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Development of occupational therapy screening tool for clients with stroke

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ABSTRACT

Background: The number of new stroke cases in the Thai population increases every year. Occupational therapy has a crucial role in stroke rehabilitation. In Thailand, there is currently no standardized occupational therapy screening tool for gathering clients' impairments to facilitate further evaluation and intervention.

Objectives: To develop an occupational therapy screening tool for clients with stroke and investigate its psychometric properties.

Materials and methods: The development of the screening tool was based on a literature review and opinions of registered occupational therapists (OTs) who have had at least five years of experience working with stroke clients. Five experts examined content validity. The Index of Congruence (IOC) was calculated, and the items that showed IOC scores of over 0.5 were incorporated into the target screening tool. Afterward, two types of reliability were measured, including test-retest and inter-rater reliability. Using purposive sampling, 44 participants with chronic stroke were selected to test each type of reliability. Intraclass correlation coefficient (ICC) models 3, 1, and 2, k were used to determine test-retest and inter-rater reliability, respectively.

Results: Based on the literature review and 128 OTs' opinions, the screening tool covers four domains: sensation, voluntary movement control of upper extremity and hand function, perception, and cognition. Content validity IOC scores were between 0.8 and 1.0 for all items. The screening tool had excellent test-retest reliability on all items, except memory. And the ICC between the two raters ranged from 0.91 to 1.00, which showed excellent inter-rater reliability.

Conclusion: The occupational therapy screening tool for clients with stroke has proven valid and reliable as a screening tool in clinical settings. Further research is recommended for concurrent, sensitivity, and specificity studies.

Introduction

A stroke is a sudden onset of abnormalities in the functioning of the nervous system. It is caused by bleeding or blocked blood vessels in the brain. It is now considered a common disease in the world population.[1] In Thailand, there are more than 250,000 new stroke cases each year, and the trend is increasing.[2] Stroke is a significant problem in the public health sector. It can cause death or disabilities which vary from person to person, depending on the severity of the stroke and the area of the brain affected. Typically, stroke clients are admitted to the hospital for the first few weeks to stabilize conditions and for observation. The most improvement is seen in the first three months,

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but recovery could continue for many years after a stroke.[3] Some never fully recover. The long-term sequelae of stroke have a negative impact on the health of stroke clients and their ability to work.[1] It also has a considerable impact on the family, as well as society in general.[4] Therefore, continuing rehabilitation for a long period of time is required to decrease the impact of stroke which could occur at the inpatient and outpatient clinics, community rehabilitation centers as well as stroke clients' dwellings.

An occupational therapist has a key role in stroke rehabilitation to improve the functions of stroke survivors. In the occupational therapy process, assessment is the first step that occupational therapists use to understand their clients.[5] Even though occupational therapy has a grounded philosophical and theoretical base that supports a holistic, functional-based approach to assessment, performance deficits are viewed as support for an occupational focus for all occupational therapy evaluations and interventions.[6] Both functional and impairment-level assessments enable the occupational therapist to understand the impacts of the stroke, set goals, and design appropriate interventions for the stroke clients.[7,8] Therefore, an appropriate assessment tool needs to be used. It is recommended that an appropriate assessment tool should be simple, practical, and brief. However, it should be a standardized tool with clear procedures and scoring.[7,9] Assessment can be performed either through screening tools or comprehensive assessment tools. Whilst the comprehensive assessment tool usually considers multiple domains of functioning, the screening tool is a preliminary assessment that is quick to administer and score.[5,10] The screening tool enables occupational therapists to learn rudimentary information about their client's abilities and deficits. It is used before performing a comprehensive assessment.[10]

Based on the literature review, multidisciplinary screening tools for stroke clients have been developed. One example is the Post-Stroke Checklist (PSC). The PSC is designed to be dichotomous questions for identifying long-term problems in stroke survivors and facilitating appropriate referrals for treatment.[11] However, as it consists of 'yes/no' questions, therapists will not have subscale information about the stroke clients' performance and challenges. In addition, no study of psychometric properties has been reported.[11] Other screening tools are designed for assessing specific impairments, such as the Occupational Therapy Adult Perceptual Screening Test (OT-APST) and the Language Screening Test (LAST).[12,13] An assessment tool developed in the Thai context is called the Activities of Daily Living Assessment Tool (ADL-AT).[14] It is developed specifically for assessing basic and instrumental daily activities in Thai stroke clients. It was examined to be reliable and valid and recommended to be used in the services system.[14] However, screening tools covering the various aspects of impairment have not been developed.

Regarding the current practice of occupational therapists in Thailand, stroke clients have been evaluated for impairment via clinical assessment. Even though they are licensed occupational therapists, differences in clinical experience might affect how to gather information from stroke clients. Standardized screening tools for assessing impairments should be used for consistency and to reduce errors due to differences in clinical experience. In addition, using standardized screening tools is regarded as the basis for an evidence-based assessment. It enables occupational therapists to communicate and collaborate with other professionals effectively. Therefore, this study aims to develop an occupational therapy screening tool specifically for performance components within the Thai context and test its psychometric properties. It is expected that the occupational therapy screening tool could be used in clinical settings as a screening tool for Thai stroke clients while rehabilitation is necessary for stroke clients for a long period of time.

Materials and methods

This study was divided into two stages. The first stage was the development of a screening tool based on literature reviews and occupational therapists' opinions. The second stage was the study of the psychometric properties of the screening tool, which includes content validity, test-retest reliability, and inter-rater reliability.

Ethical approval for the study was obtained from the ethical review committee for research in humans, Faculty of Associated Medical Sciences, Chiang Mai University (Ref. number 399/2562).

Participants

In the first stage, registered occupational therapists with at least five years of experience working with stroke patients were invited to participate in the study. They were asked to complete a questionnaire about the characteristics of the occupational therapy screening tool for clients with stroke who still need rehabilitation.

In the second stage, stroke participants were recruited from four rehabilitation centers. The sample size was calculated by using the G*Power 3.1 computational program (α=0.05, power test=0.95). The result was 36 samples, with the 20 percent dropout rate considered. Forty-four stroke patients were selected for test-retest and inter-rater reliability tests. The inclusion criteria are: stroke occurred at least three months prior, age range between 20 and 80 years old, able to read and write Thai, and no visual or hearing impairments.

Procedure

First stage: Development of the screening tools

The literature review was carried out to retrieve relevant theoretical frameworks related to stroke rehabilitation, the occupational therapy assessment process, and published instruments for cerebrovascular diseases. Then, the researcher developed a questionnaire to survey occupational therapists on the characteristics of their ideal screening tool, including what it should screen for. Registered occupational therapists of The Occupational Therapist Association of Thailand database with at least five years of experience were emailed the questionnaire. Based on the literature review and the occupational therapists' opinions, the screening

tool version 1 was developed by the research team.

Second stage: Study the psychometric properties

To measure content validity, five occupational therapists with more than five years of experience working with stroke clients were asked to examine the extent to which the screening tool version 1 represented all facets of a given construct. The index of congruence (IOC) was analyzed. The items with IOC equal to or higher than 0.5 were accepted whilst items with IOC less than 0.5 were revised according to the experts' comments. From this, the occupational therapy screening tool version 2 was subsequently developed. Then, it was used to assess ten stroke clients to test the screening tool. If the clients need clarification about the commands or testing process, the instruction was explained once to make the test process clearer.

For the reliability test, two independent raters (rater A and rater B) were invited to join the study. They were trained on how to use the occupational therapy screening tool version 2. Rater A was asked to screen 44 participants using the occupational therapy screening tool. Videos were recorded throughout the entire process of screening for rater B to assess. The results of the two raters' assessments were blinded. For test-retest, participants were asked to live as usual between the first and second assessments. The participants were asked not to keep a record in the first assessment to prevent them from copying the prior answer. Also, rater A performed the second assessment after a 14-day interval to prevent participants from recalling the screening procedure. If participants did not return for the second assessment, the researcher would perform the first and second assessments on new participants.

Statistical analysis

Descriptive statistics were presented to describe demographic data. Test-retest and inter-rater reliability were calculated using intraclass correlation coefficients (ICC 3,1 and ICC 2,k, respectively). The reliability would be excellent, good, moderate, or poor when ICC values were ≥0.75, between 0.60 and 0.74, between 0.40 and 0.59, or <0.40, respectively[15] All statistical analyses were conducted using SPSS statistical package.

Results

First stage: Development of screening tools

One hundred and twenty-eight occupational therapists returned the questionnaire, giving their opinions on a screening tool for stroke clients. The results showed that they required a screening tool that was less time-consuming to conduct (no longer than 20 minutes). It should consist of an interview and a test. It should measure the clients' performance components with a test score. Based on the occupational therapists' questionnaire results, combined with insight from the literature review, the occupational therapy screening tool for stroke clients-version 1 was developed. It consists of four domains and 15 items. Each item has its own score, as shown in Table 1.

Second stage: Study the psychometric properties

Content valid

The occupational therapy screening tool version 1 had an IOC score between 0.4 and 1.0. It was suggested that the perception domain should be modified which resulted in changing of scoring criteria. The 'ideomotor apraxia' and 'ideational apraxia' items were merged to be 'apraxia' items with a total score of 8. The result was the

Table 1 Domains and items of the occupational therapy screening tools for clients with stroke version 1.

Domains	Items	Total scores
Sensation	Light touch	6
	Superficial pain	6
	Proprioceptive	6
Voluntary movement control	Upper extremity	18
	Hand function	12
Perception	Autotopagnosia	4
	Unilateral spatial neglect	4
	Visual object agnosia	4
	Figure ground	4
	Spatial relation	4
	Ideomotor apraxia	4
	Ideational apraxia	4
Cognition	Memory	3
	Attention	3
	Orientation	4

development of the occupational therapy screening tool version 2. It includes four domains and 14 items with IOC scores between 0.8 and 1.0, as shown in Table 2.

After trial use with ten stroke clients, no problem was reported. All stroke clients could follow the screening instructions. The screening process could be completed within 20 minutes. The time varied according to the individual client's abilities and the therapist's expertise.

Test-retest and Inter-rater reliability

Participants' demographic data are presented in Table 3. For the test-retest, the participants consisted of 44 stroke clients. Most were males (72.73%) with an average age of 55.86±11.17. Most also had primary education. More than half of the participants (54.55%) have had a stroke for over 1 year. Participants for the inter-rater reliability test also had a similar demographic except 52.27% of participants have had a stroke for less than 1 year.

Table 2 Domains and items of the occupational therapy screening tools for clients with stroke version-2 and IOC scores.

Domains	Items	Index of congruence (IOC)	
		Procedure	Scoring
Sensation	Light touch	1	1
	Superficial pain	1	1
	Proprioceptive	1	1
Voluntary movement control	Upper extremity	1	1
	Hand function	1	1
Perception	Autotopagnosia	1	1
	Unilateral spatial neglect	0.8	0.8
	Visual object agnosia	1	1
	Figure ground	1	1
	Spatial relation	1	1
	Apraxia	1	1
Cognition	Memory	1	1
	Attention	1	1
	Orientation	1	1

Table 3 Demographic data of the stroke participants (N=44 for each test).

Demographics	Test-retest reliability No. of person (%)	Inter-rater reliability No. of person (%)
Gender		
Male	32 (72.73)	32 (72.73)
Female	12 (27.27)	12 (27.27)
Age (year)		
20-40	2 (4.54)	1 (2.27)
41-60	25 (56.82)	25 (56.82)
61-80	17 (38.64)	18 (40.91)
Mean (SD)	55.86 (11.17)	57.41 (11.83)
Education		
Elementary level	15 (34.09)	17 (38.64)
Secondary level	12 (27.27)	12 (27.27)
Diploma level	3 (6.82)	1 (2.27)
Bachelor level or higher	14 (31.82)	14 (31.82)
Time after the onset		
3-6 months	12 (27.27)	10 (22.72)
>6 months-1 year	8 (18.18)	13 (29.55)
>1 year-2 years	13 (29.55)	13 (29.55)
>2 years-3 years	5 (11.36)	3 (6.82)
>3 years	6 (13.64)	5 (11.36)

Test-retest reliability was calculated with the intra-class correlation coefficient (ICC 3,1) with 95% confidence. Most items from the occupational therapy screening tool version 2 had ICC values between 0.80 and 1.00, indicating excellent reliability. Only the score for memory fell outside this range. Nevertheless, it was 0.73, indicating good reliability. Similarly, inter-rater reliability was calculated using the intra-class correlation coefficient (ICC 2,k) with 95% confidence. All items showed excellent reliability, as shown in Table 4. Moreover, the average time for screening each participant was 15.17 minutes.

Table 4 Test-retest reliability and inter-rater reliability with intra-class correlation coefficient (N=44 for each test).

Item	Test-retest reliability				Inter-rater reliability			
	Time 1 (Mean) SD	Time 2 (Mean) SD	Intraclass correlation coefficient		Rater 1 (Mean) SD	Rater 2 (Mean) SD	Intraclass correlation coefficient	
			ICC (3,1)	95%CI			ICC (2,k)	95%CI
Sensation								
Light touch	2.45 (1.82)	2.50 (1.82)	0.99	0.994-0.998	2.18 (1.88)	2.16 (1.90)	0.99	0.979-0.994
Superficial pain	2.57 (1.58)	2.86 (1.50)	0.92	0.837-0.955	2.30 (1.75)	2.27 (1.78)	0.98	0.962-0.989
Proprioceptive	2.50 (1.69)	2.43 (1.72)	0.99	0.975-0.992	2.34 (1.80)	2.34 (1.84)	0.98	0.961-0.988
Voluntary movement control								
Upper extremity	6.52 (4.79)	6.82 (4.94)	0.99	0.980-0.994	6.09 (4.81)	6.16 (5.30)	0.96	0.928-0.979
Hand function	4.66 (3.31)	4.77 (3.40)	0.99	0.982-0.995	4.14 (3.74)	3.91 (3.77)	0.97	0.939-0.982
Perception								
Autotopagnosia	3.91 (0.60)	3.91 (0.60)	1.00	1.000-1.000	3.89 (0.49)	3.89 (0.49)	1.00	1.000-1.000
Unilateral spatial neglect	0.82 (0.39)	0.75 (0.44)	0.80	0.643-0.892	0.73 (0.45)	0.70 (0.46)	0.91	0.834-0.950
Visual object agnosia	3.98 (0.15)	3.98 (0.15)	1.00	1.000-1.000	3.93 (0.33)	3.91 (0.36)	0.95	0.910-0.973
Figure ground	3.91 (0.36)	3.89 (0.39)	0.95	0.923-0.977	3.91 (0.36)	3.91 (0.36)	1.00	1.000-1.000
Spatial relation	3.77 (0.52)	3.82 (0.54)	0.91	0.840-0.952	3.80 (0.55)	3.84 (0.43)	0.95	0.913-0.974
Apraxia	7.75 (1.24)	7.82 (1.21)	0.98	0.965-0.989	7.80 (0.67)	7.80 (0.67)	1.00	1.000-1.000
Cognition								
Memory	1.11 (1.10)	1.70 (1.25)	0.73	0.407-0.867	1.27 (1.21)	1.36 (1.22)	0.98	0.958-0.888
Attention	2.32 (0.80)	2.45 (0.76)	0.80	0.637-0.891	2.36 (0.75)	2.41 (0.76)	0.98	0.963-0.989
Orientation	3.59 (1.09)	3.61 (0.95)	0.95	0.905-0.972	3.55 (0.95)	3.57 (0.97)	0.97	0.941-0.982

Discussion

The occupational therapy screening tools for clients with stroke were developed based on the opinions of occupational therapists in Thailand and literature reviews. To operate the developed screening tool, two procedures were required including an interview and a test such as performing specific tasks such as moving parts of the body as instructed. In general, a screening tool should focus on elementary information and take minimal operation time. In this study, the developed screening tool took around 15 minutes to assess basic performance components in various aspects, including sensation, voluntary movement control, perception, and cognition. For example, in the part of the cognitive domain, there were only three basic cognitions including orientation, attention, and memory that were prerequisite aspects for performing daily life. This was consistent with the item of other screening tools that have three or more elements of cognitive function that also emphasize basic cognition.[11,16,17] The data obtained from the screening tool is quantitative, which allows the occupational therapist to objectively gauge the level of the patient's performance. Thus, the developed screening tool is consistent with what was found in the literature review, namely that screening tools should be a preliminary assessment that uses less time to assess clients' ability through a performance test or observing the client's behavior.[5,18] In addition, screening tools that can provide quantitative data have the advantage of allowing therapists to interpret the results quickly, which would make the screening process more convenient.[19]

Regarding the psychometric properties of the occupational therapy screening tool, its content validity was found to be at an acceptable level (IOC scores between 0.8 and 1.0).[20] This might be a result of the development process of the screening tool, which followed the instrument development process including reviewing the literature relevant to assessment theory, taking into account the role of occupational therapists in the rehabilitation of stroke clients, existing assessment tools,[1,21] as well as the opinions of Thai occupational therapists involved in the development process who have had experienced working with stroke clients. Thus, appropriate items and methods of screening were obtained. This was in line with the development processes of other assessments in using experienced professionals' opinions to make the assessment appropriate, in other words, the content is valid.[11] In addition, the occupational therapy screening tool consists of a manual guideline and

detailed interpretation. Also, the items had been adjusted following expert recommendations and re-examined, which resulted in a high level of IOC.[22,23]

In the test-retest reliability study, the study conducted two assessments on 44 stroke clients with an interval of two weeks between the first and second assessments. This was consistent with the test-retest studies of other assessment tools where the re-test interval was approximately two weeks or 15 days, and their reliability was at the same high level.[24,25] ICC scores in this study were between 0.80 and 1.00 which are considered excellent, indicating that the rater could understand the method and interpret the screening results accurately. Only memory had good, rather than excellent, reliability (an ICC score of 0.73). As the memory questions were short and uncomplicated, the participants got higher scores in the second screening compared to the first screening due to the learning effect.[26,27] In addition, clients having a stroke for less than a year memory function could recover through spontaneous rehabilitation during this time.[28-30] These factors might affect the change in memory ability and make the test-retest reliability good.

The study of inter-rater reliability showed excellent reliability on all items. This meant that all procedures of the developed screening tool were clear and appropriate for both raters. They could understand the assessment process, how to give instructions, and interpret the results of the screening. This might be attributable to the fact that the screening tool has had its methods and interpretation criteria adjusted according to the advice of experts.[31] In addition, both raters were trained until they were familiar with the screening tool. The training process is recommended to enable practitioners to obtain knowledge, understanding, and skills to perform the screening accurately and effectively.[32] In this study, inter-rater reliability was performed by using the videos from the first rater's assessment to score the participants' performance. Therefore, the scores were accurate because it was a one-time assessment of the participant's performance, and the scores were reached independently by both raters. This methodology was consistent with those in the literature review in which all raters scored participants' performance from recorded videos. The inter-rater reliability range is categorized as excellent.[25,33,34]

Limitation

These results should be considered within the context of the study's limitations. The data was collected only in clinical settings. It may not represent all stroke clients in the community. In addition, the screening tool has only been proven content valid, and test-retest and inter-rater reliability for clinical use. Therefore, all of these factors should be considered when occupational therapists select what assessment tool should be used. Further research is recommended for concurrent validity, factor analysis, sensitivity, and specificity studies.

Conclusions

The occupational therapy screening tools for clients with stroke have been developed and their psychometric properties tested, including content validity, test-retest, and inter-rater reliability. It could be used as a screening tool for Thai stroke clients in four areas: sensation, voluntary movement of UE, perception, and cognition performance. Occupational therapists could use the data derived from the developed screening tool to identify impairment and determine the need for further evaluation and treatment. It is unnecessary for occupational therapists to be trained in how to use it; however, the manual guidelines providing information about the developing screening tool and how to interpret testing results should be studied.

Conflict of interest

The authors declare that there is no conflict of interest.

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