

Developing Cerebral Palsy Screening of Functional Abilities in School (CPS –FAS)

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ABSTRACT

Objective: This study aimed to determine the psychometric property of a newly developed functional abilities screening tool for children with cerebral palsy (CP) in special education units.

Materials and Methods: This study was designed as a cross-sectional study. The tool for cerebral palsy screening of functional abilities in school (CPS-FAS) was established by surveying 28 pediatric physical therapists and holding focus group discussions with them. The CPS-FAS tool was used to evaluate content validity, reliability, and discriminative ability with 30 school-age children with CP at levels 1-3 of the Gross Motor Function Classification System (GMFCS).

Results: The CPS-FAS generation process established 21 activity-problem screening items for children with CP, which had good content validity (index of item-objective congruence (IOC) = 1), good internal consistency ($\alpha = 0.92$), and showed significant differences between GMFCS levels 1 and 3 ($p > 0.001$) and GMFCS levels 2 and 3 ($p > 0.001$).

Conclusion: The CPS-FAS tool can be applied to school-age children with CP in a special education unit to screen such children for activity problems that affect school living without environmental obstruction and language barriers, and it only takes a short time (10-15 minutes) to complete.

Keywords: Cerebral palsy; functional ability; special education school (Siriraj Med J 2024; 76: 497-503)

INTRODUCTION

Cerebral palsy (CP) is a neurological condition causing abnormal developmental pathologies affecting 1.6-3.4 children out of every 1000.¹ The most common problem is motor disability, which is demonstrated through abnormal muscle tone, muscle weakness, joint deformity, mental retardation, and impaired cognition.^{2,3} It is a persistent disorder associated with posture and movement control of the body which means children with CP have difficulty in physical activity and is the cause of social exclusion.^{4,5} Their health and disabilities mean children with CP have more barriers to participating, studying, and socializing. Therefore, children with CP have a significantly lower quality of life than typical children.⁶⁻⁸

Gross motor function deficits are an important participation restriction and lead to discriminatory education practices. The participation, motor function, and stress of children with CP are very different from those of typical children, so providing a normal environment and mainstream education system for them might be not suitable. Therefore, there is a special education system which can support special needs and optimize approaches to remove the children's barriers.^{9,10} A special education program is a modified program that involves unique tools, techniques, and instructional arrangements that are driven by multidisciplinary teams to move toward less discrimination against disabled children.¹¹⁻¹³

Physical therapists (PTs) in special education have an important role in interacting with overall health

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conditions, such as bodily functions, activities, participation, and other impacted factors, for improving children's academic performance and estimating the levels of caregiver management required in school^{14,15} A previous survey study on special education units showed that PTs used motor impairment assessment tools for admission screening, estimating children's performance, and planning rehabilitation plans and follow-up treatment. However, PTs still faced obstacles in the assessment process and had to integrate items or domains from various standard tools to solve their problems. They needed clear instructions and an appropriate scoring system, and they needed to be able to complete the assessment within a short time and document the social participation aspect.¹⁶ All these gaps found among PTs should be filled, and their requirements should also be integrated into a new simple and validated tool for children with CP.

An appropriate clinical tool is the most important item required to address the motor function problems of children with CP and decrease the size of the differences between those children and typical children. Therefore,

this study aims to develop a physical therapy screening tool to define the problematic functional activities in school-based children with CP, which will lead to more accurate decisions for further in-depth physical examination and regulation of guidelines for Individualized Education Programs (IEPs).

MATERIALS AND METHODS

The cerebral palsy screening of functional abilities in school (CPS-FAS) tool was developed from a surveying process and a focus group discussion process with pediatric physical therapists (PTs). The tool was tested for its psychometric properties and discriminative ability in children with CP. The study process is shown in (Fig 1). The study was approved by the Human Research Ethics Committee of Srinakarinwirot University (Certification number PTPT2021-004), the Physical Therapy Department of Srinakarinwirot University (Certification number SWUEC/E/G-212-2564), and the Human Research Ethics Committee of Bangkok (Certification number U004hh/66).

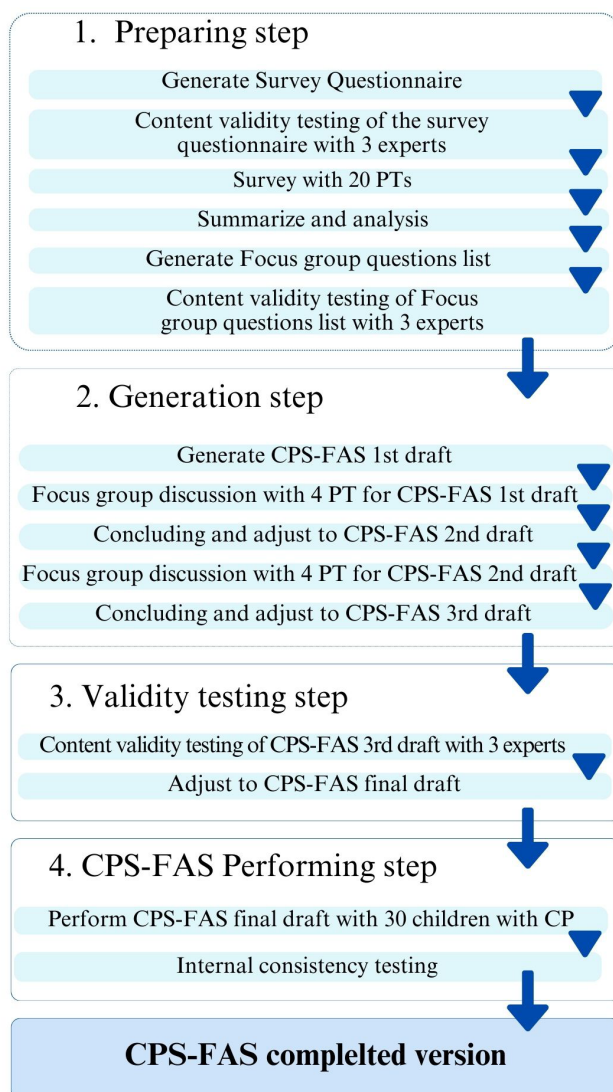


Fig 1. The process of cerebral palsy screening of functional abilities in school tool development.

Boys and girls (n=30) who had been diagnosed with CP were selected by purposive sampling according to the following inclusion criteria: studied in school grades 1-12, had CP at GMFCS levels 1-3, and were able to cooperate. They were selected to evaluate the content validity, internal consistency, and GMFCS-level discriminative ability of the CPS-FAS tool. Participants were excluded if consent had not been given by parents or legal guardians; they were in ill health; they could not move their extremities or were under weight-bearing restrictions after surgery; they had unstable epilepsy or had changed doses of anti-epileptic medication; or they had additional disabilities such as blindness or deafness.

To define school-based PT obstructions, the author created the following survey with closed and open-ended questions: Requirements of PTs in Special Education Units. The authors ensured content validity and understanding of the language of the survey questionnaire with three experts who analyzed the correspondence between the questions and the objectives by using the index of IOC. The coefficient (IOC=0.67-1) of the survey questionnaire was acceptable. Then, the survey questionnaire was applied with 12 special education units in Thailand and was submitted via Google Forms by PTs who had more than 1 year of experience (n=20) and had been recruited by purposive sampling. The author waited for 2 weeks to receive the responses and then analyzed the answers. The summary was used to generate the first draft of the CPS-FAS tool.

The online focus group discussion was an item-detail adjustment process. The question list was established based on the results of the survey that had been content validated by three experts (IOC = 0.67-1). This process was divided into two rounds with researchers and senior pediatric PTs (n=8). In the first round, the first draft of the CPS-FAS tool was sent to the senior lecturer of PTs in the pediatric field (n=4). Then, the results were used to adjust item details for the second draft. In the second round, the second draft of the CPS-FAS tool was sent to senior pediatric PTs in the special education units (n=4). Then, the results from the focus group discussion were used to develop the third draft.

The third draft from the focus group discussion was analyzed for content validity. The content validity was tested by three experts who had more than 2 years experience as pediatric PTs. This analysis resulted in the final draft of the CPS-FAS tool. The final draft of the CPS-FAS tool was used on children with CP (n=30) to evaluate the internal consistency of each item and the total consistency of all items. The total CPS-FAS score of 30 children with CP was used to define differences between levels 1-3 of the GMFCS.

Statistical analyses

Descriptive statistics were used to explain the participants' demographic data, CP type, GMFCS level, other characteristics, and the results of CPS-FAS as frequency, mean, and standard deviation values. The index of item-objective congruence (IOC) was used to test the content validity. The expected coefficient was greater than 0.5. Cronbach's alpha coefficient was used to evaluate the internal consistency of the items of the CPS-FAS tool. The expected coefficient (α) was greater than 0.8. The group difference was analyzed using the Kruskal-Wallis test, analysis of variance (ANOVA) tests, and the Bonferroni post-hoc test. The level of significant difference was set at $p < 0.05$ and 95% confidence intervals. For all of the analyses, SPSS software, version 22.0, was used (SPSS Inc., Chicago, IL).

RESULTS

The CPS-FAS tool is a newly developed tool that responds to the needs of PTs in special education units and helps remove obstructions to psychometric testing. The CPS-FAS tool has acceptable content validity (IOC=0.67-1).

The CPS-FAS tool consists of three parts: Part 1: Basic profile (name, caregiver's name, GMFCS level, study level, usage of gait aids, disabilities, other personal health issues, and body chart); Part 2: Screening scale (related to motor functions and activities in school, and consisting of 21 items); see detail in (Table 1) and Part 3: Tool instruction (suggested starting position, main idea of each item and decision criteria). The scaling system uses a 4-point ordinal scale to score the level of children's abilities and each level has a specific definition, ranging from 3, which means they are able to complete that function, to 0, which means they are unable to complete that function. The highest possible score is 63.

The demographics and characteristics of participants are presented in (Table 2). The 30 children with CP consisted of 14 boys and 16 girls. The mean age was 13.13 years (range = 8–18 years), and the median was 13 years. The participants' levels were diagnosed and classified according to the Gross Motor Function Classification System (GMFCS) by physicians.

The statistically significant differences between the total CPS-FAS scores at the three GMFCS levels were confirmed by the Kruskal-Wallis test ($p < 0.001$), and the ANOVA test ($F = 42.786$, $p < 0.001$). From the pairwise comparison between groups, differences were found between GMFCS levels 1 and 3 ($p > 0.001$) and GMFCS levels 2 and 3 ($p > 0.001$); see detail in (Table 3) and (Fig 2).

TABLE 1. The items of CPS-FAS.

Items
Sit on a chair with stability
Co-ordination of eyes and hands
Reach in sitting with stability
Co-ordination of both hands
Co-ordination of upper extremities
Co-ordination of lower extremities
Stand up from a chair
Stand with stability
Reach in standing with stability
Walk on a flat surface for a distance of 2 meters with a safety
Gait pattern on a flat surface for a distance of 2 meters
Walk in a narrow lens 30-centimeters for a distance of 2 meters
Cross objects at ankle level
Upstairs 3 steps
Downstairs 3 steps
Wheelchair using
Transfer to toilet
Hygiene care in the toilet
Bathing
Grooming
Eating

Note: CPS-FAS mean cerebral palsy screening of functional abilities in school

The reliability testing of the CPS-FAS tool involved each item related to the tool's objective. The statistics showed the CPS-FAS tool had a Cronbach's alpha of 0.921 based on all items, and a Cronbach's alpha of 0.917 based on standardized items.

DISCUSSION

Currently, each special education unit has its own diverse structure; even though all special education units have the same policy, they work differently. Therefore, some special education units established their own tool to fill their gaps, but the tools lacked psychometric properties. Some units did not establish their own tools, but instead, they chose to use standard tools, such as GMFM, and selected some dimensions that were related; however, half of them thought GMFM was uncomprehensible and selected other tools, such as the Gross Motor Function Classification System (GMFCS), visual analogue scale (VAS), modified Ashworth scale (MAS), Functional Independence Measure for Children (WeeFIM), and Barthel ADL index to be used together. Moreover, the survey results showed PTs in special education units had a lack of experience in using standard tools, insufficient time, and inadequate tools, which indicate that Thailand's special education units desire a specific standardized tool for practical use.

The International Classification of Functioning, Disability and Health for Children and Youth (ICF-CY) defines 'activity' as the execution of a task or action by an individual. The Activities and Participation chapters of the ICF-CY comprised the following nine chapters: Learning and Applying Knowledge; General Tasks and Demands; Communication; Mobility; Self-care; Domestic Life; Interpersonal Interactions and Relationships; Major Life Areas; and Community, Social and Civic Life.¹⁷ The results of the survey show the most applicable chapters in schools for children with CP are the Mobility and

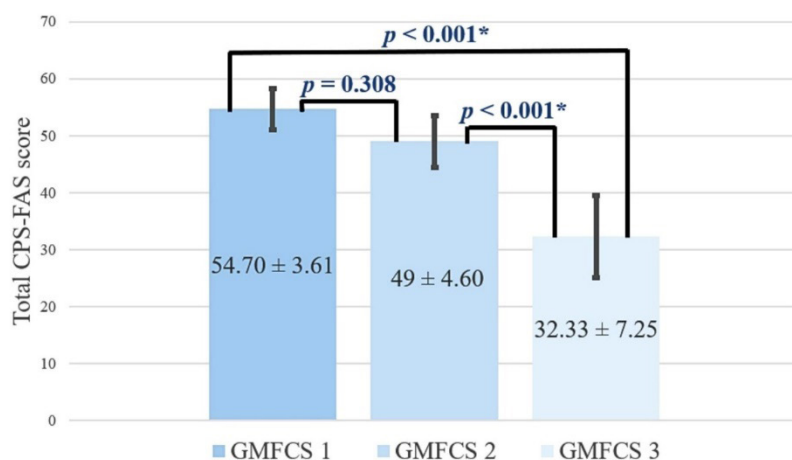


Fig 2. The mean differences between the total CPS-FAS scores at the three GMFCS levels; *mean significant difference at the 0.05 level; GMFCS mean Gross Motor Function Classifications System; CPS-FAS mean cerebral palsy screening of functional abilities in school.

TABLE 2. The demographics of children with cerebral palsy.

Variable	Level of GMFCS			Kruskal-Wallis Test (p-value)
	Level 1 (n=10)	Level 2 (n=5)	Level 3 (n=15)	
Gender (n;%) ^b				
Boy	5 (50%)	2 (40%)	7 (46.7%)	0.937
Girl	5 (50%)	3 (60%)	8 (53.3%)	
Ages (year) ^a	13.4 ± 0.53 (9 – 18)	14.8 ± 2.86 (11 – 18)	12.4 ± 3.16 (8 – 18)	0.345
Education level (n;%) ^b				
Primary	5 (50%)	2 (40%)	11 (73.3%)	0.242
Secondary	5 (50%)	3 (60%)	4 (26.7%)	
Diagnostic (n;%) ^b				
Hemiplegia	8 (80%)	0 (0%)	1 (6.7%)	0.003*
Diplegia	1 (10%)	2 (40%)	9 (60%)	
Triplegia	0 (0%)	1 (20%)	2 (13.3%)	
Ataxia	0 (0%)	1 (20%)	1 (6.7%)	
Athetoid	1 (10%)	1 (20%)	2 (13.3%)	
Gait aids (n;%) ^b				
Walker	0 (0%)	2 (6.7%)	7 (23.3%)	<0.001*
Wheelchair	0 (0%)	0 (60%)	8 (26.7%)	
No	10 (33.3%)	3 (10%)	0 (0%)	
CPS-FAS Score ^a	54.70 ± 3.61 (47 – 60)	49 ± 4.60 (42 – 55)	32.33 ± 7.25 (17 – 45)	<0.001*

Note: a mean ± standard deviation (min-max); b number (%); *mean significant difference at the 0.05 level; CPS-FAS mean cerebral palsy screening of functional abilities in school; GMFCS mean Gross Motor Function Classifications System.

TABLE 3. The differences between the total CPS-FAS scores at the three GMFCS levels.

Post-hoc test	Group	Comparing group	Mean difference (±S.E.)	p-value	95% Confidence interval
Bonferroni method	GMFCS level 1	GMFCS level 2	5.7 ± 3.37	0.308	-2.92– 14.32
		GMFCS level 3	22.37* ± 2.52	<0.001	15.95– 28.79
	GMFCS level 2	GMFCS level 3	16.67* ± 3.18	<0.001	8.54 – 24.79

Note: *mean significant difference at the 0.05 level; S.E. mean standard error; CPS-FAS mean cerebral palsy screening of functional abilities in school; GMFCS mean Gross Motor Function Classifications System.

Self-care chapters because the special education unit policy prescribes that students should have basic mobility and be able to perform self-care to guarantee that they can participate in school activities without obstacles. During the school day, children with CP have to do various activities both academic and nonacademic.^{6,18,19} Accordingly, a PT in a special education unit has a role in helping to optimize children's academic and nonacademic functional tasks to support their education.^{15,17}

CPS-FAS is concerned with the PT role in schools. The 21 items of the CPS-FAS tool represent elementary movement, such as sitting, standing, and locomotion with and without gait devices. Moreover, the CPS-FAS tool has test items on balance and limb co-ordination, which are important components in doing complex activities. Importantly, daily life activities, such as grooming, toileting, and eating, are covered to estimate children's dependence levels, which are very important for planning care plans and managing manpower in special education units.¹⁸

The CPS-FAS tool emphasizes mobility because it is often an important obstacle to doing activities. This is in accordance with a systematic review in 2019 which found that motor skills were related to school participation for children with CP, and if they had an attentive PT or school structure, it would support their school life.²⁰ The results of the internal consistency test showed the CPS-FAS tool had a Cronbach's alpha of 0.921 based on all items, and a Cronbach's alpha based on standardized items of 0.917, which means all 21 items had strong reliability and were related to the tool's objectives. All 21 items of the CPS-FAS tool were relevant, and it was not necessary to remove any items.²¹

The CPS-FAS tool had the ability to discriminate between the three GMFCS levels. The statistical testing confirmed the differences between GMFCS level 1 (very high function without gait device) and GMFCS level 3 (fair function with gait device), and between GMFCS level 2 (high function with or without gait device) and GMFCS level 3 (fair function with gait device). The study did not find a difference between GMFCS level 1 and 2, which might be due to the small number of children with CP at GMFCS level 2 (n=5).²¹

The previous studies found the gross motor skills development of children with CP had effects on school participation and quality of life.^{22,23} Accordingly, the purpose of the CPS-FAS tool is to help PTs in special education units define gross motor functions and functional activity impairment because they affect children's health and quality of life. One purpose of parents who send their children with CP to school is to get PTs to improve their children's performance, reduce physical limitations and

teach self-care activities. From the parents' perspective, it is important that teachers and multidisciplinary teams in schools are good facilitators who can improve their children's quality of life.^{10,22,23}

The strengths of the study are the inclusion of children with varying CP types, age ranges and study grades. Moreover, the purposive sampling and simple inclusion conditions of subjects generalize the result to a school-based population. A limitation is that the author focuses on studying children with CP at GMFCS levels 1-3.

CONCLUSION

The psychometric testing confirmed that the CPS-FAS tool had good validity and reliability. The CPS-FAS tool is simple to use in a school-based setting, with clear instructions, and it only takes a short time (10-15 minutes) to screen children with CP impairment using this tool before selecting more specific tools.

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Conflict of Interest

No potential conflict of interest was reported by the authors.

Author Contributions

JW, LW, and RB designed the study plan and developed the methodology. LW was investigated and collected the data. JW and LW were involved in the interpretation and analysis of data. LW and JW were involved in manuscript writing, review, and editing. All authors reviewed, edited, and approved the final version of the article.

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