Predictors of Community Participation Among Individuals With First Stroke: A Thailand Study

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Objective To describe perceived participation among persons with first stroke and to identify the predictors based on the International Classification of Functioning, Disability and Health (ICF) concept of participation after stroke.

Methods A total of 121 participants completed 4 questionnaires: the Impact on Participation and Autonomy (IPA), Personal Resource Questionnaire (PRQ2000), Hospital Anxiety and Depression Scale (HADS), and personal history. They were evaluated for their balance, motor function, functional and walking ability.

Results The majority of participants perceived participation restriction in family role as poor to very poor. The best predictors of participation included social support, walking and balance, functional ability, number of secondary health problems and affected side, account for 66.6% of the variances in participation.

Conclusion The study highlights the importance of social support, walking and balance performance, functional ability in daily living, and number of secondary health problems after stroke. These factors that facilitate participation after stroke should be addressed by health personnel during rehabilitation.

Keywords Community participation, Stroke, Social support, Predictor, Rehabilitation

INTRODUCTION

The number of persons affected with strokes among the Thai population in 2014 was estimated to be more than 220,000 [1]. Stroke incidence shows an increasing trend in younger adults aged 20 to 54 years [2]. Approximately 70% of stroke survivors still require full assistance with instrumental activities of daily living [3]. Furthermore, the participation level was shown to decline after stroke [3]. Stroke survivors with restricted participation showed a decrease in emotional well-being [4]. Previous study found a correlation between restricted participation and long-standing dissatisfaction after stroke [3]. Therefore, the important goal of rehabilitation after stroke is not only improving activities of daily life but also resuming participation in society. Although, participation was shown to be a key outcome in rehabilitation [5,6], the participation goal after stroke has not received much at-
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The concept of participation was included in the framework of the International Classification of Functioning, Disability and Health (ICF) provided by the World Health Organization in 2001. Participation is defined as personal involvement in life situation [7]. The concept of participation was expanded to include active engagement, choice and control, access and enfranchisement, personal and social responsibility, with an impact on others, and social connection [8]. Restricted participation has a dynamic interplay with all components in the ICF including impairments, activity limitation, personal and environment factors. Therefore, approaches to improve participation level are needed and should be integrated thoroughly.

Impairments and activity limitations have been shown to predict participation after stroke. Motor functions [9], balance performance [10], and functional level [9,11,12] were associated with participation. The number of co-morbidities after discharge was correlated with less perceived participation of stroke survivors [13]. In addition, stroke survivors with psychological ailments showed a low level of participation [9,11,14]. However, fundamental impairments and activity limitations are included in the analysis of impact on participation.

Regarding personal variables, previous studies have shown that age was negatively correlated with participation satisfaction [9,13,14]. However, other personal variables including type of stroke, affected side and time since stroke did not show correlation with participation [9,15].

Social support is one of the sub-components of environmental factors [7]. Approximately 90% of stroke survivors need family support during the subacute stage and two-thirds of them require family support after 6 months [16]. However, the role of social support in participation after stroke has been less investigated.

In Thailand, stroke is a major health burden [17]. Rehabilitation services are mostly provided by hospitals and rehabilitation centers [18]. Stroke survivors receive rehabilitation intervention for a short period. With the policy of early discharge, the average length of stay is 8.1 days [19]. Almost all the rehabilitation services in the acute hospitals focused on restoring function. Participation facilitation after stroke is of limited focus. Participation and role fulfillment may vary in stroke survivors in Thailand compared with other countries because of environmental barriers, social support and governmental funding.

Compared with Western countries, intermediate care centers are rare in Thailand. There are very few inpatient rehabilitation centers and nursing homes, and such services cannot be reimbursed by health insurance or the government [20]. Therefore, home-based physical therapy [21], out-patient clinics in hospitals, or private clinics are an option for stroke victims. Most Thai stroke patients usually return home instead of attending nursing care facilities [17]. Ninety-nine percent of stroke patients are supported by their family, where siblings as well as spouses are the main caregivers [20].

Although Thai people have become more westernized, strong family relationships and support are still common [20]. Caring for ailing family members is a common practice in extended families [17]. These cultural differences might affect the perception of participation [11]. No formal study has been carried out by government or health officials in Thailand on a large scale. Considering the different cultures, evidence of differences in the levels of participation in Thailand compared with Western or other Asian countries, is also essential.

This study therefore described stroke survivors’ perception of their participation after stroke and identified influential factors, which are based on ICF concepts among persons diagnosed with stroke in Thailand. We hypothesized that social support variable was the best predictor of participation among a sample of stroke victims in Thailand.

MATERIALS AND METHODS

The participants were diagnosed with a first-time unilateral hemispheric stroke. The inclusion criteria were as follows: age over 18 years, able to understand the questions involving outcome measures and living in community. The exclusion criteria were cognitive impairment (Thai Mental State Examination <24) [22], neurological disease other than stroke, or severe musculoskeletal or cardiovascular problems. The participants were enrolled in the Project of Physical Therapy Service in Community.

Outcome measures

Impact on Participation and Autonomy Questionnaire-Thai version (IPA-Thai version) was developed based on the ICF concept. It was a self-reported measure which
has been used to assess the perceived participation in various life situations (Table 1). It consists of 32 items in 5 domains: autonomy indoors, autonomy outdoors, family role, social relationships, and work and education. Each item was scored on a 6-point ordinal scale (0–5) with a higher score indicating more restricted participation and autonomy or lower level of participation. Good reliability, with Cronbach’s $\alpha$ ranging from 0.86 to 0.90 and acceptable validity of the IPA-Thai version were shown in a previous study [23].

Personal Resource Questionnaire (PRQ2000) was used to measure the perceived level of social support (Table 1). PRQ2000 is composed of 15 items with a scale ranging from 1 (strongly disagree) to 7 (strongly agree). A higher score indicated higher perceived social support. The overall scale of internal consistency and reliability was very good (Cronbach $\alpha$=0.96) [24].

Hospital Anxiety and Depression Scale-Thai version (HADS-Thai version) was used to assess anxiety and depression symptoms (Table 1). HADS consists of anxiety and depression subscales, each containing 7 items. Each item is graded on a 4-point scale (range from 0 ‘no symptom’ to 3 ‘maximum impairment’). Score $>$11 in each subscale indicated the presence of anxiety or depression, respectively. HADS-Thai version showed good reliability, with Cronbach’s $\alpha$ coefficient of 0.86 for anxiety sub-scale and 0.83 for depression sub-scale [25].

Postural Assessment Scale for Stroke Patients (PASS) was used to measure balance performance (Table 1). It includes 5 items of static balance and 7 items of dynamic balance. Each item is graded on a 4-point scale of varying difficulty for assessment of ability to maintain or change from lying, sitting, or standing posture. A higher score represents better balance performance. PASS showed good psychometric properties, reliability with Cronbach’s $\alpha$ coefficient of 0.95 [26].

Stroke Rehabilitation Assessment of Movement (STREAM) was used to evaluate motor function after stroke (Table 1). It is composed of 30 items in 3 domains including upper limb movements, lower limb movement, and basic mobility. The first two domains were scored on a 3-point scale whereas the last domain was scored on a 4-point scale. A higher score indicates better movement quality and higher independence. The reliability and validity of STREAM are well established in stroke patients [27].

Barthel Index (BI) was used to assess three groups of function: self-care, continence of bowel and bladder, and mobility (Table 1). It consists of 10 items. A higher score indicates more independence [28]. Excellent reliability was demonstrated in previous studies [28].

Functional Ambulation Category (FAC) was used to evaluate the ability of ambulation which is based on the amount of physical support required (Table 1). It is categorized into 6 scores: score 0 indicates nonfunctional ambulation, whereas score 5 implies independent ambulation on all surfaces. The FAC showed excellent reliability in hemiplegic patients, with a Cohen kappa of 0.95 [29].

Sociodemographic and clinical characteristics, including chronological age, marital status, current employment status, type of stroke, affected side, time since stroke, age at time of stroke and number of secondary health problems, were collected. The secondary health problems included presence or absence of the following conditions: pain, spasticity, urinary incontinence, urinary tract infection, fecal incontinence, constipation, and

| Table 1. Summarization of variables and outcome measures |
|----------------------------------------------------------|
| **Variable**                                              | **Outcome measure**                                           |
| Participation                                             | Impact on Participation and Autonomy Questionnaire-Thai version (IPA-Thai version) |
| Social support                                            | Personal Resource Questionnaire (PRQ2000)                     |
| Depression and anxiety                                    | Hospital Anxiety and Depression Scale-Thai version (HADS-Thai version) |
| Balance performance                                       | Postural Assessment Scale for Stroke Patients (PASS)         |
| Upper extremity, lower extremity, and mobility function   | Stroke Rehabilitation Assessment of Movement (STREAM)         |
| Functional ability                                        | Barthel Index (BI)                                            |
| Walking ability                                           | Functional Ambulation Category (FAC)                          |
| Personal characteristics                                  | Sociodemographic and clinical characteristics questionnaire  |
sexual problems (Table 1).

**Procedure**

The Ethics Committee of Mahidol University Institutional Review Board approved the study (No. MU-CIRB 2014/044.1004). The participants, who met the inclusion criteria, were informed of the research procedure and written consent was obtained before data collection. The participants were asked to complete 4 questionnaires: sociodemographic and clinical characteristics, IPA-Thai version, PRQ2000-Thai version and HADS-Thai version. Next, physical therapists evaluated the balance performance, motor function, functional ability and walking ability of the participants using PASS, STREAM, BI, and FAC, respectively. Data were collected between February 2015 and March 2016.

**Data analysis**

Descriptive statistics were used to explain the demographic data and perceived participation level of global and individual domains of participation. In this study, impairment is reflected by balance performance, functions of upper and lower extremities, mobility function, psychological problems, and secondary health conditions. Activity limitation is reflected by walking and functional abilities in daily life. Independent variables included environmental characteristics reflected by social support level, and personal characteristics reflected by age, type of stroke, affected side, and time since stroke. Multiple linear regression analysis with stepwise forward selection was used to identify the independent predictors of participation: for total participation (IPA total score) and each domain (score of autonomy indoors, family role, autonomy outdoors, social relationships). The independent variable with the highest significant probability of correlation (partial F statistic) was selected and the partial F statistic was recalculated for the remaining independent variables. The subsequent independent variables were added one at a time until the probability of the partial F statistic for a new solution exceeded the maximum probability of 0.05. Possible collinearity in data was explored based on tolerance statistics and variance inflation factor (VIF) [30]. The domain of work and education was excluded from regression analysis due to insufficient number of eligible participants. Adjusted R² was used to present the proportion of variation in the dependent variable that can be explained by the regression model. The SPSS version 17.0 for Window (SPSS Inc., Chicago, IL, USA) was used to perform descriptive and regression analyses.

**RESULTS**

A total of 121 individuals diagnosed with stroke participated in this study. There were no refusals or dropouts during the enrollment period. The sociodemographic and clinical characteristic of participants are listed in Table 2. More than half of the participants were male (65.3%), with a mean age of 59.9 years (SD=11.7), and 78.5% of all participants had ischemic stroke. Most participants were unemployed after stroke. The majority of the primary caregivers were their children and spouse.

Table 3 describes the perception about participation (%) and lists the mean scores of participation in each domain. Most participants were restricted to family role and autonomy outdoors. In the domain of family role, more than 40% of participants perceived poor to very poor participation. The greatest perceived participation level was found in the domain of social relationships with 70% of participants perceiving their participation as good to very good. The mean scores of balance performance, upper extremity, lower extremity functions, mobility function, psychological problems, walking ability, functional ability in daily life and social support are listed in Table 4.

The results of regression analysis as adjusted R² of variables, which explained the overall participation (IPA total score) are presented in Table 5. Six variables including walking ability, social support, functional ability, number of secondary health conditions, balance performance, and affected side accounted for 66.6% of variation in overall participation.

Table 6 shows the results of regression analyses in 4 domains of the IPA, including autonomy indoors, family role, autonomy outdoors, and social relationships. The explained variance for the models of each IPA domain ranged between 39.6% (social relationships) and 62.9% (autonomy outdoors). Social support was included as an explanatory variable for every domain of the IPA. Furthermore, social support had the highest standardized coefficient in all primary outcomes except family role and autonomy indoors. Four variables including lower extremity function, age, type of stroke, and time since
stroke, were not included in any model. The lower extremity function showed collinearity, and was therefore excluded. The other variables showed no correlation with the primary outcomes.

**DISCUSSION**

This is the first study that describes the level of participation, and identifies the predictors of participation among first stroke survivors in Thailand. The results showed that most individuals diagnosed with first stroke, perceived their participation as good to very good in the domain of social relationships and autonomy indoors. Most reports of poor to very poor participation were associated with the domains of family role and autonomy outdoors, respectively. This result was consistent with prior studies showing that the majority of stroke survivors had restricted participation in their family role [11,31]. Family role might be the complexity of tasks compared with other roles, underscoring the need for efficacious health interventions to enhance participation in this do-

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**Table 2.** Sociodemographic and clinical characteristics of stroke participants

| Variable                  | Value          |
|---------------------------|----------------|
| Age (yr)                  | 59.9±11.7 (26–84) |
| Time since stroke (mo)    | 14.5±24.3 (1–145) |
| Affected side             |                |
| Left                      | 69 (57.0)      |
| Right                     | 52 (43.0)      |
| Type of stroke            |                |
| Ischemic                  | 95 (78.5)      |
| Hemorrhage                | 23 (19.0)      |
| Missing                   | 3 (2.5)        |
| Gender                    |                |
| Male                      | 79 (65.3)      |
| Female                    | 42 (34.7)      |
| Marital status            |                |
| Single                    | 17 (14.0)      |
| Married                   | 76 (62.8)      |
| Divorced                  | 12 (9.9)       |
| Widowed                   | 12 (9.9)       |
| Missing                   | 4 (3.3)        |
| Educational level         |                |
| Primary school or below   | 57 (47.1)      |
| Secondary school          | 34 (28.1)      |
| College or above          | 29 (24)        |
| Missing                   | 1 (0.8)        |
| Employment status         |                |
| Unemployed                | 94 (77.7)      |
| Employed                  | 24 (19.8)      |
| Primary caregiver         |                |
| Parents                   | 8 (6.6)        |
| Children                  | 47 (38.8)      |
| Spouse                    | 47 (38.8)      |
| Relatives                 | 12 (9.9)       |
| Care assistance           | 6 (5)          |
| Missing                   | 1 (0.8)        |
| Comorbidity               |                |
| Diabetes mellitus (yes)   | 30 (24.8)      |
| Hypertension (yes)        | 77 (63.6)      |
| Dyslipidemia (yes)        | 38 (31.4)      |
| Cardiovascular disease (yes) | 2 (1.7) |

Values are presented as mean±standard deviation (range) or number (%).

**Table 3.** Perception about participation (%) and mean scores in each domain

| Participation measures (IPA) | Value          |
|-----------------------------|----------------|
| Perception about participation (%) | | | | |
| Score 0–1 | Score 2 | Score 3–4 |
| Autonomy indoors            | 7.88±6.45 | 68.6 | 19.6 | 11.8 |
| Family role                 | 14.7±8.75 | 39.0 | 18.8 | 42.3 |
| Autonomy outdoors           | 8.87±5.43 | 46.6 | 21.2 | 32.2 |
| Social relationships         | 7.46±6.49 | 70.7 | 16.1 | 13.2 |

Values are presented as mean±standard deviation. IPA, Impact on Participation and Autonomy Questionnaire; score 0–1, very good to good; score 2, fair; score 3, poor to very poor.
The predictors of participation identified by total participation score among Thai first stroke survivors in this study were social support; balance performance; functional ability; number of secondary health conditions; walking ability and affected side. These predictors suggested that stroke survivors who had greater social support, better balance performance, higher functional ability, lesser secondary health conditions, better walking ability and left hemiplegia, were more likely to show greater participation. As hypothesized, social support was the greatest contributor of all IPA subscale scores. Previous studies generally found that physical impairment was the best predictor of participation [9,13]. However, adjusting for social variables in the analysis yielded social support factor as an important predictor of participation in all domains. Considering the standardized coefficient ($\beta$) of social support factor, it showed the highest value in total participation, family role and autonomy outdoors suggesting that social support showed a stronger correlation with participation than the other variables in the model. The importance of social support was reinforced by a previous finding [11]. Approximately 70% of stroke participants in a previous study reported the need for family assistance for their daily activities at 6 months after stroke [16]. In the samples of stroke in Iran, access to caregiver services was the most important factor in social participation while it was not correlated with performance-based participation [11]. However, in Chinese stroke subjects, social support was not correlated with participation [32]. These reflect the cultural differences of participation among countries. In Thailand’s social structure, social support was mainly based on family relationships. As stated, Thai people have very strong family connections. Social support variables in this study represented availability of information, emotional, and material support, opportunity for nurture and self-esteem, which correspond to Thai social structure. Therefore, social support variable was included as a predictor of participation in all domains of IPA. This study

### Table 4. Mean scores of variables

| Variable                          | Value   |
|-----------------------------------|---------|
| PRQ2000 (total score=105)         |         |
| Social support                    | 80.80±15.99 |
| HADS (total score=21)             |         |
| Anxiety                           | 6.70±4.24 |
| Depression                        | 3.58±3.15 |
| PASS (total score=36)             |         |
| Balance performance               | 28.68±6.84 |
| STREAM (total score=100)          |         |
| Upper extremity function          | 60.21±35.67 |
| Lower extremity function          | 57.89±31.02 |
| Mobility function                 | 57.63±26.58 |
| BI (total score=100)              |         |
| Functional ability                | 80.58±19.03 |
| FAC (total score=5)               |         |
| Walking ability                   | 3.15±1.65 |

Values are presented as mean±standard deviation.

PRQ2000, Personal Resource Questionnaire; HADS, Hospital Anxiety and Depression Scale; PASS, Postural Assessment Scale for Stroke Patients; STREAM, Stroke Rehabilitation Assessment of Movement; BI, Barthel Index; FAC, Functional Ambulation Classification.

### Table 5. Regression analysis of predictors of total participation (IPA total score)

| Predictor                          | B       | $\beta$ | CI               | p-value     | Adjusted $R^2$ |
|------------------------------------|---------|---------|------------------|-------------|----------------|
| FAC (walking ability)              | -1.82   | -0.14   | -4.94 to 1.29    | 0.23        | 0.666          |
| PRQ2000 (social support)           | -0.68   | -0.49   | -0.84 to -0.52   | 0.001***    |                |
| BI (functional ability)            | -0.23   | -0.20   | -0.49 to 0.03    | 0.08        |                |
| Number of secondary health problems| 3.22    | 0.18    | 1.16 to 5.27     | 0.001***    |                |
| PASS (balance performance)         | -0.89   | -0.27   | -1.61 to -0.16   | 0.02*       |                |
| Affected side                      | 5.54    | 0.12    | 0.41 to 10.68    | 0.04*       |                |
| Constant                           | 138.59  | -       | 116.41 to 152.62 | 0.001***    |                |

B, regression coefficient; Beta, standardized coefficient; CI, confidence interval; IPA, Impact on Participation and Autonomy Questionnaire; FAC, Functional Ambulation Classification; PRQ2000, Personal Resource Questionnaire; BI, Barthel Index; PASS, Postural Assessment Scale for Stroke Patients.

*p<0.05, ***p<0.001.
showed that over 90% of participants received care from their family and relatives reflecting the strong Thai family support in Thai culture. The present study emphasizes the need for promoting social support program essential for a stroke patient’s family similar to the rehabilitation program facilitating participation after stroke. Balance performance was found to facilitate participation in the autonomy outdoor domain and the total score. Previous studies reported that balance was an important factor of participation during the first 6 months after stroke but not in long-term stroke (2–4 years) [13,33]. However, the average time since stroke in this study was 14.5±24.3 months, which emphasized that balance remained important to participation in long-term stroke since it is a prerequisite for daily activity. Mobility functions were contributors to participation in family role domain, which implied that stroke survivors with greater mobility were more likely to report higher participation in a family role. Furthermore, stroke survivors who had greater upper extremity motor function were more likely to display greater levels of participation outdoors consistent with previous studies. Bouffioulx et al. [16] found that manual ability was the strongest predictor of satisfaction with activity and participation among patients with chronic stroke. Therefore, focusing on balance performance, upper extremity motor functions and mobility training might facilitate participation in those domains. This study showed collinearity of the lower extremity motor functions with mobility, functional activity and walking ability. Thus, the lower extremity motor functions were not selected as a predictor in the model despite showing moderate correlation with participation. Psychological problems were found to be associated with participation. The participation of stroke survivors,

| Predictor                        | B   | β  | CI            | p-value | Adjusted R² |
|----------------------------------|-----|----|---------------|---------|-------------|
| Autonomy indoors                 |     |    |               |         | 0.600       |
| BI (functional ability)          | -0.22 | -0.67 | -0.26 to -0.18 | 0.001*** |             |
| PRQ2000 (social support)         | -0.14 | -0.34 | -0.18 to -0.09 | 0.001*** |             |
| HADS (depression)                | 10.16 | 0.15 | 2.05 to 18.26 | 0.02*   |             |
| Constant                         | 36.26 | -   | 31.35 to 41.18 | 0.001*** |             |
| Family role                      |     |    |               |         | 0.475       |
| STREAM (mobility function)       | -0.20 | -0.61 | -0.25 to -0.16 | 0.001*** |             |
| PRQ2000 (social support)         | -0.13 | -0.24 | -0.21 to -0.05 | 0.03*   |             |
| HADS (depression)                | 16.04 | 0.18 | 3.21 to 28.88 | 0.19    |             |
| Constant                         | 36.60 | -   | 30.11 to 43.09 | 0.001*** |             |
| Autonomy outdoors                |     |    |               |         | 0.629       |
| PRQ2000 (social support)         | -0.19 | -0.57 | -0.24 to -0.15 | 0.001*** |             |
| BI (functional ability)          | -0.08 | -0.27 | -0.14 to -0.02 | 0.01**  |             |
| Affected side                    | 1.92  | 0.17 | 0.56 to 3.28  | 0.01**  |             |
| Number of secondary health problems | 0.90  | 0.20 | 0.36 to 1.44  | 0.001*** |             |
| PASS (balance performance)       | -0.25 | -0.31 | -0.42 to -0.08 | 0.01**  |             |
| STREAM (upper extremity function) | 0.02  | 0.14 | 0.00 to 0.05  | 0.05*   |             |
| Constant                         | 34.48 | -   | 30.01 to 38.96 | 0.001*** |             |
| Social relationships             |     |    |               |         | 0.396       |
| PRQ2000 (social support)         | -0.26 | -0.65 | -0.32 to -0.20 | 0.001*** |             |
| HADS (anxiety)                   | -3.33 | -0.17 | -6.27 to -0.39 | 0.03*   |             |
| Constant                         | 29.12 | -   | 24.02 to 34.22 | 0.001*** |             |

B, regression coefficient; Beta, standardized coefficient; CI, confidence interval; BI, Barthel Index; PRQ2000, Personal Resource Questionnaire; HADS, Hospital Anxiety and Depression Scale; STREAM, Stroke Rehabilitation Assessment of Movement; PASS, Postural Assessment Scale for Stroke Patients.
*p<0.05, **p<0.01, ***p<0.001.
who were depressed, displayed lower autonomy indoors and in the family role, than people without depression, similar to previous studies [9,11,14,16]. The psychological problems, especially depression, were important determinants of participation restriction. This finding underlines the importance of psychological management to enhance participation in indoor activities and family role. In addition, the present study found that anxiety was also a predictor of participation in social relationships. Compared with previous study, the results showed that stroke survivors experiencing anxiety were found to participate in social relationships at a higher level than those without anxiety. Stroke survivors with anxiety might perceive that they still have good social relationships because of increased family caregiving and subsequent attention. This practice reflected Thai family culture as responsible for caregiving and support. In the domain of social relationships, social support and anxiety state explained only 39.6% of variances in participation. Other factors, such as environmental and personal factors, not included in this study may influence this domain. Further studies are needed to investigate the role of these factors in this aspect.

The number of secondary health problems appears to be an important predictor of participation in autonomy outdoors and total participation. This result was consistent with previous studies, showing that the stroke survivors who had high secondary health problems were more likely to display limited participation [13,14]. The present study suggested that the prevention education of family regarding secondary health problems is essential to facilitate participation after stroke.

The functional ability in daily life appeared to be a predictor of participation in 3 domains: autonomy indoors, autonomy outdoors, and total participation. Stroke survivors, with adequate abilities to perform the activities of daily life, were more likely to display higher participation in many domains. Walking ability appeared to be a predictor of total participation. This result was consistent with previous findings of walking ability as the best predictor of participation in 3 domains: autonomy indoors, autonomy outdoors, and total participation. This result was consistent with previous studies, showing that walking ability as the best predictor of total participation. This result was consistent with previous findings [9,11].

This study measured the perceived participation of each individual, and therefore, stroke survivors with cognitive impairment were excluded. Time since stroke varied from 1 to 145 months. With low numbers of employed participants, work and education was not included in the analysis. The influential factors of participation in this domain were not investigated. This study determined the role of factors according to ICF parameters except the physical environment. Thus, additional studies investigating the role of physical environment in participation are needed.

The study showed the influence of variables on different aspects according to the ICF. Several factors explaining participation were similar to studies from other countries. However, social support was shown to be the key contributor to participation among Thai stroke population. Rehabilitation programs need to address not just increased balance, walking ability, functional ability in daily living, treatment of psychological problems but also facilitate strategies to increase social support, especially in stroke survivors who have limited social resources. The healthcare authorities may recommend families of stroke victims to rehabilitation. Education of families in efficient support measures may be needed to improve participation amongst Thai stroke survivors. An additional strategy of social support facilitation in rehabilitation will enhance stroke survivors to lead a better life.

In conclusion, participation is a biopsychosocial issue that requires a review of the person as a whole. Social support is the most important factor underlying participation in all domains. The predictors of total participation contributing to a large amount of variance (66.6%)

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were social support, walking and balance ability, functional ability in daily living, number of secondary health problems, and affected side. Depression and anxiety, upper extremity and mobility functions, and affected side were also factors affecting participation.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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REFERENCES

1. Ministry of Public Health. Annual report of the Non-communicable Disease Office 2015 [Internet]. Bangkok, Thailand: Ministry of Public Health; 2015 [cited 2018 Aug 15]. Available from: http://thaincd.com/document/file/download/paper-manual/Annual-report-2015.pdf.
2. Kissela BM, Khoury JC, Alwell K, Moomaw CJ, Woo D, Adeoye O, et al. Age at stroke: temporal trends in stroke incidence in a large, biracial population. Neurology 2012;79:1781-7.
3. Hartman-Maeir A, Soroker N, Ring H, Avni N, Katz N. Activities, participation and satisfaction one-year post stroke. Disabil Rehabil 2007;29:559-66.
4. Egan M, Davis CG, Dubouloz CJ, Kessler D, Kubina L.A. Participation and well-being poststroke: evidence of reciprocal effects. Arch Phys Med Rehabil 2014;95:262-8.
5. Dijkers MP. Issues in the conceptualization and measurement of participation: an overview. Arch Phys Med Rehabil 2010;91(9 Suppl):S5-16.
6. Heinemann AW. Measurement of participation in rehabilitation research. Arch Phys Med Rehabil 2010;91(9 Suppl):S1-4.
7. World Health Organization. The International Classification of Functioning, Disability and Health (ICF). Geneva, Switzerland: World Health Organization; 2001. p. 10-7.
8. Hammel J, Magasi S, Heinemann A, Whiteneck G, Bogner J, Rodriguez E. What does participation mean? An insider perspective from people with disabilities. Disabil Rehabil 2008;30:1445-60.
9. Obembe A, Mapayi B, Johnson O, Agunbiade T, Emechete A. Community reintegration in stroke survivors: relationship with motor function and depression. Hong Kong Physiother J 2013;31:69-74.
10. Schmid AA, Van Puymbroeck M, Altenburger PA, Diekers TA, Miller KK, Damush TM, et al. Balance and balance self-efficacy are associated with activity and participation after stroke: a cross-sectional study in people with chronic stroke. Arch Phys Med Rehabil 2012;93:1101-7.
11. Fallahpour M, Tham K, Joghataei MT, Jonsson H. Perceived participation and autonomy: aspects of functioning and contextual factors predicting participation after stroke. J Rehabil Med 2011;43:388-97.
12. Crawford A, Hollingsworth HH, Morgan K, Gray DB. People with mobility impairments: physical activity and quality of participation. Disabil Health J 2008;1:7-13.
13. Desrosiers J, Noreau L, Rochette A, Bourbonnais D, Bravo G, Bourget A. Predictors of long-term participation after stroke. Disabil Rehabil 2006;28:221-30.
14. Desrosiers J, Demers L, Robichaud L, Vincent C, Belleville S, Ska B, et al. Short-term changes in and predictors of participation of older adults after stroke following acute care or rehabilitation. Neurorehabil Neural Repair 2008;22:288-97.
15. Pang MY, Eng JJ, Miller WC. Determinants of satisfaction with community reintegration in older adults with chronic stroke: role of balance self-efficacy. Phys Ther 2007;87:282-91.
16. Bouffioulx E, Arnould C, Thonnard JL. Satisfaction with activity and participation and its relationships with body functions, activities, or environmental factors in stroke patients. Arch Phys Med Rehabil 2011;92:1404-10.
17. Suwanwela NC. Stroke epidemiology in Thailand. J Stroke 2014;16:1-7.
18. Suttiwong J, Vongsirinavarat M, Chaiyawat P, Vachalathiti R. Predicting community participation af-
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ter spinal cord injury in Thailand. J Rehabil Med 2015;47:325-9.
19. Khiaocharoen O, Pannarunothai S, Zungsontiporn C. Cost of acute and sub-acute care for stroke patients. J Med Assoc Thai 2012;95:1266-77.
20. Kuptniratsaikul V, Kovindha A, Massakulpan P, Piravej K, Suethanapornkul S, Dajpratham P, et al. An epidemiologic study of the Thai Stroke Rehabilitation Registry (TSRR): a multi-center study. J Med Assoc Thai 2008;91:225-33.
21. Hiengkaew V, Vongsirinavarat M. Home-based physical therapy for individuals with stroke in Thailand. Home Health Care Manag Pract 2016;28:209-15.
22. Train the Brain Forum Committee. Thai Mental State Examination (TMSE). Siriraj Hosp Gaz 1993;45:359-74.
23. Suttitiwong J, Vongsirinavarat M, Vachalathiti R, Chaiyawat P. Impact on participation and autonomy questionnaire: psychometric properties of the Thai version. J Phys Ther Sci 2013;25:769-74.
24. Tuppotayan P. The relationships between hope, social support and depressive symptoms in patients with spinal cord injury [dissertation]. Nakhon Pathom, Thailand: Mahidol University; 2007.
25. Nilchaikovit T. Development of Thai version of hospital anxiety and depression scale in cancer patients. J Psychiatr Assoc Thai 1996;4:18-30.
26. Benaim C, Perennou DA, Villy J, Rousseaux M, Pelissier JY. Validation of a standardized assessment of postural control in stroke patients: the Postural Assessment Scale for Stroke Patients (PASS). Stroke 1999;30:1862-8.
27. Wang CH, Hsieh CL, Dai MH, Chen CH, Lai YF. Interrater reliability and validity of the stroke rehabilitation assessment of movement (stream) instrument. J Rehabil Med 2002;34:20-4.
28. Dajpratham P, Meenaphant R, Junthon P, Pianmanakij S, Jantharakasamjit S, Yuwan A. The inter-rater reliability of Barthel Index (Thai version) in stroke patients. J Thai Rehabilitation 2006;16:1-9.
29. Mehrholz J, Wagner K, Rutte K, Meissner D, Pohl M. Predictive validity and responsiveness of the functional ambulation category in hemiparetic patients after stroke. Arch Phys Med Rehabil 2007;88:1314-9.
30. Field A. Discovering statistics using IBM SPSS statistics. Thousand Oaks, CA: Sage Publications; 2013. p. 293-356.
31. Cardol M, de Jong BA, van den Bos GA, Beelem A, de Groot IJ, de Haan RJ. Beyond disability: perceived participation in people with a chronic disabling condition. Clin Rehabil 2002;16:27-35.
32. Chau JP, Thompson DR, Twinn S, Chang AM, Woo J. Determinants of participation restriction among community dwelling stroke survivors: a path analysis. BMC Neurol 2009;9:49.
33. Desrosiers J, Noreau L, Rochette A, Bravo G, Boutin C. Predictors of handicap situations following post-stroke rehabilitation. Disabil Rehabil 2002;24:774-85.
34. Rochette A, Desrosiers J, Noreau L. Association between personal and environmental factors and the occurrence of handicap situations following a stroke. Disabil Rehabil 2001;23:559-69.