ORIGINAL ARTICLE

Effectiveness of Mindfulness and Self-Regulation Program on Healthcare Behaviors among Stroke Patients: A Randomized Controlled Trial

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Background: Stroke is the second cause of Thai death after cancer. Therefore, stroke patients need to change their healthcare behavior (HB) for sustainable recovery.

Objective: To study the effectiveness of mindfulness and self-regulation program (MSRP) on the HB and to analyze the interaction between family social support (FSS), and MSRP on HB of stroke patients.

Materials and Methods: The randomized controlled trials (RCTs) were designed to test the program's effectiveness. Fifty-eight stroke patients at the Neurological Institute participated in this trial. This was calculated by using G*Power 3.1 at power 0.85. Random assignment was used to allocate 28 participants in the experimental and 30 in the control group. The data were collected from the Likert rating scale with a Cronbach's reliability of 0.934 to 0.989. The MSRP ran for five weeks with five activities between April and December 2021. T-tests and two-way ANOVA were used for data analyses.

Results: After participation, stroke patients had a mean HB of 5.32 (SD 0.423) and were at a high level. The MSRP was effective, significantly enhancing HB. Additionally, the experimental group had a higher HB than the control group and higher than before participation in the intervention (p<0.05). The present study found that the interaction between FSS and the MSRP affected HB.

Conclusion: This MSRP should be used to initiate promoting the HB of stroke patients.

Keywords: Mindfulness; Self-regulation; Strokes; Healthcare; Health behavior; Health Program

Stroke is a chronic non-communicable disease (NCD) that causes premature mortality and results in the loss of life on a global scale. The World Stroke Organization[1] estimated that 13.7 million new cases of stroke occur each year, 5.5 million deaths per year, and 80 million people worldwide are still alive after a stroke. In Thailand, stroke is an important public health problem. According to the latest statistics in 2019, it was found that stroke was the second leading cause of death in Thailand after cancer. According to the information in 2018, there were 30,837 patients, representing a mortality rate of 47.15 per 100,000 population, and in 2019, there were 34,728 patients, representing a mortality rate of 53.0 per 100,000 population[2]. Stroke is caused by the blockage or rupture of a blood vessel supplying to the brain resulting in damage or destruction of brain cells, which has different effects depending on where it occurs in the brain. The patient's body, movement, speech, thoughts, and feelings are all affected[3]. Stroke has a chance of recurrence. Therefore, it is essential to effectively control the risk factors by educating patients about stroke and making the right changes in health behaviors and lifestyles to optimize disease prophylaxis and minimize recurrence[4-6].

Therefore, it is crucial for the patients to pay attention at changing their behaviors to healthcare behavior (HB) to control their disease and prevent recurrence. Changing lifestyles to be appropriate and encompassing physical, mental, and social dimensions

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are therefore a sustainable solution. Currently, there have been studies of the HB of patients in terms of physical, mental, and emotional lifestyle including diet, smoking cessation, unhealthy alcohol use, medication use, exercise, rehabilitation, physical activities, rest, illness prevention and treatment, mental health and stress management, ongoing treatment and prevention of complications, spiritual development, and interpersonal relationships[5-8]. Thus, the HB of stroke patients in the present research consisted of diet, exercise, medication, and stress management. When patients have the ability to take care of themselves physically and mentally, they will be able to adapt to society and have good relationships with others.

Stroke patients are a group of people who need to change their self-care habits in a sustainable way because it is one of the factors that contribute to disease recurrence. Studies have shown that individuals are more likely to maintain this behavior if they were physically and mentally prepared[9]. There were studies on the program implemented in the NCD group. In the studies of positive psychology programs among patients with NCDs, most of the research found that mindfulness and self-regulation had a high influence on the outcomes of the patients[10]. A review of literature and research suggests that positive psychology is applied in the care of NCDs, which has been shown to improve outcomes in psychology, health, and lower mortality rates. Patient well-being results in lower mortality in patients with chronic diseases[11,12]. At present, mindfulness practice, which is a concept of positive psychology, has been applied to reduce stress and benefits the health of stroke patients. It is found that patients have a better quality of life in all aspects. Mindfulness practice for mental and physical well-being helps patients learn to deal with diseases and manage stress, as observed with lower blood pressure levels after mindfulness practice[13,14]. There is an application of mindfulness practice in conjunction with healthcare in stroke patients. Mindfulness has been found to improve early mindfulness skills, reduce physical and mental tension, and increase attention and determination. Mindfulness practice is a long-term treatment for mental fatigue after a stroke and has been shown to reduce muscle spasms in patients with chronic stroke[15-17]. According to the concept of Kabat-Zinn[18], mindfulness is awareness, which consists of two components, attention to the present and an attitude of openness and acceptance in the present moment. For the change in health behavior,

mindfulness can help develop self-awareness and awareness of one's own thought processes. It facilitates openness and acceptance of ideas with calmness, which is a process of mindfulness to the lack of self-awareness to behavior and change behavior[19,20].

Self-regulation is a process where a person makes a plan and direct their own behaviors with the purpose to change their behaviors to the target behaviors. It is a process that requires practicing and developing to achieve behavioral change. Self-regulation consists of three processes, self-observation through goal setting and self-monitoring, self-judgments, and self-reaction[21]. According to the study on the effectiveness of telephone follow-up to set a goal of HB among stroke patients, the program used in the experimental group was a goal-setting program, a procedure for self-regulation. The study results showed that the telephone follow-up had effectiveness to increase consistency in medicine taking among stroke patients[7]. Besides, there was a study through systematic review about the use of self-management among stroke patients. Most of the used programs emphasized the most common components, such as information giving, goal setting, planning, and problem-solving. All of the programs gave importance to the psychosocial aspect in addition to physical factors. The study results found that after receiving the self-management program, patients gained more knowledge and self-efficacy including self-management behaviors, HB adjustment about physical rehabilitation and daily life activities, social activities, quality of life, and perceived emotions of participants, with the reduction of undesirable outcomes like dependence and death[22,23].

Social support is one of the factors influencing health behaviors. Family support is an environmental factor that plays an important role in the recovery from illness. When patients receive support from family members in various ways, it gives them encouragement, understand the problem, and fight it. It also affects the good quality of life. From the literature review, family involvement is the action taken by family members to gain comfort by taking care of family members during hospital admission. Families involved in care in many ways, such as helping with meals and brushing teeth, activities for comfort and assist in patient posture or joint movement or exercise[24]. The study found that to improve the patient's quality of life, health personnel and family members, in addition to providing physical assistance should also provide emotional
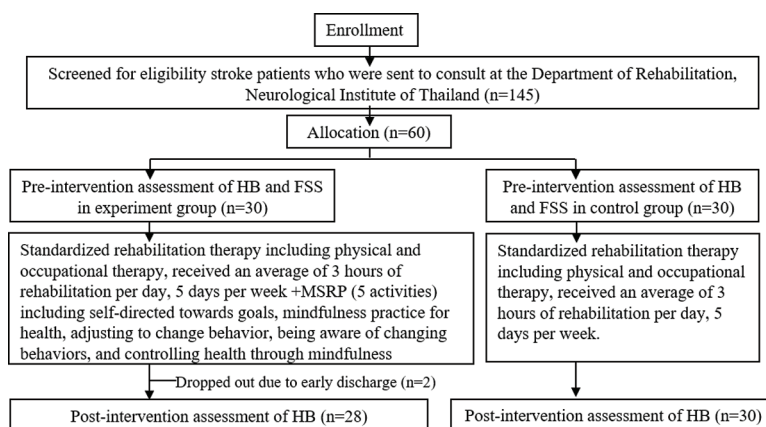
Figure 1. Flow chart of the study. MSRP indicates mindfulness and self-regulation programs.

support. Social support is important for social activity participation, rest, and return to work in stroke patients[25,26].

Consequently, the researchers were interested in studying the effect of mindfulness and self-regulation programs (MSRP) affecting HB among stroke patients since only one concept is not enough to change self-care behaviors. It is believed that when patients have mindfulness, awareness, acceptance, and attention to the present, they should be able to express those behaviors through self-regulation, leading to the HB adjustment in terms of physical, mental, and social aspects in a sustainable manner.

Materials and Methods
Setting and subjects
The present study used randomized controlled trials (RCTs) conducted to study the effectiveness of MSRP on HB of stroke patients at the Neurological Institute of Thailand. The study, including evaluation and intervention, was conducted at a physiotherapy unit. Participants were in-patients referred for rehabilitation counseling at the rehabilitation department in the hospital where the present study was conducted.

The inclusion criteria were patients diagnosed with a stroke aged 20 to 80 years, was communicable by stroke severity scores based on the National Institutes of Health Stroke Scale where item 1a (level of consciousness), item 1b (questions), and item 1c (commands), were 0, Barthel Activities of Daily Living Index Score greater than or equal to 9/20, which is moderately dependent and never received a training program. Exclusion criteria included patients on the nasogastric tube and inability to eat food by mouth, communication problems, dementia, impaired cognition, cannot read and write, and Thai mental state examination test scores equal to or less than 23.

The number of patients was calculated by the G*Power program with a prescribed α level of 0.05 and the researchers set the power of the test at 0.85 and the effective size was obtained based on a previous study[27], which was calculated to be 0.77. Therefore, 50 stroke patients were required, plus 20% of the sample size as the likelihood of drop-out[28]. Thus, a sample size of 60 persons was required. The stroke patients were divided into two groups, using assignment random sampling. Fifty-eight out of 60 stroke patients participated in all activities, 28 in the experimental group, and 30 subjects in the controlled group. Stroke patients in each group were assessed pre-and post-intervention (Figure 1).

Ethical approval and consent to participate.
The present research received ethical approval from the Srinakharinwirot University Board of Ethics Committee with a certificate numbered SWUEC/E/G-117/2564 and the Neurological Institute of Thailand Board of Ethics Committee with a certificate number 64027. Every participant received and signed a consent form with thorough explanation of the program before participating in the trial.

Instruments and procedure
The instruments used in the present study consisted of MSRP referring to the activities that promoted the patient's awareness and acceptance of what was happening at the present moment, recognized their own mental and physical symptoms according to the actual situation without judgment, and be able to self-direct to carry out purposeful

Table 1. Activities of MSRP for the experimental group

MSRP	Activities
Self-direction towards goals	- To give knowledge about stroke and healthcare for preventing the recurrence of the disease.
	- Learning the process of self-regulation and practicing self-regulation skills: self-monitoring and goal setting.
Mindfulness practice for health	- Activities related to healthcare skills in food, exercise, medicine, and stress management including continuous mindfulness practice (body scan) and mindfulness homework on one's own (mindful walking meditation).
	- Practice self-regulation skills for self-judgments by practicing how to create a self-care plan.
Adjust to change behavior	- Practicing self-regulation skills for self-reaction.
	- Continuous mindfulness practice and mindfulness homework on one's own (yoga/mindful movement sequent).
Be aware of changing behaviors	- Follow up on the results of the self-regulation.
	- Continuous mindfulness practice and mindfulness homework on one's own (seated mindfulness meditations/ loving kindness, imagery-based guided meditations).
Control health through mindfulness	- Review all activities for healthy behavior modification.
	- Review mindfulness practices for healthcare.
	- Activities reflect what has been gained from participating.

activities to achieve their own health behavioral goals. The intervention program, developed by the researchers based on a review of the literature, is mindfulness training based on the concept of Kabat-Zinn[18]. Each activity was contextualized for stroke patients based on the previous research[29] and Bandura's concept of self-regulation[21] consisted of three processes, self-observation, self-judgments, and self-reaction. The patients practiced self-regulation by setting goals and recording health behavior data. In addition, they participated in the activities with the technique of group activities once a week, consisting of five activities, namely 1) self-direction towards goals, 2) mindfulness practice for health, 3) adjust to change behavior, 4) be aware of changing behaviors and 5) control health through mindfulness as shown in Table 1.

The questionnaires used in the experimental stage included 1) a general demographic information questionnaire with 12 items, 2) an HB questionnaire that had been developed by the researchers and referred to the operational definition of the actions of stroke patients in diet, exercise taking medicine, and stress management. These were the continuous, intentional, and objective practice by using their abilities and potential to maintain a good quality of life and live in a normal society. The researchers created a measure based on the operational definition. The measure consisted of 31 items. It was a 6-level estimation scale with "most practice" at 6 points and "never practice" at 1 point. The questionnaire consisted of ten items focusing on dietary, nine items focusing on exercise, eight items focusing on medicine, and four items focusing on stress management, with the reliability of 0.939, and 3) family social support (FSS) questionnaire had

been developed by the researchers referring to the operational definition to the perception of stroke patients being supported by their families in various fields, including emotional, informational, instrumental, and appraisal. The researchers created a measure based on the operational definition, consisted of 19 items. It was a 6-level estimation scale in which "most true" was given 6 points and "not true" was given 1 point. There were seven items focusing on emotional support, five items focusing on informational, five items focusing on instrumental, and two items focusing on the appraisal, with a reliability of 0.988.

For the experimental stage, between April and December 2021, the control group received standardized rehabilitation therapy, meaning received an average of three hours per day of rehabilitation at the hospital as an inpatient, five days per week, or at least 15 hours per week. Rehabilitation therapy was determined according to the disability and loss of function of each patient including physical and occupational therapy. The progress of symptoms was monitored by a multidisciplinary team. The experimental group received standardized rehabilitation therapy and participated from the first to the fifth activities of MSRP, which the intervention was based on the concept of Kabat-Zinn[18] and Bandura's self-regulation concept[21]. The MSRP were contextually adjusted to suit a stroke patient with five activities in five weeks.

Content validation: Three experts accepted the MSRP for all activities with the Index of Congruence ranging from 0.67 to 1.00. The program was also revised according to the recommendations of those experts and piloted by some of the stroke patients to determine if this program fitted.

Statistical analysis

First of all, to accurately measure the data collected, a descriptive statistic was employed to determine the mean, standard deviation (SD) values, and percentage (%) to study the demographic information of the participants. For the test of normality, the Shapiro-Wilk test was used. The baseline of demographic characteristics used the chi-square for the comparison of categorical variables. Secondly, the independent-sample t-test was used to compare the mean level of HB between the experimental group and the control group. Thirdly, the paired sample t-test was used to compare the mean level of HB in both groups before and after participating in the program. Finally, two-way ANOVA was used to compare the mean of HB between groups and FSS by IBM SPSS Statistics, version 22.0 (IBM Corp., Armonk, NY, USA). In addition, a two-tailed p-value of less than 0.05 was considered statistically significant.

Results

Demographic data

Sixty participants were included in the present study but two participants in the experimental group dropped out due to early discharge. Therefore, the data of 28 participants in the experimental group and 30 participants in the control group were entered for analyses. The basic characteristics of the two groups are shown in Table 2. Most of the participants were males, aged 31 to 60 years and more than 60 years. The participants were married and graduated at a level of bachelor's degree. Most participants used rights to healthcare schemes and were employed, with a mean monthly income of 20,001 to 30,000 baht and live with their spouse. Most of the participants had underlying diseases, a duration of illness of fewer than three months, and weakness on one non-dominant side of the body. No significant differences were found in the demographic between the two groups.

The independent samples t-test was performed to compare the means of the two groups on the levels of HB after participating in the program. In addition, Levene's test for equality of variances was analyzed, and the assumption of homogeneity of variances was met (p>0.05). Thus, the equal variances assumed part was shown in the result after running the independent samples t-test. Before participation, there was no statistically significant difference between the means of the two groups on the level of HB (p>0.05). After participation, the experimental and the control group had different HB with a statistical significance level of 0.05 (t=–9.406, p=0.0005). It was found that the experimental group had higher scores of HB than the control group, as shown in Table 3.

Paired t-test was used to compare differences in the average scores before and after participating in the program within the experimental group and the control group. The Shapiro-Wilk test for normality was achieved prior to running the t-test (p>0.05). The experimental group had a higher average score of HB in the posttest than in the pretest (t=–15.344, p=0.0005). Stroke patients in the control group had a lower average score of HB in the pretest than in the posttest. According to the statistical test to compare the average scores of HB, the average score of HB in the posttest was higher than in the pretest without a statistical significance level of 0.05 (t=–1.403, p=0.086), as shown in Table 4.

Two-way ANOVA was used to compare HB among patients that participated or not participated in the program, with different FSS. The Shapiro-Wilk test for the normality of two variables was achieved prior to running the t-test (p>0.05). Test results of interaction between patients who participated or not participated in the program and FSS, significance value was 0.046, which was lower than the significance level set at 0.05. It meant that the interaction between participated or not participated in the program and FSS had an effect on scores of HB among stroke patients. The stroke patients who participated in the MSRP and received a high level of FSS had a higher average score of HB at a mean of 5.585, than the stroke patients who did not participate in the MSRP and received a low level of FSS at a mean of 3.587.

At a high level and low level of FSS, the average scores of HB of stroke patients who participated or did not participate in the program were different with a statistical significance level of 0.05. Patients who participated in the program had a higher average score of HB than patients who did not participate in the program. The average scores of HB of stroke patients with different levels of FSS were different with a statistical significance level of 0.05. Patients with a high level of FSS had a higher average score of HB than patients with a low level of FSS, as shown in Table 5.

Discussion

The results of the present study found that HB average scores of the experimental and control groups were different. The experimental group was

Table 2. The biosocial characteristics of participants in the experimental and the control group

Biosocial characteristics	Experimental group		Control group		p-value
	Number (person)	Percentage (%)	Number (person)	Percentage (%)	
Sex					0.800
Male	14	50	16	53.3	
Female	14	50	14	46.7	
Age					0.455
Less than/equal to 30 years	2	7.1	1	3.3	
31 to 60 years	18	64.3	16	53.4	
More than 60 years	8	28.6	13	43.3	
Marital status					0.754
Single	9	32.1	8	26.6	
Married	13	46.5	18	60.0	
Divorced/separated	3	10.7	2	6.7	
Widow/widowed	3	10.7	2	6.7	
Education level					0.067
Primary school	5	17.9	8	26.7	
Secondary school/equivalent	6	21.4	8	26.7	
Bachelor's degree	16	57.1	8	26.7	
Higher bachelor's degree	1	3.6	6	19.9	
Rights to healthcare scheme					0.066
Use rights to healthcare scheme	25	89.3	30	100.0	
Pay medical expenses on one's own	3	10.7	0	0.0	
Duration of illness					0.929
Less than 3 months	25	89.3	27	90.0	
3 to 6 months	3	10.7	3	10.0	
Characteristics of living					0.713
Live with their spouse	13	46.4	14	46.7	
Live with their children/relatives	13	46.4	12	40.0	
Live alone	2	7.2	4	13.3	
Career					0.421
Unemployed	5	17.9	8	26.7	
Employed	23	82.1	22	73.33	
Patients' history of underlying diseases					0.849
Have underlying diseases	18	64.3	20	66.7	
Do not have underlying diseases	10	35.7	10	33.3	
Income					0.184
Less than 10,000 Baht	2	7.1	0	0.0	
10,001 to 20,000 Baht	4	14.3	9	30.0	
20,001 to 30,000 Baht	11	39.3	6	20.0	
30,001 to 40,000 Baht	4	14.3	7	23.3	
More than 40,000 Baht	7	25.0	8	26.7	
The side of the body that is affected					0.259
Dominant side	9	32.1	14	46.7	
Non-dominant side	19	67.9	16	53.3	

higher than before participating in the intervention with statistical significance, possibly because "MSRP is the process of a group activity designed to be consistent with the context of patients with stroke", aimed to strengthen HB among patients with stroke. This is in harmony with a study on a mindfulness program to promote recovery from stroke, increase the ability to live a life among patients with chronic stroke, and help reduce stress levels[29]. The program was adjusted to meet the

Table 3. Comparison of differences of the average scores of HB among stroke patients in the pretest and posttest between the experimental group and the control group

Healthcare behavior	Experimental group (n=28)		Control group (n=30)		p-value
	Mean	SD	Mean	SD	
Pre-experiment	4.05	0.774	3.99	0.591	0.379
Post-experiment	5.32	0.423	4.05	0.592	0.0005*

SD=standard deviation

* p<0.05, statistical significance

Table 4. Test results of the average scores of HB among stroke patients in the pretest and posttest, compared within the group

Healthcare behavior	Experimental group (n=28)			Control group (n=30)		
	Mean	SD	p-value	Mean	SD	p-value
Pre-experiment	4.05	0.774	0.0005*	3.99	0.591	0.086
Post-experiment	5.32	0.423		4.05	0.592	

SD=standard deviation

* p<0.05, statistical significance

Table 5. Comparison results of the average scores of HB among those participating in the program (the experimental group) and not participating in the program (the control group) and FSS at different levels

Level	Mean	SD	p-value
High level of FSS			<0.001*
Participated in the program	5.585	0.087	
Not participated in the program	4.523	0.087	
Low level of FSS			<0.001*
Participated in the program	5.012	0.094	
Not participated in the program	3.587	0.087	
Participated in MSRP			<0.001*
High level of FSS	5.585	0.087	
Low level of FSS	5.012	0.094	
Not participated in the MSRP			<0.001*
High level of FSS	4.523	0.087	
Low level of FSS	3.587	0.087	

SD=standard deviation; FSS=family social support; MSRP=mindfulness and self-regulation program

* p<0.05, statistical significance

group of stroke patients. Furthermore, a study found that social cognitive theory using self-regulation as the conceptual framework can be adapted to be a guideline for developing a program for patients with chronic diseases[30]. The result was consistent with the previous study indicating that mindfulness, self-efficacy, and self-regulation-based psychology program were most applied in the study on health outcomes of patients with chronic NCDs[10,14].

In the present research, the program was designed to meet the context of stroke patients through a series of activities that last for five weeks. Self-regulation was applied to the five series of activities with the following three procedures[21], 1) self-observation, 2) self-judgment, and 3) self-reaction. Self-observation is about self-care behavior, thus, analyzing behaviors that affect their health. Goal setting is done in terms of behaviors that need to be changed or improved, and self-monitoring by recording self-care behaviors in a personal health record book. Data obtained from the self-observation shall lead to the second procedure, self-judgment. Self-judgments is done by making a plan to adjust behaviors as intended. Therefore, a comparison is made between the goal setting and the result. Self-reaction is when self-care met the goal. In the present study, a reward was used as external reinforcement for the experimental group. Self-rewarding was recommended to create internal motivation for self-care. Therefore, internal motivation and external motivation are significant since motivation shall promote the durability of behaviors if it constantly helps people be satisfied with the outcomes from expressing new behaviors[9]. According to the self-regulation process, changes occurred among participants in the experimental group as they were aware of and see the importance of adjusting their self-care behaviors to prevent the recurrence of the disease. They could control their own actions and practiced health behaviors as they set the goal to change things for the better, making their average healthcare score increase. This is consistent with the self-regulation concept of Bandura who believed that behaviors have not resulted from external reinforcement only but from actions to control one's thoughts, feeling, and actions. It is a

procedure that requires practice and development to lead to behavioral adjustment. Self-regulation uses mental resources and shall decrease when it is used in the self-regulation process caused by stress and tiredness, including emotional factors. Therefore, coping with stress and emotional management shall help promote the self-regulation process to be durable[31,32]. Consequently, the experimental group was given mindfulness practice to be aware of and accept what happen to them at present according to the concept of Kabat-Zinn[18]. That concept is to enhance activity of the participants to mental and physical preparedness, to modify self-care behaviors in both physical and mental aspects. This is done through group activities by being aware of each in-breath and out-breath as the main activity of mindfulness practice and the continuous practice of mindfulness by oneself. According to a previous study[29], each activity adjusted its context to meet the requirement of the patients with stroke. It was found that the mindfulness program had the effectiveness to change HB after practicing activities of the program, which can be seen from the increased average scores of HB. Mindfulness practice increasingly promotes behavioral changes since it can help support and promote behavioral changes through the interaction of three components affecting better self-regulation, 1) increased attention control that supports emphasis on goals, 2) better emotional control that helps increase positive emotions and self-reinforcement, and 3) change in self-awareness by becoming less attached to something and increased perceived self-efficacy, improved self-observation and calmness while maintaining monitoring[19,33,34]. This is consistent with a study finding that mindfulness practice can help reduce stress, depression, and anxiety, and helps boost brain function responsible for attention control and positive emotions including caring and other social emotions that promote behavioral changes[34-37]. It is consistent with a systematic review, indicating that mindfulness training could help reduce blood pressure in patients with chronic NCDs[10,14]. This is consistent with a study on the effect of short-term mindfulness training in stroke patients to improve basic mindfulness skills and enhance the ability to restore physical function and movement[16]. It was found that mindfulness practice for two weeks was able to increase the level of mindfulness. In addition, according to a study on the effectiveness of telephone follow-up to determine the goals in health behaviors of stroke patients, it was found that goal setting is a process of self-regulation through telephone follow-

up that was efficient to increase consistency in taking medicines among patients with stroke[7].

In addition, the results of the present study revealed that HB of stroke patients that participated in the MSRP and received a high level of FSS had a higher average score than patients who did not participate in the program and received a low level of FSS, possibly because based on the concept of social support of House[38], social support plays a vital role since it is able to reduce illness, death, and confrontation with stress or hazardous conditions to health including preventing the effects of stress on health. Furthermore, social support from families and surrounding people are positively associated with a higher level of self-esteem among patients and have an effect on the health of stroke patients. Stoke patients who live alone, not accompanied by friends or families, are at risk for loneliness, have a low level of self-esteem, poor livelihood, and bad health[39]. This is consistent with the study finding that low-level social support was associated with a higher risk of death caused by stroke, which was 1.6 times in men compared to the group of patients receiving a high level of social support[40]. A previous study found a high level of social support had a positive effect on participation in social activities and rest, including the ability to return to work after a stroke[25]. It is in line with a study that revealed a high level of FSS, friends, or health workers had an effect on the better quality of life of stroke patients in every aspect. Therefore, it is essential that in addition to the physical rehabilitation of patients in a hospital, FSS should be provided to develop stroke patients' quality of life in conjunction with an efficient rehabilitation program[26].

The limitation of the present study includes the duration for data collection among the sample in the control group and the experimental group. Because they were quite similar, there might be sample contamination. Therefore, group activities for patients in the experimental group were organized at a time and in a place where the sample from both groups had no chance to meet each other.

Conclusion

MSRP is able to organize samples with different biosocial characteristics. In addition, the MSRP affecting HB of stroke patients is efficient for further application and additional study.

What is already known in this topic?

It is widely known that HB is necessary for stroke patients. According to the findings, HB outcomes

of stroke patients are used to design the MSRP consisting of behavioral changes. This study shows that the HB of stroke patients is at a high level, leading to a guideline for relevant agencies or hospitals caring for stroke patients to bring the MSRP program to strengthen HB accordingly.

What does this study add?

This study results found the questionnaire about HB and FSSs has quality. It can be used to screen and evaluate a training program given to inpatients. Furthermore, the MSRP with five activities for five weeks is practical and can improve the HB of stroke patients. Relevant agencies or hospitals caring for patients with stroke can apply this study results to serve other benefits such as organizing learning activities that allow family members to participate in caring for stroke patients, organizing activities to practice self-care skills to patients, allowing patients to set a goal and make a plan by themselves while undergoing treatments, and organizing daily mindfulness practice in which the context is appropriately adjusted to meet stroke patients.

Conflicts of interest

The authors declare no potential conflicts of interest.

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