Measuring Functional Status in Thai Children with Disabilities

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Abstract

Objective : The purpose of this study was to compare normal children with age-appropriate functional abilities and children with identified disabilities in Thailand.

Subjects and Method : Data were collected for 157 nondisabled children and 80 children with cerebral palsy. Their ages ranged from 6 to 100 months. The Functional Independence Measure for children (WeeFIM™) is an instrument used to assess independence in self-care, sphincter control, transfers, locomotion, communication, and social cognition.

Results : The WeeFIM™ of the disabilities scored consistently lower in all areas than those of the nondisabled children ($p<0.05$). Total score, motor score, and cognitive subscores increased with age. When data from Thai children was compared with that from American and Japanese children, total WeeFIM mean scores for each age group and Pearson's correlation coefficients between each age group and total WeeFIM scores showed similar trends.

Conclusion : WeeFIM can be used as a disability-measuring instrument for Thai children.

Key word : Cerebral Palsy, Pediatric, Functional Status

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In developing countries, cerebral palsy is the most common cause of childhood physical disability with an incidence of about 2.0 to 2.5 per 1,000 live births[1,2]. The prevalence of all physical disabilities is approximately 2.8 per 100 people in Thailand. The increased survival of very low birth weight infants and that of children with technology dependency have been major factors in this increase [3,4]. The study of cerebral palsy has prompted increased recognition of the need for a more uniform classification system of cerebral palsy emphasizing topography (hemiplegia, diplegia, triplegia, and quadriplegia) and functional severity[5,6]. The Functional Independence Measure (FIM™)[7] instrument was developed to ensure uniformity in assessing the activities of daily living (ADL) in adults. It contributes to outcome prediction and can be used to estimate burden of care[8]. For the pediatric population, the FIM for children (WeeFIM™)[9] instrument has been increasingly used as a universally applicable measure of ADL. The WeeFIM builds on the conceptual framework and is an adaptation of the Functional Independence Measure (FIM) for adults[10,11]. This instrument focuses on evaluating disability and determining the level of functional independence. It is conceptually and pragmatically distinct from many existing pediatric assessment approaches that are based on discriminative measures of impairment. The functional approach reflects a child's ability to meet the cultural and environmental demands for independence expected of his or her peer group, and directs assessment away from criteria centered on developmental sequence and/or establishing diagnoses of motor, communication, or cognitive impairment[12]. The advantage of this approach is that it specifies an interaction between the child and the environment. This interaction is used to determine the skills necessary for independent function[15] in daily activities. The second underlying concept of the WeeFIM is concerned with the amount of assistance required for disabled children to perform basic life activities. The test - retest and inter - rater reliability have also been examined in various studies and found to be excellent with ICC >0.95 for subscale and total rating [14-17]. Its reliability and validity have been studied both in non-disabled and disabled children[14,18] normal data are available for American[18] and Japanese[19] children but there have been no published reports on Thai children.

The purpose of this study was to compare normal children with age-appropriate functional abilities and children with identified disabilities in Thailand.

Specific research questions included: 1) Is WeeFIM of children with cerebral palsy (CP) or motor impairment (MI) lower than that of their non-disabled peers? 2) Do the WeeFIM measures of children with CP grade the children by severity of disability?

SUBJECTS AND METHOD

Subjects

Eighty children with cerebral palsy and 157 non-disabled children participated in the investigation. Their ages ranged from 6 to 100 months. All of the children lived in the central region of Thailand and were from middle-class families. Cerebral palsy children were recruited from the Foundation for the Welfare of the Crippled under the Royal Patronage of H.R.H. the Princess Mother of Thailand. Diplegia was present in 37.5 per cent, hemiplegia in 26.25 per cent and quadriplegia in 36.25 per cent. All children had a confirmed medical diagnosis and were receiving evaluation or treatment and follow-up services in early intervention or school-based programs. A proportional sampling plan based on severity, type of disability, and age was used to ensure that children were evenly distributed into groups. Etiology was determined by medical diagnosis.

Instrument

All children were evaluated using the WeeFIM. The WeeFIM instrument consists of 18 items in six subscales: self-care, sphincter control, transfer, locomotion, communication, and social cognition (Table 1). The self-care subscale had six items: eating, grooming, bathing, dressing of upper body, dressing of lower body, and the perineal hygiene and adjustment of clothing required for toileting. Sphincter control involves bladder management and bowel continency. Transferring involved the ability to get in and out of chairs, on or off toilets, and in or out of bathtubs or shower stalls. Locomotion includes walking in a standing position or self-directed mobility such as crawling or use of a wheelchair, and complex locomotion such as going up and down a flight of 12 to 14 stairs.

Table 1. Sample WeeFIM Instrument Rating Form*.

(Level of Scoring)	7 Complete independence (timely, safely)	No
	6 Modified independence (device)	helper
	Modified dependence	
	5 Supervision or setup	
	4 Minimal contact assistance (child ≥ 75%)	
	3 Moderate assistance (child ≥ 50%)	helper
	Complete dependence	
	2 Maximal assistance (child ≥ 25%)	
	1 Total assistance (child < 25%)	
		Self-care
A. Eating		( )
B. Grooming		( )
C. Bathing		( )
D. Dressing: upper body		( )
E. Dressing: lower body		( )
F. Toileting		( )
		Sphincter control
G. Bladder management		( )
H. Bowel management		( )
		Transfer
I. Chair / wheelchair transfer		( )
J. Toilet transfer		( )
K. Tub / shower transfer		( )
		Locomotion
L. Walk / wheelchair / crawl		( )
M. Stairs		( )
		Communication
N. Comprehension		( )
O. Expression		( )
		Social cognition
P. Social interaction		( )
Q. Problem solving		( )
R. Memory		( )
	Total WeeFIM rating	( )

* WeeFIM® Instrument. Copyright©2000. Uniform Data System for Medical Rehabilitation, a division of U.B. Foundation Activities, Inc. World rights reserved. Adapted with permission.

Communication involves comprehension of verbal and nonverbal information and the expressive use of language by demonstrating basic needs and ideas in gestures, words, and sentences. Social cognition includes social interaction (sharing and taking turns with peers), problem solving (the initiation, sequencing, and self-corrections required in responding to a situation), and memory (the storage and retrieval of information required for completing routines).

The scoring system of the WeeFIM is based on a seven-level ordinal scale with high scores of 0-7 reflecting a child's ability to complete all components of a task without adult help or supervision in a safe and timely manner. Low scores of 1 or 2 reflected that the child required at least half of the task components be performed by an adult.

Procedure

The WeeFIM is designed as either an observation or interview instrument. Some items are easily observed (e.g., walking up stairs); others are more difficult to observe. The bathing and tub/shower transfer items from the WeeFIM were not consistently observed in the school setting because these items are not skills typically performed there. The interview was usually conducted with someone (ie, parents, teachers, or other caregivers) who was familiar with the child.

Data analysis

All statistical analyses were performed using the SPSS For Windows Version 10 software package. Descriptive statistics, i.e. ANOVA with multiple comparison analysis, were conducted for mean WeeFIM item, subscale scores and the mean motor and cognitive domain score. Pearson's correlation coefficients were calculated between each group and the American and Japanese data.

RESULTS

Demographic characteristics

Characteristics of disabled and non-disabled children are shown in Table 2. Of the disabled, 36 were boys and 44 were girls. In the non-disabled group 70 were boys and 87 were girls. No predetermined method for division by sex was used, because previous published research on the WeeFIM instrument has not indicated consistent significant performance differences between boys and girls[7,9,12]. The children were grouped by age: from 6 to 21 months, 22 to 45 months, 46 to 62 months, and 63 to 100 months, according to Msall et al[12].

The WeeFIM is a self-care assessment which divides performances into two categories, motor and cognitive. The analysis results presented in Table 3 revealed statistically significant differences between mean WeeFIM scores for children with and without disabilities. As expected, children with disabilities scored consistently lower in all areas than non-disabled children. Total scores, motor subscores, and cognitive subscores increased progressively with age.

WeeFIM domain scores in the areas of self-care, sphincter control, transfer, locomotion, communication, and social cognition were compared in children with hemiplegia, diplegia and quadriplegia (Fig. 1). Mean difference scores for the diplegia group were found to be lower than those for hemiplegia, but the differences were not statistically significant. Children with hemiplegia and diplegia scored significantly higher than the children with quadriplegia in the areas of self-care, sphincter control, transfer, locomotion, communication, and social cognition skills on the WeeFIM ($p < 0.01$). When domain WeeFIM scores in the four age groups (6-21 mo, 22-45 mo, 46-62 mo, and 63-100 mo) were compared, there were differences among the four age groups in difficulty pattern between both groups of children (Fig. 2).

Table 2. Demographic information for sample of children with and without developmental disabilities (B=Boy, G=Girl).

Age range (mo)	Disabled		Non-disabled	
	No. (B/G)	Mean ± SD (mo)	No. (B/G)	Mean ± SD (mo)
6-21	20 (10/10)	18.5 ± 6.14	41 (20/21)	14 ± 5.61
22-45	15 (6/9)	32.6 ± 4.04	37 (10/27)	32 ± 6.04
46-62	25 (11/14)	52.4 ± 7.48	47 (25/22)	54 ± 8.01
63-100	20 (9/11)	87.1 ± 7.65	32 (15/17)	73.5 ± 7.24
Total	80 (36/44)	47.7 ± 6.51	157 (70/87)	43.4 ± 6.70

Table 3. Means and standard deviations for motor and cognition WeeFIM rating scores.

Age range (mo)	Disabled (n=80)			Non-disabled (n=157)			P value
	Motor	Cognition	Total	Motor	Cognition	Total	
6-12	13.2 (2.1)	6 (1.7)	19.2 (2.3)	20.5 (2.1)	10.5 (2.4)	31 (3.0)	0.020
22-45	17 (2.5)	11 (2.4)	28 (3.1)	50.2 (2.6)	23.7 (2.7)	74 (6.1)	0.000
46-62	23.5 (3.5)	17 (2.6)	40.5 (5.9)	77 (6.5)	26 (2.7)	103 (6.9)	0.000
63-100	35 (6.5)	22 (2.9)	57 (6.7)	85 (6.5)	31.5 (3.4)	116.5 (7.0)	0.010
Total	22.4 (3.5)	14 (2.1)	36.4 (5.5)	59.5 (3.0)	23.7 (2.4)	83.5 (6.0)	0.015

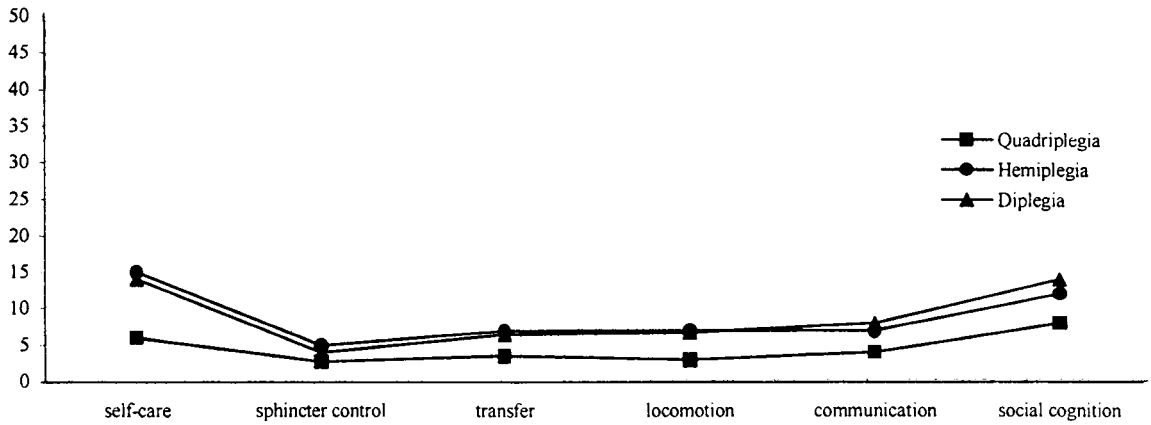

Fig. 1. Comparison of WeeFIM domain scores: hemiplegia (n=21), diplegia (n=30), and quadriplegia (n=29).

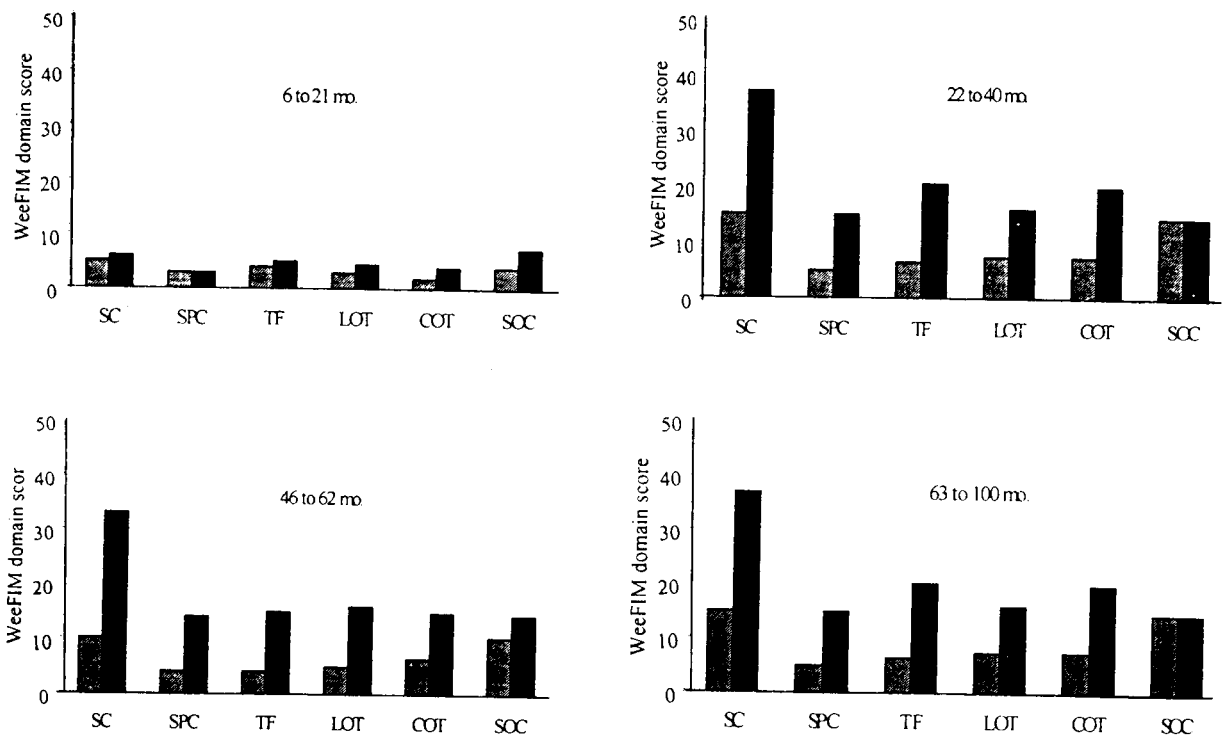

Fig. 2. Mean WeeFIM domain score for disable and nondisable Thai children aged 6 mo to 7 yr.

SC = self-care, SPC = Sphincter control, TF = Transfer, LOT = Locomotion, COT = Communication, SOC = Social cognition, ▨ disabled, ■ nondisabled.

The authors analyzed the chronologic changes of the WeeFIM total scores in 157 non-disabled Thai children to get preliminary normative data and compared them with the American data and Japanese data (Table 4). Total WeeFIM mean scores for the age groups and the Pearson's correlation coefficients between each age group and total WeeFIM scores showed similar trends.

DISCUSSION

In this study, the Pediatric Functional Independence Measure (WeeFIM) was used to evaluate children with and without a disability. Previous research has also found that there is a positive correlation among scores derived by direct observation of motor, self-care, and communication tasks and interview reports from parents using the WeeFIM (8,15,18). In addition, WeeFIM scores have been found to correlate with degree of neuromotor impairments, perceived current health status, and age, but not with family's socioeconomic status, the child's birth weight, or the presence of neonatal complications(10,15,18). Studies exploring the clinical application of the WeeFIM with different populations of children with developmental disabilities have also been conducted. Specifically, the WeeFIM has been administered to more than 500 children with a variety of impairments including limb deficiencies, Down's syndrome, motor impairment, spina bifida, and prematurity(19). These investigations provide detailed information regarding the clinical usefulness of the WeeFIM. However, information on the interrater agreement and stability of WeeFIM ratings is limited.

There are no published studies in which children in Thailand have been assessed with the WeeFIM. The WeeFIM differs from existing pediatric instruments that assess adaptive and functional skills. First, the WeeFIM uses a system of graded responses from 1 to 7. Second, responses are directly related to the amount of caregiver assistance necessary to complete a task. The WeeFIM was specifically designed as a minimal data set to collect information on functional independence. It can be administered in 15 to 20 min, and this facilitates its use as a tool to track function, set goals, and review supports at regular intervals. This study, the first to use WeeFIM in Thailand, yielded results similar to those of American and Japanese normative samples. The increase in mean scaled scores with increasing chronological age suggests the WeeFIM to be appropriate for the detection of consistent age-related gains in functional abilities.

The WeeFIM has proven useful in tracking outcomes after neurosurgery or orthopedic surgery in children with cerebral palsy(20,21). More recently, the equivalence reliability of the WeeFIM using either phone interview or clinical encounter interview/observations has been demonstrated(11,22).

Increased parental effort to complete the child's task plays a strong role in measuring the burden of care. In our study, parental reports of severe motor, communicative, and reading delay were significantly correlated with WeeFIM scores. Children in the 63 - 100 month age group can easily perform WeeFIM items, the distribution of WeeFIM scores around high scores is influenced by a ceiling

Table 4. Characteristics of non-disabled children as compared with the American data* and Japanese data.**

Age (mo)	No. of children			Mean age (mo)			Total WeeFIM			rδ		
	Thai	Japan	Amer	Thai	Japan	Amer	Thai	Japan	Amer	Thai	Japan	Amer
6-21	41	18	96	14	12	12	31	30	30	0.64ψ	0.77ψ	0.62ψ
22-45	37	35	121	32	30	33	74	74	79	0.75ψ	0.77ψ	0.73ψ
46-62	47	28	104	54	53	53	103	107	106	0.54ψ	0.56≠	0.43ψ
63-100	32	29	96	73.5	73	78	116.5	118	117	0.54ψ	0.57≠	0.29ψ
Total	157	110	417	45	42	44						

* American data were cited from Msall et al. with permission.

** Japanese data were cited from Liu et al. with permission.

δ Pearson's product moment of correlation coefficients for age groups and total WeeFIM are significant at the ψ $p < 0.01$, ≠ $p < 0.05$ level of significance.

effect. Items more difficult than grooming need be added to avoid this effect.

In general, when children with diplegia, hemiplegia and quadriplegia were compared, low WeeFIM scores and higher burden of care correlated with the increased functional limitations and caregiver support required by children with quadriplegia.

The functional approach reflects a person's ability to meet the cultural and environmental demands for independence expected from members of his or her peer group and directs assessment away from a topology, centered on developmental sequence and/or impairment. Functional assessment focuses on a domain of independent function skills such as self-care, sphincter control, transfers, locomotion, communication and socialization. The advantage of this approach is that it specifies an interaction between the child and the environment. This interaction is used to determine the skills necessary for independent function. A primary issue distinguishing developmental from functional assessment is the difference between form and function. White (1985) contends that form relates to a particular sensorimotor act and is essential in the developmental approach, whereas function focuses attention on the purpose the behavior is intended to serve. The developmental approach, with an emphasis on form, may overlook the possibility that there are multiple ways to accomplish the same basic function. The function of dressing, for example, may be accomplished in a number of ways - using adapted clothing (e.g., Velcro fasteners) and/or assistance (e.g., button hooks). It is performing the function of dressing that is the focus of functional assessment and not the specific motor acts.

The results indicated there were no statistically significant differences between the two groups of diplegia and hemiplegia children in terms of functional independence. However, the negative difference scores for both groups indicate that, on average, these children performed below the functional level expected for non-disabled children. The authors compared domain difficulty in the four age groups, and found it way more difficult for the younger children than for the older ones (Fig. 2).

Although the present study provided preliminary normative data of the WeeFIM instrument for Thai children that would serve as a reference for evaluating disabled children, the number of subjects was still too small and it was not strictly a random community sample. The authors need a further large scale study to establish normal standards of the WeeFIM instrument in Thai children and to analyze the effects of factors such as gender difference, living arrangements, and educational and economic levels of the parents. The research potential of this base has not been explored but holds considerable promise for systematically describing the emergence of functional independence in children with various degrees of disability. The ability to visually illustrate a difference in performance between nondisabled and disabled children using the WeeFIM supports further sensitivity testing of the WeeFIM with a larger sample of disabled Thai children. The final goal is to develop a psychometrically sound, clinically useful measure of functional independence in children.

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การวัดความสามารถในการช่วยเหลือตัวเองของเด็กสมองพิการและเด็กปกติ

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วัตถุประสงค์ : เพื่อศึกษาเปรียบเทียบความสามารถในการช่วยเหลือตัวเองในการทำกิจวัตรประจำวันต่าง ๆ ในเด็กไทยปกติและเด็กที่มีความพิการทางสมอง

วัสดุและวิธีการ : โดยที่เด็กไทยที่แบ่งเป็นเด็กไทยที่ปกติจำนวน 157 คน และเด็กที่มีความพิการทางสมองจำนวน 80 คน เข้าร่วมในการศึกษานี้ อายุเฉลี่ยเด็กทั้งหมด คือ 6 ถึง 100 เดือน โดยใช้ Functional Independence Measure for children (WeeFIM™) ในการประเมินความสามารถในการช่วยเหลือตัวเองในด้านกิจวัตรประจำวันต่าง ๆ และความคิดความเข้าใจ

ผลการศึกษา : จากการศึกษาพบว่า ในเด็กที่มีความพิการทางสมองจะมีระดับของ WeeFIM ต่ำกว่าเด็กปกติ ($p<0.05$) ทั้งนี้ระดับคะแนนรวมของ WeeFIM คะแนนความสามารถในการเคลื่อนไหวและคะแนนในด้านความคิด, ความเข้าใจจะเพิ่มมากขึ้นตามอายุ และเมื่อเปรียบเทียบคะแนน WeeFIM ในเด็กไทยกับคะแนนของเด็กอเมริกันและเด็กญี่ปุ่น พบว่าคะแนนรวมเฉลี่ยและ Pearson's correlation coefficients พบว่า คะแนนรวมทั้งหมดของ WeeFIM กับในแต่ละช่วงอายุของเด็กจะมีแนวโน้มคล้าย ๆ กัน

สรุป : WeeFIM น่าจะสามารถใช้เป็นเครื่องมือที่ดีในการวัดความสามารถในการช่วยเหลือตัวเองในเด็กไทยได้

คำสำคัญ : เด็กพิการทางสมอง, เด็ก, ความสามารถในการช่วยเหลือตัวเอง

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