. Presently, Smith *et al*.[16] applied the PRPP assessment to examine the effectiveness and relevance of this measurement with two Aboriginal Australian people in the Northern Territory of Australia following ABI. The finding of this study presented the PRPP assessment assessing change in cognitive strategy application over a 6-month period.[16] In Thailand, there is a research limitation about applying top-down approach to enhance functions in stroke patients with cognitive impairments. Juntorn *et al*.[17] were perceived as the first study that combined the intervention between the PRPP System of Intervention and the Four-Quadrant Model (4QM) of Facilitated Learning to examine the effect of information strategy training for children with learning disabilities. However, no research or evidence applied the combination of the PRPP System and the Multicontext Approach to provide cognitive strategy training for stroke patients in Thailand and foreign countries.

In this study, the researchers intend to combine two top-down approaches namely, the Multicontext Approach and the PRPP System of Intervention, to promote the performance of stroke patients who have cognitive impairment. The Multicontext Approach is based on the Dynamic Interactional Model which emerged from cognitive and educational psychology in 1992 by Toglia. This approach is a metacognitive strategy-based intervention that focused on practicing a specific cognitive strategy in multiple contexts, with a variety of meaningful activities, and with several techniques.[8] The PRPP System of Intervention and the PRPP System of Task Analysis were based on the Occupational Performance Model (Australia) (OPMA) which was developed by Chapparo and Ranka in 1997. The intervention programs in the PRPP System of Intervention provided a sequence of processing strategies "Stop/Attend, Sense, Think, Do" which are provided through physical, verbal, and visual prompts.[11] In this study, the intervention is based on a cognitive strategy training protocol that focused on using cognitive strategy training and self-awareness training in various contexts while the participants perform IADL tasks on their needs and desires. From this viewpoint, this study emphasized on observation difficulties in performing task and strategy usage in information processing systems through information processing theory and explored task mastery of the participants through observable information processing behaviors while performing the tasks. In this study defined task mastery is a person's skill that is measured against what is expected of a person within the

environment where the performance usually occurs. However, the cognitive skills in cognitive strategy training protocol, combining the PRPP System of Intervention and the Multicontext Approach, was based on the information processing theory[11]. The PRPP System views the skills of cognitive function through the descriptors in each sub-quadrant of the PRPP System of Task Analysis[11], descriptors are also called cognitive behaviors as depicted in Figure 1. While the Multicontext Approach views the skills of cognitive function were metacognitive skills which are also called higher-level cognitive skills including self-awareness and executive function. In addition, the cognitive function of the processing strategy in this approach consists of attention, visual processing, memory, organization, and problem solving skills.[8]

This study had two purposes. The first purpose was to examine the task mastery of stroke patients during the performance of the IADL tasks, and the second purpose was to examine the effects of the cognitive strategy training protocol on cognitive performance in stroke patients.

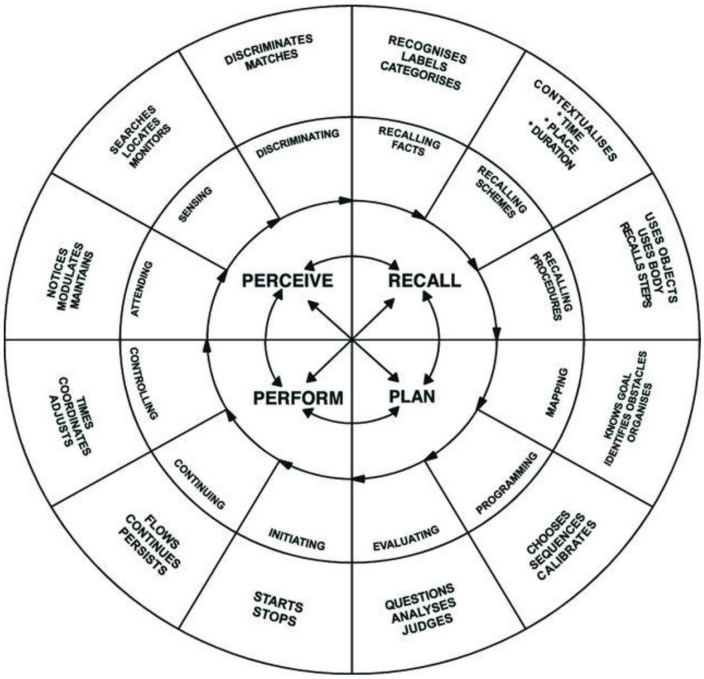

Figure 1. *PRPP System of Task Analysis: a conceptual model of information processing behaviors*[11]

Materials and methods

Participants

Eight stroke patients with cognitive impairment who received occupational therapy services in hospitals, institutes, or rehabilitation settings in Chiang Mai and Bangkok participated in this study. The sample size was calculated using the G*power program (version 3.1.9.4)[18] based on the study of Nott, Chapparo, and Heard,[6] with effect size=0.92, α error probably=0.05, power (1-β error probably)=0.8, and correlation among repeated measures =0.001. The inclusion criteria were stroke patients with cognitive impairment between 6-24 months after the first onset of stroke, 18-70 years old, had cognitive impairment (MoCA or MoCA-B score ≤24), had zero to mild depression conditions as measured by the Patient Health Questionnaire (PHQ-9)-Thai version, did not have aphasia (motor, sensory, and global aphasia), and did not have diagnostic psychotic disorders.

Instrumentation

The Montreal Cognitive Assessment (MoCA)-Thai version and the Montreal Cognitive Assessment Basic (MoCA-B)-Thai version were used to screen for cognitive impairment. The cut-off score of MoCA-Thai version was below 25[19] and 1 point was added for individuals having ≤ 6 years of education. The sensitivity and specificity of the MoCA-Thai version in Thai elderly were 0.80 and 0.80, respectively, for a mild cognitive impairment.[20]

The MoCA-B-Thai version was developed from MoCA to detect mild cognitive impairments for participants who had low educational attainment. Scoring in this instrument included adding 1 point for individual had ≤4 years of education, and adding 1 point with low educational attainment. The optimal cut-off score is 24 out of 25. This test presented a test-retest reliability of 0.91 (p<0.001) and had an internal consistency of 0.82.[21]

The PHQ-9-Thai version was used to screen for depression of the participants. It is a self-reported screening diagnostic instrument used for making criteria-based diagnoses of depressive and other mental disorders. The PHQ-9-Thai version showed internal consistency, a Cronbach's alpha=0.79, and displayed moderate convergent validity with the Hamilton Rating Scale for Depression (HAM-D)-Thai version, r=0.56; p<0.001. The cut-off score of this instrument was ≥9.[22]

The Canadian Occupational Performance Measure (COPM) 4th Edition was also used to select IADL activities in this study. It is a semi-structured interview, asking the participant to identify problem areas (self-care, productivity, and leisure) in daily function and scoring for satisfaction and performance.[23] The 4th Edition of COPM examined the test-retest reliability in 30 Thai stroke survivors and their family caregivers. The Spearman's rho correlation coefficient of the test-retest performance and satisfaction scores for the stroke survivors were 0.88 (p<0.001) and 0.956 (p<0.001). The Spearman's rho correlation coefficient of the test-retest performance and satisfaction scores for the family caregivers were 0.99 (p<0.001) and 0.992 (p<0.001).[24]

The outcome measurement in this study is the PRPP System-Thai version which was developed by Munkhetvit[25] to be used in the Thai context. It applies procedural task analysis to break down occupational performance into measurable elements and considers related criteria for evaluating one's abilities of occupational performance through systematical-process observation. This outcome measurement is separated into two stages. Stage One is the procedural task analysis that is used to indicate an error during the performance. The therapist must break down the unit of activity task into steps to be performed and record the participant's errors. Four error types have been divided including errors of accuracy, repetition, omission, and timing. The interpretation of each score will be indicated as a percentage score of the actual task performance which is termed the level of task mastery. Stage Two focused on observable processing strategies (in this instrument called "descriptors") considered regarding processing behaviors in which the participant has difficulty performing the task in each of the four quadrants of the PRPP System as illustrated in Figure 1. Task performance is broken down into processing strategies in Stage Two, while these descriptors become the criterion for which cognitive elements of task performance are to be considered. The therapists analyzed the behaviors and errors of participants during the performance through videotaped performances by using the Stages One and then using the Stage Two, to identify and accurately record more of the details of descriptor performance. The PRPP System-Thai version has been examined for psychometric properties in Thai clients who suffer from an ABI. It showed high inter-rater and test-retest reliability.[25] Stage one was analyzed for task mastery, and Stage Two was analyzed to examine the effect of the cognitive strategy training protocol.

Intervention

The intervention of this study, called a cognitive strategy training protocol as presented in Figure 2, was the combination of the PRPP System of Intervention and the Multicontext Approach. It was implemented in stroke patients with a cognitive impairment through performing IADL tasks which the participants had the opportunity to perform both in the hospital and in their environments. The intervention protocol included 12 sessions. Each session was administered for 60 minutes per day, three times a week, for a period of 4 consecutive weeks. The participants were asked to complete and prioritize five activities or tasks according to their needs and desires by the COPM. These first two IADL tasks were used for training with the cognitive strategy training protocol. Each session of the protocol consisted of 3 phases including the beginning phase (10-15 minutes), the intervention phase (30-35 minutes), and the ending phase (10-15 minutes). Starting with the beginning phase, the participant was asked to anticipate any problem that might occur before the intervention phase and rate the levels of difficulties or challenges. Afterward, the researcher provided the opportunity for the participant to generate strategies or to guide strategy choices when needed. The intervention phase was divided into three parts including error detection, strategy training, and relearning of strategy uses. The participant must self-evaluate to find an error in specific tasks while the researcher asked a guided question to facilitate self-assessment and strategic thinking and

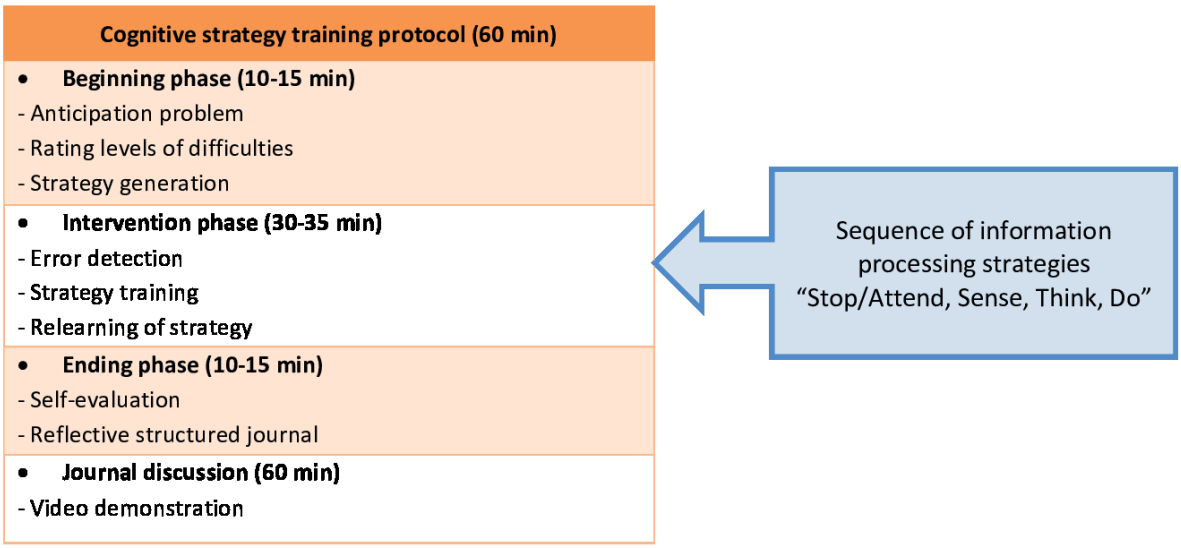

Figure 2. *Cognitive strategy training protocol.*

generation. When the participant encountered a challenge while performing the task, the researcher provided the sequence of information processing strategies "Stop, Sense, Think, Do" of the PRPP System of Intervention. Moreover, the participant learned the effective strategy used and was linked to the previous activity experiences in the relearning of strategy uses part. The ending phase included two parts: self-evaluation and a reflective structured journal. The self-evaluation required the participant to indicate and rate the level of difficulties and strategies used and experienced during the intervention phase. Using a reflective structured journal facilitated to the production of self-monitoring, connecting the strategy to other tasks, and establishing a goal for the next session interventions. Each activity session of intervention was included in the three main phases listed above except sessions 6, 9, and 12. The journal discussion involved a video demonstration in session 6, 9, and 12. The journal discussion helped the participant learn through another's experience and they could discuss their errors and strategies used by watching the video demonstration of the tasks being performed. Examples of activities included meal preparation, personal device caring, clean-up, making a telephone call, making a planner, arranging pills in a pill organizer, and creating a weekday schedule. In order to decrease the limitation of motor problems of the participant, the researcher did provide adaptive/assistive devices or equipment to facilitate the participants who could not use two hands properly in task performance. For example, providing a larger handle for optional choices in clean-up tasks, and preparing a meal.

Procedures

The participants who met the criteria were asked to accept and sign an informed consent form and were asked to complete and prioritize five activities or tasks by the COPM. The researchers asked the participants to perform the first two tasks from their COPM's list. The participants were videotaped while they were performing the tasks. The video clips of the participants were sent to the occupational therapist who did not involve in the intervention to score using the PRPP System-Thai version. Scores obtained from this stage were the pre-test scores. After that, all participants received the intervention three times a week for 4 consecutive weeks, approximately 60 minutes per day. After the intervention period was over, the participants were asked to perform the two tasks again and were videotaped while they were performing the tasks. The video clips were sent to the same therapist for scoring using the PRPP System-Thai version. Scores obtained from this stage were the post-test scores. Scores from Stage One Analysis of the PRPP System-Thai version were analyzed to determine the task mastery and were presented as the mean, standard deviation, and percentiles. Scores obtained from Stage Two Analysis of the PRPP System-Thai version were computed to compare the disparity between pre-and post-intervention using the Wilcoxon signed-rank test (see Figure 3 for the details). Ethical approval was obtained by the review board. All participants signed a consent form verbal and written explanation of the study was provided.

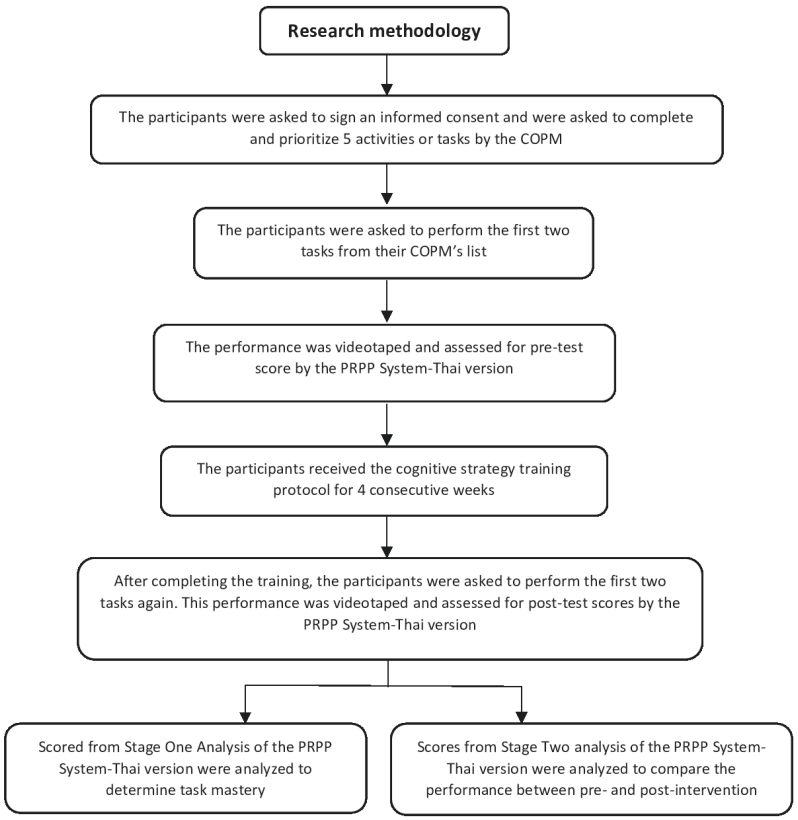

Figure 3. *Summary of research methodology.*

Results

The demographic characteristics of the participants are divided into two parts. The first part is characteristic of the participants who met the inclusion criteria is presented in Table 1. The other part is the scores from the screening tests which are depicted in Table 2.

From Table 1, there were 8 stroke patients, 4 males, and 4 females, participated in this study. The average age was 63±8 years old. The average level of education was 7±5 years. The average onset of the first stroke was within 6±7 months. Most of them (75.00%) were married, 62.50% were retired, and 87.50% were diagnosed with ischemic stroke. All participants were right-handed dominant. The number of brain-side lesions was equal, in that there were 4 left-sided strokes and 4 right-sided strokes.

From Table 2, most of the participants were at the Brunnstrom stage of motor recovery in stage 6 (62.50%) while there was only one participant who was in stages 1, 3, and 4 (12.50%). The average MoCA and MoCA-B scores were 13.50 and 11.33 respectively. The average PHQ-9 score was 2.25.

Table 1 Demographic characteristics of the participants (N=8)

Characteristic	Min-Max	±SD	N	Percentage
Age (year)	46-70	63.12±8.03	8	-
Year of education	3-16	7.00±4.63	8	-
Onset (month)	6-24	6.25±7.38	8	-
Gender				
Male	-	-	4	50.00
Female	-	-	4	50.00
Marriage status				
Single	-	-	2	25.00
Married	-	-	6	75.00
Disability				
Left hemiparesis	-	-	4	50.00
Right hemiparesis	-	-	4	50.00
Diagnosis				
Hemorrhage stroke	-	-	1	12.50
Ischemic stroke	-	-	7	87.50
Hand dominance				
Left side	-	-	0	0
Right side	-	-	8	100.00
Job				
Merchant	-	-	1	12.50
Private business	-	-	1	12.50
Secretary	-	-	1	12.50
Retire	-	-	5	62.50

Table 2 Scores obtained from screening tests (N=8)

Characteristic	Min-Max	$\bar{x}$ ±SD	N	Percentage
Brunnstrom stage of motor recovery				
Stage 1	-	-	1	12.50
Stage 3	-	-	1	12.50
Stage 4	-	-	1	12.50
Stage 6	-	-	5	62.50
MoCA scores	12-15	13.5±2.12	2	-
MoCA-B scores	9-14	11.33±2.25	6	-
PHQ-9 scores	0-5	2.25±1.75	8	-

Task mastery

The percentage of task mastery in all tasks is analyzed from Stage One of the PRPP System-Thai version. All performances were estimated against a pre-determined criterion of 100%. However, in this study, each participant was asked to select only two tasks and perform them. The percentage scores of task mastery from Stage One of the PRPP System is presented in Figure 4. The findings show that before the intervention, all participants had scores lower than the criterion of 100% and showed below the expected task mastery. After the intervention, every participant had higher scores of the post-test percentage scores of Stage One of the PRPP System for at least 1 activity even though some still had scores below 100%. Most of them (5 out of 8) showed higher scores in both activities but some participants indicated lower scores after the intervention in one out of two activities, and one participant showed equal pre-test and post-test scores.

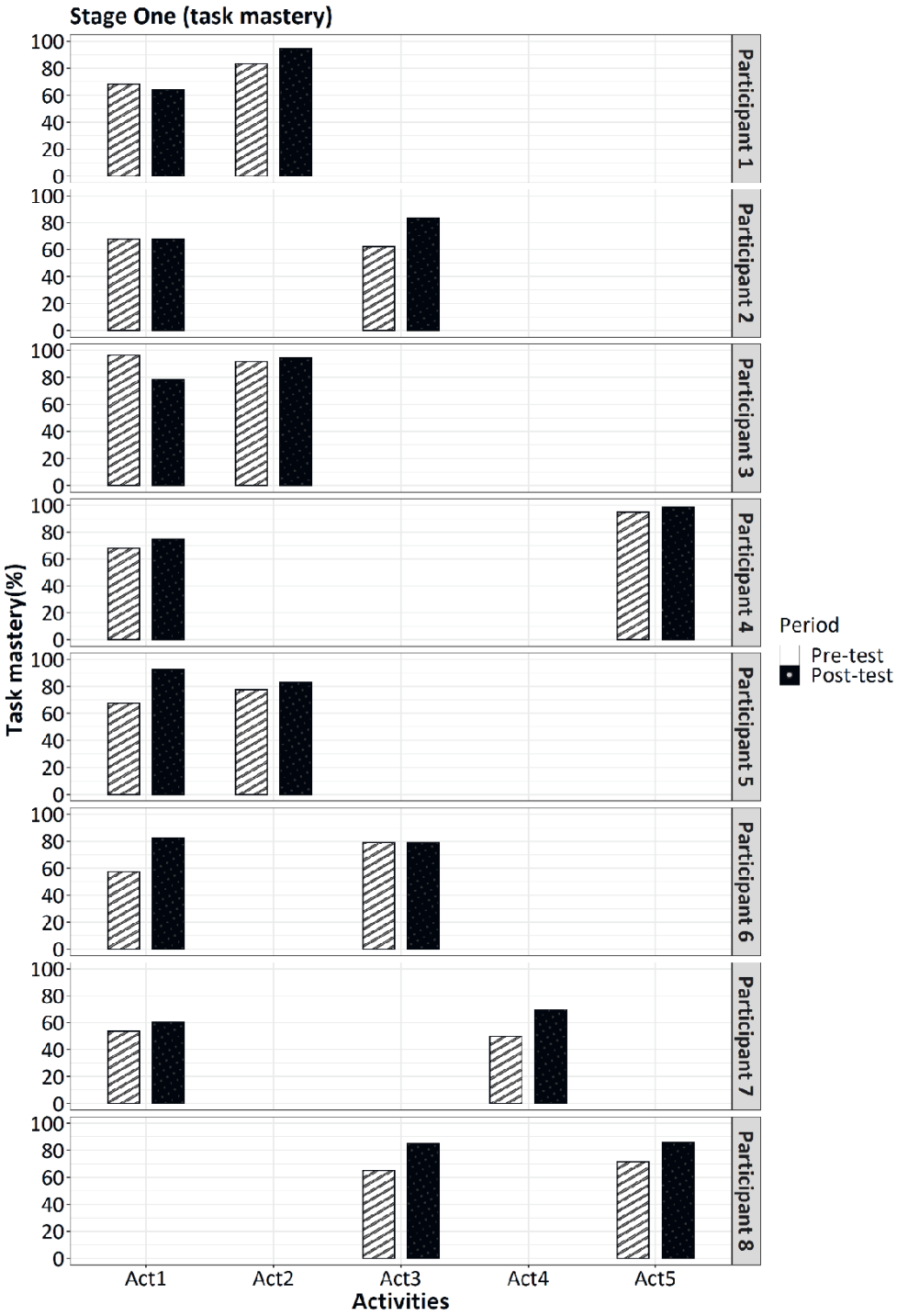

Figure 4. *Percentage scores of Stage One of the PRPP System-Thai version in the two tasks of each participant.*

The cognitive performance

After receiving the cognitive strategy training protocol, the cognitive performance of the participants was obtained from the scores in Stage Two of the PRPP System-Thai version that were computed using the Wilcoxon signed-rank test and was presented in Table 3. The analysis results of activity 1 show positive ranks for 3 persons, negative ranks for one person, and ties of scores occurred in 3 participants. In activities 2 and 3, only one person received a positive rank, 2 people had ties of scores, and there were no negative ranks. Although activity 5 presents all positive ranks for all participants, activity 4 shows ties occurring in only one person. Notwithstanding, the overall tendency of the results seem to be positive, as there were no differences of statistical significance within the cognitive strategy training protocol (p>0.05). However, the descriptive-analytic results of the post-test percentage scores of Stage Two of the PRPP System as depicted in Figure 5, 4 out of 8 participants had higher scores for at least 1 activity even though still had scores below 100%. Two participants presented higher scores in both activities. Nonetheless, one participant showed lower scores after the intervention in one out of two activities, and some participants also indicated equal pre-test and post-test scores. The tendency of enhanced performance of the participants after the intervention despite the significant difference was found.

Table 3 Change in ability for each activity of the participants (N=8).

Wilcoxon Signed Ranks Test					
Stage Two (Posttest-Pretest scores)		**N**	**Mean rank**	**Sum of ranks**	***p* value**
Activity 1	Negative ranks	1	2.00	2.00	0.273
	Positive ranks	3	2.67	8.00	
	Ties	3			
	Total	**7**			
Activity 2	Negative ranks	0	0.00	0.00	0.317
	Positive ranks	1	1.00	1.00	
	Ties	2			
	Total	**3**			
Activity 3	Negative ranks	0	0.00	0.00	0.317
	Positive ranks	1	1.00	1.00	
	Ties	2			
	Total	**3**			
Activity 4	Negative ranks	0	0.00	0.00	-
	Positive ranks	0	0.00	0.00	
	Ties	1			
	Total	**1**			
Activity 5	Negative ranks	0	0.00	0.00	0.180
	Positive ranks	2	1.50	3.00	
	Ties	0			
	Total	**2**			

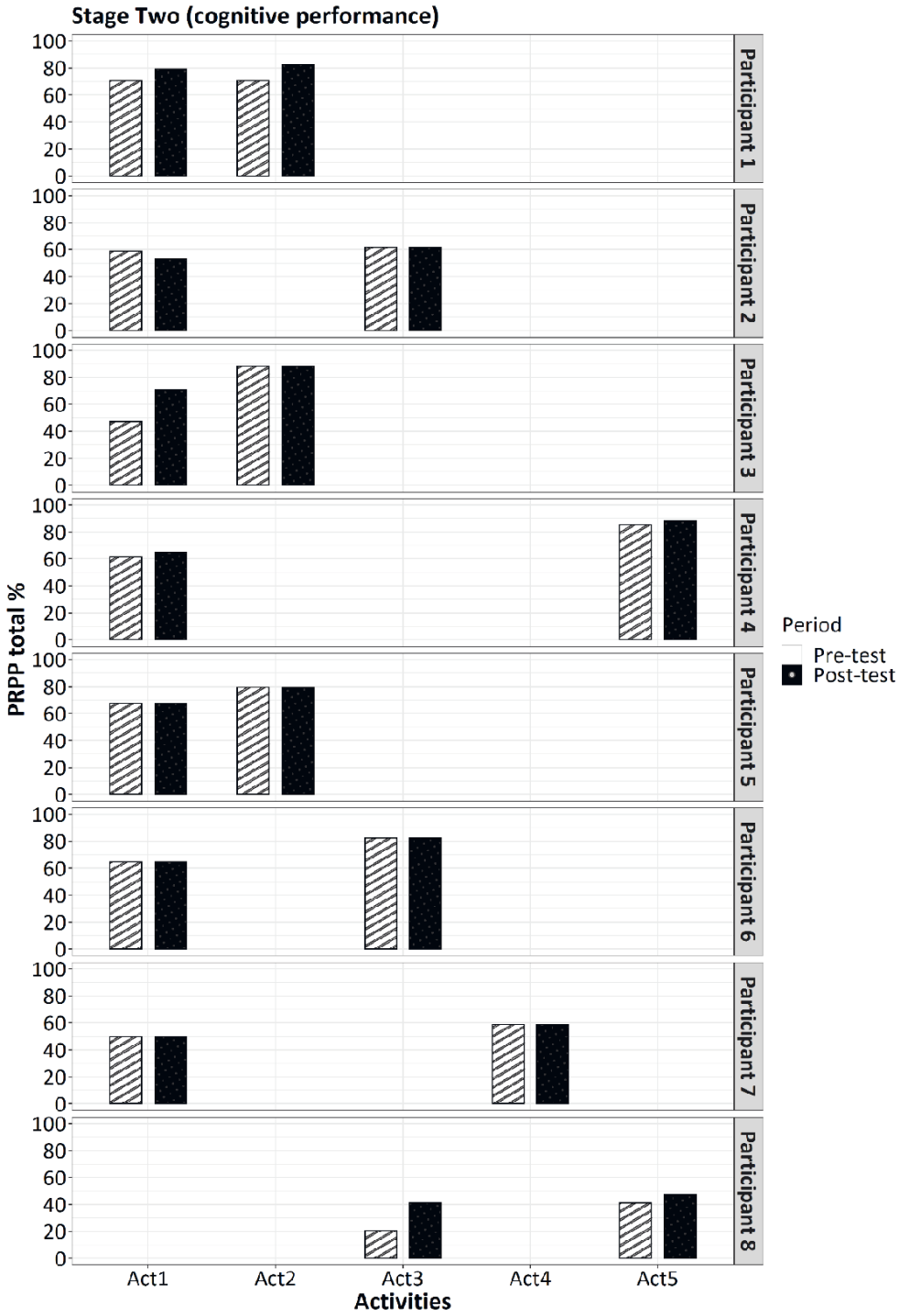

Figure 5. *Percentage scores of Stage Two of the PRPP System-Thai version in the two tasks of each participant.*

Discussion

This study aimed to examine the task mastery of stroke patients during the performance of the IADL tasks and to examine the effects of the cognitive strategy training protocol on cognitive performance in stroke patients. According to the definition of the term in this study, task mastery is an individual's skill that is measured against what is expected of a person where the performance usually occurs within the environment. In this study, activities in the protocol were divided into two groups. The first group performed easier tasks that included 7 steps, which required 3 to 4 pieces of tools and materials per task; involved the orientation to time, place, and person in daily living; and included activity 3 (making a calendar) and activity 1 (making a weekly planner). These activities facilitated to the improvement of self-awareness, recognizing present events, recalling the past, predicting the future in daily living situations, and helping the participants organize their thoughts, plans, decision-making, and usage strategies while performing. The other group performed more difficult activities that required more complex skills, including 10-14-step tasks,

which required 4-9 tools and materials per task, and performing the task with another person. This group performed activity 5 (making a telephone call), activity 2 (arranging pills in a pill organizer), and Activity 4 (hot drink preparation).

From the results of Stage One of the PRPP System, the participants tended to improve their task mastery after the cognitive strategy training protocol, especially the participant who performed the more difficult activities (Activities 2, 4, and 5). These activities provided an opportunity for the participants to use multi-strategies while performing the challenging tasks. Multi-strategy training may help the participants by providing more choices of strategies to apply to their performance when needed.[26] The helpful concept of the Multicontext Approach involves practicing specific strategies and many techniques by asking and guiding the participants before, during, and after the task to facilitate participants to anticipate problems, generate their strategies, discover their errors, and evaluate their performances when completing the tasks. In addition, the combination of the Multicontext Approach and the PRPP System of Intervention in this study also probably increased the positive task mastery of the participants. The sequence of information processing strategies termed "Stop/Attend, Sense, Think, and Do" of the PRPP System of Intervention focuses on using specific strategies to guide and address the errors for each participant. However, the participants who performed the easy task group, especially Activity 1 (making a weekly planner), showed no change in scores, and some participants had decreasing scores when compared with pre-test scores because the activity may have been too easy and did not challenge their cognitive abilities.

Interestingly, the three phases of the cognitive strategy training protocol also enhanced to improve task mastery among the participants. Following the beginning phase, the anticipation of problems and self-strategy generation probably showed more changes in self-awareness and level of task mastery by observation than by self-rating levels of difficulties. Likewise, the intervention phase and ending phase of the cognitive strategy training protocol seemed to be effective too. Particularly, the reflective structured journal of the ending phase may contribute to the participant rechecking their performance, figuring out problems, learning from experience, identifying strengths and weaknesses, and creating plans for future performance.[27] Moreover, video demonstrations presented during discussion sessions may help the participants to learn through another's experience and the participant can train to clarify the happening errors and assess the strategic behaviors of another person by watching them performing tasks.[28] Furthermore, this study applied the two IADLs for each participant which were obtained following their needs and desires as measured by the COPM. Because using meaningful and relevant activities impacts participants to compensate or adapt by using new cognitive strategies.[29] Applying predictable and familiar tasks can increase the motivation of the participants to intently perform the tasks leading to more active engagement in performance.[26,30]

The second purpose of this study was to examine the effects of the cognitive strategy training protocol on cognitive performance. The findings presented that after the cognitive strategy training protocol, the pre-test and post-test scores showed no significant difference (p>0.05) despite the tendency to increase performance both from Stage One Analysis and analysis of the raw scores in Stage Two. Many factors might be considered as affecting cognitive performance change. Firstly, the characteristics of the participants include age, years of education, jobs, and levels of cognitive performance. Most of the participants (7 out of 8) in this study were aged over 60 years, possessed undergraduate degrees, and had low cognitive scores on the MoCA/MoCA-B; 13.50 and 11.33 respectively. A review of risk factors for cognitive impairment in stroke survivors found that one of the major predictors for cognitive impairment was increased age and a lower level of education.[31] By its very nature, stroke can expedite cognitive decline in older adults, influence novel learning, and can lead to slow response to cognitive stimulation. Similarly, an individual having a higher education level as a stroke victim probably does not influence cognitive performance very much since they have a larger brain storage capacity allowing for compensation for the damaged brain.[32] Moreover, patients with a low level of cognitive performance tend to gradually respond to strategy training.[33] Secondly, the characteristic of the intervention protocol might be another factor that results in little or no cognitive performance changes discovered in this study as well. Recently, systematic review and meta-analysis of the effectiveness of intervention protocols to improve ADL performance in neurological adults indicated mixed results. In forty-one studies, the intervention time ranked from 30-120 minutes/session. The duration time of intervention ranged from 1 to 16 weeks, and the frequency was between 1 and 5 days per week.[34] This study provided a duration time of about 60 minutes per day, 3 times a week for 4 consecutive weeks. The duration and frequency of this study might not be sufficient and intense enough for patients with severe cognitive impairment or those having low levels of education to show a cognitive change. Furthermore, the cognitive strategy training protocol might not fit low levels of cognitive function. IADL tasks done by low-level cognitive functioning participants are too hard to complete without guidance and as such they do not show an obvious change in their performance outcomes. Similarly, the level of difficulty of the activities in this study might be one of the influencing factors as well. According to the Dynamic Interactional Model perspective, more complicated tasks demand more time and effort to process and may be related to the use of multiple strategies.[29] Even if IADL tasks in this study were obtained based on the needs and desires of the participants expressed by the COPM, these selected tasks appeared to be too easy and were apparently not very challenging activities. Finally, this study is a preliminary study, combining the PRPP System of Intervention and the Multicontext Approach,

was applied the top-down, occupation-based assessment, and intervention in Thai clients with stroke. The finding of this study might affirm the effectiveness of cognitive strategy training protocol to improve task mastery and cognitive performance during the instrumental activity of daily living in stroke patients in Thailand.

Limitations

There are some limitations of this study that need to be considered. The results from this study might not be generalized to the overall population due to the small sample size. likewise, there was no control group to compare with conventional interventions or to eliminate the effect of simultaneous recovery. Consequently, future research with a larger sample size having higher levels of cognitive function with a younger group of participants, having higher levels of education along with a control group is recommended. Similarly, having various levels of difficulty among the activities and having a variety of tasks within several environments and contexts are also suggestions for further study. In addition, increasing the frequency and duration of time intervention might show better cognitive performance outcomes.

Conclusion

It was found that most of the participant's post-test scores in both Stage One and Two of the PRPP System-Thai version showed higher than pre-test scores in both activities. It is possible that task mastery and cognitive performance can be improved while performing the IADLs tasks despite no statistically significant difference (p>0.05) was found. Therefore, future research with a larger sample size having higher levels of cognitive function with a younger group of participants having higher levels of education along with a control group is recommended.

Conflicts of Interest

The author declares no conflict of interest regarding the publication of this paper.

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