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Psychometric properties of the Thai version of Allen Cognitive Level Screen-5 (Thai ACLS-5) for individuals with schizophrenia

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ABSTRACT

Background: Cognitive impairment is a critical concern for individuals with schizophrenia, affecting their occupational performance, daily activities, and the potential for rehabilitation and skill development. The Allen Cognitive Level Screen-5 (ACLS-5) is a standardized, performance-based assessment designed to evaluate functional cognitive abilities and limitations, providing guidance for individualized interventions. However, there is currently no Thai translation for the ACLS-5.

Objectives: This study aimed to translate the ACLS-5 into Thai using a back-translation method and to evaluate its psychometric properties, focusing on construct validity and inter-rater reliability, to ensure its suitability for use in Thai clinical settings.

Materials and methods: The ACLS-5 was translated from English into Thai following Beaton's protocol, a five-step process for cross-cultural adaptation, and the pre-final version was tested on a sample of 30 individuals with schizophrenia to assess cultural adaptation and content validity. Construct validity was evaluated using a sample of 102 participants, comprising of 51 individuals with schizophrenia and 51 healthy individuals. Inter-rater reliability was examined by two occupational therapists who independently evaluated 38 participants from the schizophrenia group.

Results: In the translation and cultural adaptation phase, the names of the stitching tasks were modified to match Thai culture. Feedback from the Allen Cognitive Group suggested that the terms lacked direct Thai equivalents; consequently, they remained in their original English form. The pre-final Thai ACLS-5 was tested with 30 individuals with schizophrenia, in which it was reported that the instructions were clear and easy to understand. The Mann-Whitney U test indicated a significant difference in construct validity between individuals with schizophrenia and healthy controls ($Z=-6.511$, $p<0.000$), confirming the assessment's effectiveness in distinguishing cognitive impairment. The intraclass correlation coefficient (ICC) for inter-rater reliability was 0.932, demonstrating excellent reliability.

Conclusion: These findings confirm that the Thai ACLS-5 is a valid and reliable assessment for evaluating functional cognition in individuals with schizophrenia. It allows for a quick and effective assessment of functional cognition in clinical settings. Future research should examine usage in different populations to further establish its utilization.

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Introduction

Schizophrenia is a mental disorder characterized by abnormalities in neurotransmitter systems, leading to significant cognitive impairments.[1] Symptoms usually appear in adolescence or early adulthood, affecting various cognitive domains, such as attention, verbal fluency, working memory, processing speed, and executive functions.[2] These

deficits are associated with functional skills affecting their daily life activities.[3] A study of the relationships between occupational engagement and cognitive functioning among persons with schizophrenia suggests that cognitive functioning influences occupational engagement and the capacity to perform daily activities.[4]

The evaluation of cognitive abilities is an important part in the occupational therapy process. Assessing cognitive abilities in daily activities allows for the identification of strengths and limitations, as well as providing how an individual acquires new skills and adjusts to environmental strategies that support daily living.[5,6] There are various cognitive assessment tools available, such as self-report measures, performance-based tests, and computer-based measures. However, performance-based assessments are most used for psychiatric patients.[7]

One of the performance-based assessments is the Allen Cognitive Level Screen-5 (ACLS-5), a standardized tool based on the Cognitive Disabilities Model (CDM). This model suggests that functional performance in daily activities is influenced by the interaction between cognitive abilities and environmental contexts. The model categorizes cognitive abilities into six levels, reflecting brain processing capacity, learning potential, problem-solving skills, and performance capacity. These levels are determined through the observation of performance on three leather stitching tasks with increasing complexity.[8] The ACLS-5 facilitates the classification of individuals based on cognitive performance and is useful in the development of specific treatment strategies that relate to their cognitive abilities.[9] Additionally, the application of the ACLS-5 in clinical settings enables professionals to promptly and effectively evaluate cognitive capacities, hence impacting the formulation of treatment plans and subsequent interventions after discharge.[10]

Studies on the psychometric properties of the ACLS-5 have demonstrated strong inter-rater reliability across all versions of the ACLS and LACLS (1978-2007), with correlation coefficients ranging from r=0.91 to 0.99. [11] A study involving 225 individuals in a mental health setting found a significant association between functional cognition, as measured by the LACLS-5, and the level of independence (r=0.55, p<.01).[11] The ACLS-5 has been translated and validated in multiple languages, for example, Japanese,[11] Chinese,[12,13] and Turkish,[14] demonstrating robust psychometric properties. Significant correlations have been reported with cognitive and functional assessments, including the Mini-Mental State Examination (r=0.90, p<.0001),[11] the Chinese Mini-Mental State Examination (Z=0.61, p<.01),[12] the Social Functioning Scale (Z=0.382-0.480, p<.05),[14] and the Wisconsin Card Sorting Test (Z=0.257-0.557, p<.01). [14] Overall, findings consistently support the construct validity, reliability, and discriminant validity of the ACLS-5, confirming its effectiveness in evaluating functional cognition across diverse populations.

The ACLS-5 is widely utilized for evaluating functional cognition and designing interventions for daily living activities. However, there have been no reports of the translation of the ACLS-5 into Thai.

This study aimed to translate the ACLS-5 from English to Thai and evaluate its psychometric properties, including content validity, construct validity, and inter-rater reliability.

Materials and methods

Study design

This study was conducted in two phases: 1) the translation and cultural adaptation of the ACLS-5, and 2) the evaluation of psychometric properties, which included construct validity and inter-rater reliability.

Phase 1: Translation and cultural adaptation

The researchers obtained permission from the Allen Cognitive Group for the translation of the administration and scoring manuals. The translation process followed the Beaton's guideline[15] and consisted of five steps:

Step I: Initial translation

ACLS-5 was independently translated from English to Thai by two bilingual translators. One translator had a medical background with expertise in psychiatric occupational therapy, while the other had no medical background. This step produced two initial Thai versions, labeled T1 and T2.

Step II: Synthesis of translations

Two translators and the researchers synthesized T1, T2, and the original ACLS-5 to develop a unified version, referred to T-12. Both translators reviewed and approved this synthesized version.

Step III: Back translation

Two bilingual translators who were blind to the original ACLS-5 independently back-translated the T-12 version into English. This step produced two English versions, BT1 and BT2. Both versions were thoroughly reviewed to confirm their consistency with the original ACLS-5 content. The outcome of this step was a combined English version (BT12).

Step IV: Expert panel discussion

An expert panel was focused on semantic equivalence, idiomatic equivalence, and conceptual equivalence to ensure the accuracy and appropriateness of the translation. The panel consisted of seven members: four translators involved in steps I-III, one English language expert, one research methodology expert, and one occupational therapist. Through consultations and discussions, the panel refined the assessment, resulting in a pre-final version. Additionally, the BT12 English version was approved and verified by the original developers (The Allen Cognitive Group) to confirm consistency with the original content.

Step V: Pre-testing

The pre-final Thai version of the ACLS-5 was administered to 30 individuals with schizophrenia. They

were recruited from a psychiatric hospital in Chiang Mai Province, Thailand, using purposive sampling. The inclusion criteria were as follows:

1. A diagnosis of schizophrenia based on the International Classification of Diseases, 10th Revision (ICD-10) criteria
2. Stable psychiatric symptoms, indicated by a score of the Positive and Negative Syndrome Scale Thai version (PANSS-T)
3. Aged between 20 and 65 years
4. No auditory or visual impairments
5. Ability to communicate in Thai
6. No history of brain injury or neurological disorders
7. No history of experience with stitching leather

After completing the assessment, interviews were conducted to assess the clarity and comprehensibility of the assessment. Feedback was analyzed, and necessary modifications were made to refine the instrument. Following this process, the final version of the Thai ACLS-5 was completed.

Phase 2: Psychometric properties study

Construct validity of the Thai ACLS-5 was examined using the known-group technique. The sample size for the study was calculated using the G*Power 3.1.9.4 software, with an effect size of 0.5, a power level of 0.8, and a significance level of α=0.05.[14] Based on this calculation, a total of 102 participants were included in the study, comprising 51 individuals with schizophrenia and 51 healthy individuals. Ethical approval for the study was obtained from the Ethics Committee of the Faculty of Associated Medical Sciences, Chiang Mai University (EC Number: AMSEC-67FB-001) and the Human Research Ethics Committee at Suanprung Hospital (EC Number: SPH. IRB002/2567SCs_Ful).

Individuals with schizophrenia were recruited from a psychiatric hospital in Chiang Mai Province, Thailand, using purposive sampling. The inclusion criteria for this group were identical to those used in Phase 1.

A control group of healthy individuals was recruited from the community in Chiang Mai Province, Thailand, through purposive sampling. The inclusion criteria of the control group were as follows:

1. Aged between 20 and 65 years
2. No auditory or visual impairments
3. Ability to communicate in Thai
4. No history of psychiatric disorder
5. No history of brain injury or neurological disorders
6. No history of experience with stitching leather

To ensure comparability, the healthy controls were demographically matched with the schizophrenia group based on gender, age, education level, and work experience.

Inter-rater reliability was assessed in a subgroup of 38 individuals with schizophrenia from the construct validity sample. Two occupational therapists with experience in psychiatric patients were trained by the researcher to administer the Thai ACLS-5. One therapist administered the assessment while the other observed, with both independently scoring the participants to minimize bias and ensure objective evaluation.

Instruments

The Allen Cognitive Level Screen-5 (ACLS-5)

The Allen Cognitive Level Screen-5 (ACLS-5) is a standardized assessment tool developed within the framework of the Cognitive Disabilities Model (CDM).[16] The ACLS-5 consists of three visuomotor tasks of increasing complexity: the Running Stitch, the Whipstitch, and the Single Cordovan Stitch. Each task requires participants to follow the examiner's verbal and demonstrative instructions, utilizing feedback from their motor actions to make necessary corrections. Scoring ranges from cognitive level 3.0 to 5.8, with higher scores indicating better cognitive functioning. The assessment typically takes 15 to 20 minutes to complete and reflects the capacity of the individual to learn and adapt while performing various activities.

The Positive and Negative Syndrome Scale Thai version (PANSS-T)

The Positive and Negative Syndrome Scale Thai version (PANSS-T)[17] is a tool designed to assess symptom severity in individuals with schizophrenia, based on clinical interviews and observations. The PANSS-T has been assessed for both reliability and criterion validity in Thai patients with schizophrenia. Significant correlations between the PANSS and PANSS-T scales were observed, including positive symptoms (r=0.89), negative symptoms (r=0.72), and general psychopathology (r=0.88), all with p<.0001. Additionally, the agreement for each item ranged from 70% to 100%, demonstrating strong reliability.[17]

In this study, a composite scale score was calculated by subtracting the negative scale score from the positive scale score. The composite scale score below 0, indicating the relative predominance of no positive symptoms.

Statistical analysis

All statistical analyses were conducted using SPSS software. Descriptive statistics were used to summarize demographic data. The Chi-square test was employed to compare demographic characteristics between the individuals with schizophrenia and healthy controls. The Mann-Whitney U test was used to assess construct validity by comparing the Thai ACLS-5 scores between individuals with schizophrenia and healthy individuals. Inter-rater reliability was evaluated using the intraclass correlation coefficient (ICC).

Results

Phase 1: Translation and cultural adaptation

The Thai ACLS-5 was reviewed by an expert committee for semantic and idiomatic equivalence. Seven experts discussed key occupational therapy terms (such as visuospatial-motor, cognitive activity demands, performance, and cues), stitching task names (such as

Running Stitch, Whipstitch, and Single Cordovan Stitch), and the phrasing of instructional directions. During this review, terms without direct Thai equivalents were identified. The Allen Cognitive Group commented on specific terms, such as "Allen Cognitive Level," "Cross-in-Back Error," and "Twisted Lace Errors," which lacked direct Thai translations. To address these issues, the stitching task names were adapted to align with Thai cultural practices, phrase patterns were clarified, and the original technical terms were retained when necessary.

The pilot testing was conducted on 30 individuals with schizophrenia, with their demographic characteristics presented in Table 1. The results of the pilot testing, as shown in Table 2, include the Thai ACLS-5 scores and the time taken to complete the three tasks. Participant feedback indicated that the instructions were clear and easy to understand.

Phase 2: Psychometric properties study

The analysis of demographic characteristics, as shown in Table 3, revealed no differences between schizophrenia and healthy groups. The construct validity of the Thai ACLS-5 was assessed by comparing scores between individuals with schizophrenia and healthy controls. The results indicated a significant difference between the two groups (Z=-6.511, p<.000), as presented in Table 4. Additionally, the comparison of time taken to complete the Thai ACLS-5 between the two groups, analyzed using the Independent Samples T-Test, is shown in Table 5.

The inter-rater reliability analysis demonstrated a high level of agreement for the Thai ACLS-5, with an intraclass correlation coefficient (ICC) of 0.932 (Table 6), indicating excellent consistency between raters.

Table 1. Characteristics of individuals with schizophrenia (N=30) in the pilot testing.

Characteristics		Schizophrenia	%
Gender	Male	17	56.7
	Female	13	43.3
Age (years)	20-40	11	36.7
	41-60	18	60.0
	61-65	1	3.3
Education	Primary	11	36.7
	Secondary	18	60.0
	University	1	3.3
Work experience	None	18	60.0
	Farmer	4	13.3
	Self-employed	5	16.7
	Employee	3	10.0

Table 2. Result of pilot testing for the Thai ACLS-5 in schizophrenia (N=30).

Result of Testing	Minutes	Max	Mean (SD)	Median
Thai ACLS-5 score	4.4	5.6	5.17 (0.31)	5.2
Time used (minute)	2.49	28.10	13.19 (6.12)	

Table 3. Comparison of demographic data between schizophrenia (N=51) and healthy controls (N=51) using the Chi-square test.

Characteristics		Schizophrenia	%	Healthy controls	%	*p* value
Gender	Male	39	76.5	19	37.3	0.748
	Female	12	23.5	32	62.7	
Age (years)	20-40	23	45.1	19	37.3	0.942
	41-60	24	47.1	22	43.1	
	61-65	4	7.8	10	19.6	
Education	Primary	15	29.4	18	35.3	0.156
	Secondary	29	56.9	28	54.9	
	University	7	13.7	5	9.8	
Work experience	None	16	31.4	5	9.8	0.229
	Farmer	5	9.8	3	5.9	
	Self-employed	24	47.1	36	70.6	
	Employee	6	11.7	7	13.7	

Table 4. Comparison of the Thai ACLS-5 scores between schizophrenia (N=51) and healthy controls (N=51) using the Mann-whiney U test.

	Schizophrenia			Healthy controls			Z	*p* value
	Min	Max	Mean (SD)	Min	Max	Mean (SD)		
Thai ACLS-5 score	3.4	5.8	4.8(0.65)	5.2	5.8	5.5(0.17)	-6.511	0.000

Table 5. Comparison of time used of the Thai ACLS-5 scores between schizophrenia (N=51) and healthy controls (N=51) using Independent Samples T-Test.

	Schizophrenia			Healthy controls			*p* value
	Min	Max	Mean (SD)	Min	Max	Mean (SD)	
Time used (minute)	1.36	24.34	10.24 (4.31)	1.00	23.10	9.50 (5.39)	0.106

Table 6 Inter-rater reliability analysis of the Thai ACLS-5 scores between two raters using the intraclass correlation coefficient (ICC) test.

	Rater 1			Rater 2			ICC	95% CI
	Min	Max	Mean (SD)	Min	Max	Mean (SD)		
Thai ACLS-5 score (N=38)	3.4	5.8	4.7 (0.65)	3.2	5.8	4.7 (0.64)	0.932	0.873-0.964

Discussion

The back-translation process, following Beaton's protocol, was utilized to ensure the concepts and content of the original assessment. A key component of this method is the expert panel review, which serves as a content validity. The panel improved the translation to ensure accuracy, clarity, and consistency with the original assessment.[18] In this study, the expert panel revised the names of the three stitching tasks to better reflect Thai cultural contexts for the purpose of defining the type of stitching. The adjustments improved the instrument's meaning and clarity within Thai context. Additionally, in pilot testing of individuals with schizophrenia, task instructions were simplified while keeping meaning. Participant feedback indicated that the instructions were clear and easy to understand.

The construct validity of the Thai ACLS-5 indicated that individuals with schizophrenia had significantly lower scores compared to healthy controls (Z=-6.511, p<0.000); supporting the hypothesis that the ACLS-5 is effective in distinguishing individuals with cognitive impairment. The results highlight that cognitive impairment plays a crucial role in determining functional cognition in schizophrenia, impacting more than 80% of individuals with the condition.[19] Previous studies conducted by Ozturk, Bumin, Ozturk, and Akyurek[14] examined the ACLS-5 in a sample of 61 individuals with schizophrenia compared to 61 healthy participants; reporting significantly lower scores in the schizophrenia group. Like this study, their findings confirmed that the Thai ACLS-5 effectively differentiates individuals with cognitive impairment.

The inter-rater reliability analysis of the Thai ACLS-5 demonstrated an Intraclass Correlation Coefficient (ICC) of 0.932, which indicated excellent reliability.[20] Various versions of the ACL have demonstrated excellent inter-rater reliability, with correlation coefficients ranging from 0.92 to 0.99.[11] For instance, the Cantonese version of the ACLS reported high inter-rater reliability (ICC=0.98),[13] as their raters received training in assessment. In this study, raters had prior experience with the cognitive disability model in schizophrenia and received introduction and training on the assessment instruction and scoring criteria. Therefore, it is recommended that training in the cognitive disability model and assessment instructions be provided before administering the Thai ACLS-5 to ensure a comprehensive understanding of the assessment process and scoring. This training enhances accuracy in identifying cognitive levels. Additionally, the ACLS-5 includes clear and standardized instructions, promoting consistency in administration and interpretation among examiners. Moreover, participants completed the three stitching tasks within thirty minutes, highlighting that the Thai ACLS-5 is a quick and practical assessment tool. In clinical settings, it allows professionals to efficiently evaluate the cognitive abilities of patients, thus facilitating informed treatment and post-discharge intervention recommendations.[10,21]

Limitations

This study has several limitations. The individuals with schizophrenia were recruited from a single setting, and construct validity used the known-groups method. To strengthen the evidence base, future research should include participants from multiple centers and conduct further validation with additional cognitive assessment tools. Additionally, examining psychometric properties such as test-retest reliability and intra-rater reliability is recommended.

Conclusion

The Thai ACLS-5 has been effectively translated and culturally adapted to align with Thai context. The findings confirm its reliability, validity, and practicality as an assessment for evaluating functional cognition in individuals with schizophrenia. The assessment demonstrates significant potential for occupational therapists in Thailand, providing important perspectives for intervention strategies.

Future research should examine its application across diverse populations and settings to further validate its utility in both clinical practice and research.

Ethical approval

The Research Ethics Committee of the Faculty of Associated Medical Sciences, Chiang Mai University (EC Number: AMSEC-67FB-001) and the Human Research Ethics Committee at Suanprung hospital (EC Number: SPH.IRB002/2567SCs_Ful) both gave their approval to this research study.

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Conflict of interest

The authors declare no conflicts of interest

CRedit authorship contribution statement

Kaewalin Sriyuang: data collection, trained occupational therapists training to serve as research assistants, and statistical analysis, manuscript preparation; **Pornpen Sirisatayawong**: critical comments providing and contributing to develop research, analysis, and writing.

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