

# The Thai Version of the Montreal Children's Hospital Feeding Scale (MCH-FS): Psychometric Properties

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**Objective:** To standardize and evaluate the psychometric properties of the Thai version of the Montreal Children's Hospital Feeding Scale (MCH-FS).

**Material and Method:** The MCH-FS was translated and the cultural effects of the Thai version (Thai.MCH-FS) were reviewed. Caregivers of 200 children between the age of 12 and 48 months were interviewed and completed the Thai.MCH-FS. In addition to demographic information, each child had a physical exam and anthropometric measures were taken. Each child was classified with or without feeding problems by at least two of three pediatricians who were blind to the results of the feeding scale.

**Results:** Internal consistency for reliability was high (Cronbach's alpha at 0.835). The area under the ROC curve was 0.864. With a discrimination score of 40, both sensitivity (72%) and specificity (80.67%) were at acceptable levels. Factor analysis resulted in three factors accounting for 52.3%. Of the 200 children, 150 children were classified with no feeding problems and 50 with feeding problems. There were no significant differences in the characteristics of the two groups; however, the Thai.MCH-FS scores were significantly different for the two groups.

**Conclusion:** The Thai version of the MCH-FS has been shown to be a valid and reliable short scale for detecting feeding problems in a pediatric care setting.

**Keywords:** Feeding problem, Questionnaire, Children

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Feeding problems are prevalent among normal children and tend to be more common in children with developmental disabilities. The prevalence rates range from 4.8% to 50% worldwide<sup>(1-3)</sup> depending on the definitions and criteria used to identify the feeding problems. Based on the DSM IV criteria, feeding problems were identified in 4.8% of children from 3 to 6 years of age in Catalonia, Spain<sup>(1)</sup>. The prevalence of "picky eaters" in infants and toddlers in the United States ranged from 19 to 50%<sup>(2)</sup>. Finally, Benjasuwantep and colleagues, using Kerzner's diagnostic categories<sup>(4)</sup>, found that in Nakhon Nayok, Thailand<sup>(5)</sup>, 26.9% of the children between one and four years of age had feeding problems.

Given the considerable prevalence of feeding problems in children, several reliable and valid parent-report questionnaires have been developed to

assist in assessing feeding problems. The Children's Eating Behavior Inventory (CEBI)<sup>(6)</sup> was based on the transactional model of parent-child relationship. With 40 items, each on a 5-point rating scale, the inventory assesses eating and mealtime problems of children between 2 and 12 years of age. The Behavioral Pediatric Feeding Assessment Scale (BPFAS)<sup>(7)</sup> was also based on parental report of feeding problems for children between 9 months and 7 years. The Children's Eating Behavior Questionnaire (CEBQ)<sup>(8)</sup> was developed to assess the eating styles of young children in eight areas with 35 items: responsiveness to the food served, enjoyment of the food, overeating secondary to emotional issues, desire to drink, satiety responsiveness, hesitancy in eating, emotional under eating and fussiness. By contrast, The Montreal Children's Hospital Feeding Scale (MCH-FS)<sup>(9)</sup> is a one-page 14-item screening tool aimed at helping pediatricians identify feeding problems in their offices. This scale has already been translated into Dutch and standardized in Netherlands with normative scores that are comparable to the original norms<sup>(10)</sup>. The items for

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the MCH-FS were chosen to cover feeding behaviors of children between 6 months and 6 years, by which time all the feeding skills and mealtime feeding patterns have developed. The following feeding domains are covered by the 14 items with some overlap: appetite (items 3 and 4), oral sensory involvement (items 7 and 8), and oral-motor development (items 8 and 11). The remaining items reflect parental concerns about the child's feeding in general (items 1, 2 and 12), mealtime behaviors (items 6 and 8) and the use of maternal strategies to improve food intake (items 5, 9, and 10) and finally, family's reactions to their child's feeding problems (items 13 and 14). Each question is rated on 7-point Likert scale. The questionnaire takes less than 5 minutes to complete<sup>(9)</sup>.

Given the high magnitude and negative effects of feeding problems in children and the limited time available for pediatricians in the Child Health Supervision Clinics, pediatricians need screening instruments to help them detect feeding problems as early as possible. The MCH-FS was chosen because its content includes all aspects of feeding problems, as well as it allows to mark each feeding problem according to its frequency or difficulty level, or according to the level of parental concern. In addition, the MCH-FS has already been translated into Dutch and standardized with results similar to the original scale<sup>(10)</sup>. The administration of this questionnaire is fast, easy and suitable for application in clinical use and can be completed in a regular visit by the parents in a Child Health Supervision Clinic. Therefore, the purpose of the present study was to standardize and assess the psychometric properties of the Thai version of the MCH-FS and to determine the discrimination score for identifying feeding problems with acceptable sensitivity and specificity in the Thai children population.

## **Material and Method**

### ***Translation and cultural affect***

The MCH-FS was translated by the permission of the owner of the questionnaire, who is also one of the authors of the present article. It was translated into Thai language by the first author and translated back to English by a bilingual health care practitioner and a non-practitioner. The re-translated English version was audited by the questionnaire's senior author.

Five experts in the field of developmental pediatrics have reviewed the Thai.MCH-FS to ensure that the scale appropriately reflects the Thai culture. According to experts, all items, with the exception of item 9, reflected appropriately the Thai culture. Given

that Thai parents normally follow their children around to feed them, it was expected that the score on item 9 would be consistently higher than in the Montreal and Dutch normative samples.

### ***Material: modification of item 5***

Based on the concern expressed by the senior author of the MCH-FS that there was no option for parents to score "never finished the meal" on item 5 of the MCH-FS, the options on the 7 point scale were changed from a range of 10 minutes (option 1) to over 60 minutes (option 7) to a range of 20 minutes (option 1) to never finished the meal (option 7). As well, the Dutch study found that the original item 5 was "statistically weak"<sup>(10)</sup>.

In order to resolve the question around item 5, the authors of the Thai.MCH-FS decided to standardize the Thai version with both the original item 5 and with the slightly modified item 5 in two separate studies, and choose the one that better differentiates between the group with and without feeding problems.

### ***Population and procedure***

In the first standardization study of the Thai.MCH-FS, the original item 5 was used. Caregivers of 213 healthy children from 12 to 48 months of age were enrolled consecutively in a Child Health Supervision Clinic at the HRH Princess Maha Chakri Sirindhorn Medical Center in Nakhon Nayok, Thailand. In the second standardization study, the modified version of item 5 was used. Caregivers of another set of 200 normal children between 12 and 48 months of age were enrolled. Children with developmental disabilities, significant underlying diseases and those who were born prematurely were excluded from the study. Demographic data, feeding history, present feeding practices, types and amounts of food taken daily, parental concerns about their child's feeding issues and anthropometric information were recorded. All children were evaluated by the same three pediatricians with the same process in both studies. The caregivers of both studies were asked to complete the Thai.MCH-FS after informed consent was obtained. The study was ethically approved by the Research Ethic Committee of Faculty of Medicine of Srinakharinwirot University. All children were physically examined by one of three pediatricians. Afterward, three pediatricians reviewed each child's physical exam and medical and feeding histories, not including the Thai.MCH-FS. Of the several clinical descriptions of feeding difficulties<sup>(11-13)</sup>, Kerzner's description<sup>(4)</sup> was chosen for the present

study and used to classify children with or without feeding problems. At least two of the three pediatricians had to agree to the diagnosis of feeding problems.

The mean scores of the original item 5 for children with and without feeding problems were  $2.63 \pm 1.37$  and  $2.51 \pm 1.59$ ,  $p = 0.58$  respectively in the first study, and of the modified item 5 were  $3.0 \pm 2.40$  and  $2.0 \pm 1.40$ ,  $p = 0.007$  respectively in the second study. Therefore, the second standardization with the modified item 5 was chosen as the final version of the Thai.MCH-FS and was selected for analyzing its results for the standardization process.

### Statistical analyses

SPSS software version 19.0 was used for statistical analysis. For comparing the variables between the no feeding problem and feeding problem group, t-test was used for continuous and Chi-square test for categorical variables. A  $p$ -value of less than 0.05 was considered statistically significant. Factor analyses were assessed by employing Principal Component Analysis. Internal consistency was determined with Cronbach's alpha. Criterion validity was established by comparing the total and mean item scores of the groups identified with or without feeding problems. As the distribution of individual scores was skewed, the second tertile (66.7 percentile) representing a score of 40 was chosen to calculate the statistical parameters for sensitivity, specificity and the area under the ROC curve.

## Results

### Study population

In terms of demographic characteristics, there were no significant differences between the group with and without feeding problems, as exhibited in Table 1.

However, of interest is that a high percentage of children (46.5%) were taken care of grandmothers or other family members in the Thai culture. Whereas, the original MCH-FS and Dutch questionnaires were sent home and were filled out by the mothers, the questionnaire was filled out at the clinic in the present Thai study.

There were as many boys in the group without feeding problems (49%) as in the group with feeding problems (52%). As well, the mean ages of the two groups were identical ( $22.25 \pm 9.72$  months vs.  $22.44 \pm 9.04$  months). Six percent (3 of the 50) of children with feeding problem weighed less than third percentile, while all children without feeding problem weighed over third percentile. Height of all children in the present study was higher than third percentile (data not shown).

### Individual item and total scores

The mean individual item scores of the Thai.MCH-FS compares well with the mean individual item scores of the normative sample of the MCH-FS and its Dutch version as demonstrated in Fig. 1. The range of the mean scores of the 14 items is almost the same in the three versions.

### Internal consistency

The means and standard deviations of the individual items and total mean score are presented in Table 2. The scale has good internal consistency with a high Cronbach's alpha at 0.835. The individual items were reduced to three factors accounting for 52.3% of the variances as shown in Table 3. The first two factors related to causes of negative mealtime behaviors and parental reactions and concerns and the third factor

**Table 1.** Characteristics of the study population according to classification of feeding problems

Characteristics	No feeding problem (n = 150)	Feeding problem (n = 50)	p-value
<b>Family</b>			
Maternal age, years (mean $\pm$ SD)	30.70 $\pm$ 6.40	29.72 $\pm$ 6.15	0.345
Paternal age, years (mean $\pm$ SD)	34.22 $\pm$ 7.40	33.50 $\pm$ 7.33	0.554
Family income, baht (mean $\pm$ SD)	25,024 $\pm$ 15,984	26,680 $\pm$ 23,693	0.580
Maternal education <12 years, n (%)	79 (52.7)	25 (50.0)	0.744
Paternal education <12 years, n (%)	85 (58.2)	26 (53.0)	0.528
Maternal occupation; housewife, n (%)	39 (26.0)	15 (30.0)	0.581
Caretaker; mother, n (%)	78 (52.0)	29 (58.0)	0.461
<b>Child</b>			
Age, months (mean $\pm$ SD)	22.25 $\pm$ 9.72	22.44 $\pm$ 9.04	0.902
Birth weight, grams (mean $\pm$ SD)	3,006 $\pm$ 331	2,978 $\pm$ 433	0.681
Boys, n (%)	73 (48.7)	26 (52.0)	0.683
First born, n (%)	90 (60.0)	35 (70.0)	0.206

related primarily to effects of negative mealtimes, such as poor growth and relationships. The correlation between factors 1 and 2 is 0.474, between factors 1 and 3 is 0.443, and between factors 2 and 3 is 0.343, suggesting a moderate correlation among the three factors.

**Table 2.** Means and standard deviations of individual items and total score of Thai.MCH-FS

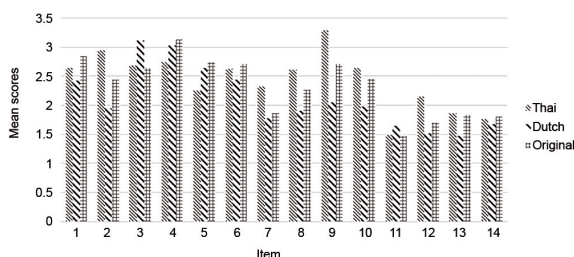
Item	Mean	SD
1	2.65	1.84
2	2.94	2.03
3	2.68	1.68
4	2.75	1.80
5	2.25	1.75
6	2.63	1.65
7	2.32	1.70
8	2.62	1.97
9	3.30	2.10
10	2.64	1.88
11	1.49	1.09
12	2.15	1.54
13	1.87	1.43
14	1.76	1.46
Total	34.01	13.65

Thai.MCH-FS = Thai version of the Montreal children's hospital feeding scale

**Table 3.** Rotated factor loadings of individual items of the Thai.MCH-FS

Item	Question content	Factor 1	Factor 2	Factor 3
1	Difficulties at mealtime	0.836*	0.135	0.245
2	Concern with child's eating	0.616*		0.242
3	Appetite	0.739*	0.297	0.139
4	Mealtime refusal	0.781*		
5	Mealtime duration	0.170	0.546*	0.109
6	Mealtime behavior	0.457*	0.156	0.124
7	Gags, spits or vomits during meal	0.476*	0.219	
8	Holds food	0.117	0.693*	0.115
9	Feeding distraction	0.186	0.762*	0.108
10	Force feeding	0.529*	0.394	0.233
11	Chewing or sucking abilities	0.113		0.728*
12	Child's growth	0.318	0.114	0.530*
13	Parent-child feeding relationship	0.237	0.187	0.787*
14	Child and family members feeding relationship		0.110	0.818*

\* Loadings higher than 0.40 in absolute value



**Fig. 1** Comparison of mean item scores of the Thai (n = 200) and the Dutch (n = 1,448) versions with the MCH-FS (n = 198).

### Criterion validity

Table 4 shows that there was significant difference between the mean scores of 13 individual items and the total scores of the group with no feeding problems and the group with feeding problems, the difference in the mean scores of item 14 between the two groups showed only a trend ( $p = 0.09$ ).

The area under the ROC curve in the present study is at 0.864, similar to the results of the original scale (the 0.845) suggesting good accuracy. With a discrimination score of 40, the Thai version of the MCH-FS has acceptable sensitivity and specificity at 72% and 80.67% respectively.

### Discussion

In the present research, two standardization studies were carried out with two different versions of mealtimes. The study where one item gave the option

**Table 4.** Mean and standard deviation of total and individual item scores of the Thai.MCH-FS based on classification of feeding problems

Item	No feeding problem (n = 150)		Feeding problem (n = 50)		p-value
	Mean	SD	Mean	SD	
Item 1	1.98	1.29	4.66	1.77	<0.01
Item 2	2.49	1.92	4.26	1.76	<0.01
Item 3	2.15	1.37	4.26	1.55	<0.01
Item 4	2.15	1.47	4.52	1.53	<0.01
Item 5	2.00	1.40	3.00	2.40	0.007
Item 6	2.37	1.62	3.40	1.48	<0.01
Item 7	2.11	1.57	2.94	1.94	0.008
Item 8	2.40	1.84	3.28	2.19	0.013
Item 9	3.06	2.04	4.00	2.16	0.006
Item 10	2.18	1.62	4.00	1.97	<0.01
Item 11	1.38	1.00	1.80	1.29	0.04
Item 12	1.80	1.35	3.18	1.65	<0.01
Item 13	1.68	1.31	2.44	1.63	0.004
Item 14	1.66	1.44	2.06	1.49	0.09
Total score	29.41	10.39	47.80	13.01	<0.01

of “never finished the meal” was chosen for standardization. Indeed, a caretaker is more likely to say that my child never finished his meal, than say that my child took over 60 minutes to eat. Given that this scale, like the other feeding questionnaires, is a parent report-measure, it is clearly important to use their vocabulary.

Of note is that while the factor analysis resulted in a one-factor model for the original MCH-FS, it resulted in a two-factor model in the Dutch sample. However, with high correlation between the two factors, the Dutch version could be reduced to a factor model. In our sample, the items were reduced to a three-factor model. Given that there is a moderate correlation between factors 1 and 2 and those two factors encompass 10 of the 14 items, the severity of feeding problems reported by parents can be indicated with the total score.

Interestingly, there were no gender, age, and birth order differences between the group with and without feeding problems, suggesting that well-developed healthy children can develop feeding problems in early life. Of importance is the fact that feeding problems do not equal failing to thrive. As

this study suggests, only 6% of the Thai subjects had weight under the third percentile. Thus, the feeding scale reflects the caretakers’ concerns and struggles with feeding a child, who may have low appetite or oral sensorial difficulties, in order to achieve the desired weight gain for their child. This screening tool should direct the pediatrician in their assessment of the level of feeding problems from minimal to extreme, as well as the degree of parental preoccupation and involvement with feeding the child. Such assessment should aid the pediatrician in deciding whether a simple education and reassurance for the caretakers is adequate, or a referral to a pediatrician specialized in feeding problems is warranted.

Of note is that the mean score of item 9 in the Thai version was higher (3.295) than the scores for the same item in the Dutch (2.05) and the original version (2.75). The finding confirms the suggestion by the committee of five experts that as Thai parents and other caretakers normally follow their children around to feed them, the score on item 9 would be higher in the standardization study than the scores of the original MCH-FS. However, considering that there is a significant difference on item 9 between the group with and without feeding problems, this item still reflects the increased amount of following around that the mothers and caretakers do in order to feed the child with feeding problems.

The difference between the mean scores of item 14 of the group with and without feeding problems showed only a trend ( $p < 0.09$ ), probably reflect the fact that grandmothers/caregivers were less likely to feel negative about having to follow their grandchildren around and thus less likely to reflect negatively to the family about it. In the Thai culture, almost half of the children were taken care of by the grandmothers or other family members of the family.

With the two caveats above, the means of both the individual items and the total scores of the Thai.MCH-FS compare well with the Dutch version and the original version of the scale. The Thai.MCH-FS has good internal consistency with a high Cronbach’s alpha at 0.835, which is similar to the Dutch version at 0.84<sup>(10)</sup> and the original scale at 0.845. The Thai version of the MCH-FS has acceptable sensitivity and specificity at 72% and 80.67% respectively, and with the discrimination score of 40 it should give a low rate of misclassification of feeding problems.

The findings highlight the universality of feeding parameters, regardless of the culture of North America, Europe, and Southeast Asia. The

similar scores in terms of severity of problems on the individual items of the three versions suggest that there is a maturational component in the development of feeding in the child and a maternal reaction component, which are both universal and instinctual, particularly in the way mothers are trying to help their child feed and grow.

### Conclusion

The Thai.MCH-FS provides a reliable short screening tool for efficiently identifying feeding problems in young children in a Child Health Supervision Clinic where only limited time is available to examine children. Further studies are planned with the clinical application of the Thai.MCH-FS.

### What is already known on this topic?

Feeding problem is a common childhood disorder with different level of difficulties. Since the 1980's feeding problems have been identified by several authors and subsequently, several screening instruments, such as CEBI, BPFAS, CEBQ and MCH-FS, were developed for identifying feeding problems for use in general pediatric settings. However, there is no Thai version of the questionnaire to aid in identifying feeding problems in the pediatric population.

### What this study adds?

The results of the present study demonstrated that the Thai version of the MCH-FS is a reliable and valid questionnaire in detecting feeding problems in the pediatric population, as well as the level of caretaker concerns associated with the feeding problem, and thus, suitable for using in Child Health Supervision Clinic in Thailand.

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### Potential conflicts of interest

None.

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คุณลักษณะทางจิตของแบบทดสอบ *the Montreal children's hospital feeding scale (MCH-FS)* ฉบับภาษาไทย

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**วัตถุประสงค์:** เพื่อประเมินคุณลักษณะทางจิตของแบบทดสอบ *the Montreal children's hospital feeding scale (MCH-FS)* ฉบับภาษาไทย

**วัสดุและวิธีการ:** แบบทดสอบ *MCH-FS* ได้รับการแปลเป็นภาษาไทยและประเมินผลกระทบบางทางวัฒนธรรมต่อแบบทดสอบ ฉบับภาษาไทย ผู้เลี้ยงดูของเด็กอายุระหว่าง 12 ถึง 48 เดือน จำนวน 200 คน ได้รับการสัมภาษณ์ เก็บข้อมูลประชากร และทำแบบทดสอบ *MCH-FS* ฉบับภาษาไทย เด็กแต่ละคนจะได้รับการตรวจร่างกายและประเมินการเจริญเติบโต จากนั้นจึงแบ่งเด็กออกเป็นเด็กที่มีและไม่มีปัญหาการรับประทานอาหารโดยกุมารแพทย์อย่างน้อย 2 ใน 3 คน มีความเห็นตรงกัน ซึ่งกุมารแพทย์แต่ละคนจะไม่ทราบผลของแบบทดสอบ *MCH-FS* ฉบับภาษาไทย

**ผลการศึกษา:** การทดสอบความเชื่อมั่นของแบบทดสอบจากค่าความสอดคล้องภายในมีค่าสูง โดยค่า Cronbach's alpha เท่ากับ 0.835 พื้นที่ใต้กราฟ ROC เท่ากับ 0.864 เมื่อใช้ค่าคะแนน 40 เป็นเกณฑ์ประเมิน พบว่าความไวของแบบทดสอบอยู่ที่ร้อยละ 72 และความจำเพาะอยู่ที่ร้อยละ 80.67 ซึ่งทั้งสองค่าอยู่ในเกณฑ์ยอมรับได้ ผลการวิเคราะห์ห่อองค์ประกอบได้ทั้งหมด 3 องค์ประกอบ คิดเป็นร้อยละ 52.3 ในเด็กจำนวน 200 คน แบ่งเป็นเด็กที่ไม่มีปัญหาการรับประทานอาหาร 150 คน และมีปัญหาการรับประทานอาหาร 50 คน เด็กทั้งสองกลุ่มไม่มีความแตกต่างกันในลักษณะด้านต่างๆ เว้นแต่คะแนนของแบบทดสอบ *MCH-FS* ฉบับภาษาไทยของเด็กทั้งสองกลุ่มแตกต่างกันอย่างมีนัยสำคัญ

**สรุป:** แบบทดสอบ *MCH-FS* ฉบับภาษาไทยเป็นแบบทดสอบขนาดสั้นที่มีความตรงและความเชื่อมั่น สำหรับค้นหาปัญหาการรับประทานอาหารในการดูแลเด็กของกุมารแพทย์

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