Validation and Reliability of Full and Short Thai-Version Modified Yale Preoperative Anxiety Scale (m-YPAS) in Young Children

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Objective: *This study aimed to test the validity and reliability of a modified Yale Preoperative Anxiety Scale (m-YPAS) in the Thai language, and to find out whether a short version of the m-YPAS correlated with the full version.*
Material and Method: *After using the standard forward-back-forward translation technique to convert the original m-YPAS to a Thai m-YPAS-full version, the content validity was approved. The children's behavior in the waiting area and induction phase was video recorded. The inter- and intra-rater reliabilities were tested by two residents and two nurses, who independently scored a random arrangement of 40 videos. Then, the construct and concurrent validities were examined.*
Results: *The content and construct validity was acceptable to good. The inter-rate reliabilities, intraclass correlation coefficients ranged from 0.75, 95% CI 0.63 to 0.84 in activity and use of parents category to 0.88, 95% CI 0.80 to 0.93 in emotional expressivity category. The intra-rate reliabilities, ICC ranged from 0.88, 95% CI 0.72 to 0.93 to 0.97, 95% CI 0.94 to 0.98 for R1, and from 0.78, 95% CI 0.63 to 0.88 to 0.94, 95% CI 0.89 to 0.97 for R2. The Cronbach's alphas of the full and short versions of the m-YPAS-Th were 0.98 and 0.97, respectively. The concurrent validity between the full and the short versions of the Thai m-YPAS had a very strong, positive correlation, which was statistically significant (r_s = 0.98, p = 0.01).*
Conclusion: *The modified Yale Preoperative Anxiety Scale in the Thai language was excellent in terms of both reliability and validity, and it correlated with the short version of the m-YPAS.*

Keywords: *Anxiety scale, Young children, mYPAS, Short version, Thai*

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The incidence of preoperative anxiety in children has been reported as 40 to 60%[1,2]. Preoperative anxiety causes psychological stress in such forms as nightmares, separation anxiety, eating problems and an increased fear of physicians. These negative behaviors can last from days to months. The main medical consequences include a stormy anesthetic induction, a reduced defense against infections, an increased need for anesthetics in the intraoperative period, and a requirement for more analgesics in the postoperative period. Higher preoperative pediatric anxiety has also been related to a higher incidence and severity of emergence agitation[3-9]. Therefore, anxiety assessment in children is important during perioperative care.

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Anxiety assessments can be categorized into diagnostic interviews, self-report measures and observation. Unfortunately, young children cannot adequately report their degree of anxiety because of their communication limitations.The Modified Yale Preoperative Anxiety Scale (m-YPAS) was therefore developed in 1995 by Kain ZN to assess children's anxiety levels during the preoperative period. This observational instrument consists of five categories, including activity, vocalization, emotional expressivity, state of apparent arousal and use of parents. Not only correlating well with the gold standard,the self-report STAIC test[10,11], the m-YPAS also has good to excellent observer reliability, and high concurrent and construct validities. However, the m-YPAS is not widely used in Thailand because of the absence of a validated Thai version. Therefore, this study enrolled children aged between 2 and 5 years (this age group having a high incidence of preoperative anxiety) who had the ability to pronounce words clearly and interact with the personnel involved in the assessment.

The objectives of this study were, firstly, to test reliability and validity of a Thai-language version of the modified Yale Preoperative Anxiety Scale, and secondly, to examine whether a short, Thai-language version of the m-YPAS (i.e., excluding the parental factor) correlates with the full version.

Material and Method

This study was approved by the Institutional Review Board (Si 252/2015), and the permission to translate m-YPAS was obtained from Kain ZN (the developer of the m-YPAS English version). The full version of the m-YPAS is comprised of five categories: activity, emotional expressivity, state of arousal, vocalization and use of parents. However, the last category (use of parents) was removed in the short version of the m-YPAS. The instrument is used to rate the level of anxiety observed in children's behavior during the perioperative period. The total anxiety scores of both versions range from 23 to 100.

During the period June 2015 to March 2016, data were collected of 2 to 5 year-old children with the American Society of Anesthesiologists (ASA) classification of I or II who were scheduled for ambulatory surgery. The exclusion criteria were neurological disorders, cognitive impairment, physical disability and non-Thai-speaking families. A few days before surgery, a research assistant called the parents in order to explain the purposes of the research, and written consent was obtained on the day of the surgery. Twenty children were enrolled in this study. Their parents were apprised of the whole process of this research before informed consent was obtained. A total of 40 video recordings were conducted in the waiting area and later in the operating room. The waiting-phase video was recorded for 5 to 15 minutes from when the child and the parent entered the waiting room. The induction-phase video was recorded from when the child and the parent entered the operating room until consciousness was lost as a result of inhalation induction. During the anesthetic induction phase of all of the children, the anesthesia team gave toys, played animated cartoons and allowed the parent to be present.

The modified Yale Preoperative Anxiety Scale was independently translated into Thai by two, bilingual, medical officers. After the two translations were reviewed and a single, finalized version was prepared, it was retranslated into English by a third, bilingual, medical officer and compared with the original English version of the m-YPAS by an English teacher. The finalized Thai version of the m-YPAS (m-YPAS-Th) was considered to be correct if it was deemed to correspond accurately with the original English version. The m-YPAS-Th was then adjusted as necessary with the cooperation of an anesthesiologist and a pediatric psychiatrist to ensure that it was fully comprehensible. The content validity of the m-YPAS-Th was tested by four experienced personnel, comprising a pediatric anesthesiologist, a pediatric psychiatrist and two pediatric-ward nurses; they gave their opinions on their level of agreement for each of the individual items in each category of the m-YPAS-Th questionnaire (+1 = agree, 0 = neutral, and -1 = disagree). The construct validity was tested by comparing the anxiety scores of the waiting and induction phases.

To assess the inter-rater reliability, two, certified, registered nurses (experienced in the care of pediatric patients) and two, second-year, anesthesia residents (not experienced in the care of pediatric patients) independently scored a random arrangement of 40 videos. Two weeks later, the intra-rater reliability was assessed by comparing the m-YPAS-Th scores of the same residents, who separately watched a new, random set of the same videos.

Statistical analysis

The data were analyzed using PASW Statistics for Windows, 18.0 Chicago: SPSS, Inc. The sample size was calculated with nQuery Advisor with 2-sided Type I error 0.05 and 85% power; a Spearman's rank correlation of 0.78, obtained from a previous study[10], was used to determine the concurrent validities of the m-YPAS full and short versions. The required sample size was estimated to be 40 video clips. The content validity was analyzed by item correlation, which was the average of the scores for each item. A value of more than 0.5 was considered to be acceptable. The construct validity was analyzed by the Wilcoxon signed-rank test. The test tool should show significant differences in the levels of anxiety by comparing the anxiety scores of the waiting phase and the induction phase. If the mean score of the induction phase was higher than that of the waiting phase, then the construct validity was deemed as acceptable.The concurrent validity was analyzed by Spearman's rank correlation (r_s value: 0.00 to 0.19 = very weak, 0.20 to 0.39 = weak, 0.40 to 0.59 = moderate, 0.60 to 0.79 = strong, and 0.80 to 1.00 = very strong). The inter-rater reliability and intra-rater reliability were analyzed by intra-class correlation (ICC value: <0.40 = poor, 0.40 to 0.59 = fair, 0.60 to 0.74 = good, and 0.75 to 1.00 = excellent). The Cronbach's alpha was used to test the reliability

consistency of the full and short versions of the m-YPAS-Th (α coefficients over 0.65 were acceptable).

Results

Twenty children, age varied from 2.25 to 4.58 with the median of 3.5 years. Fourteen children were males (70%). Nine children (45%) had a history of fear of hospitals, and four children (20%) had a fear of strangers. Sixty five percent of parents had at least bachelor degree. Only six children (30%) had an experience of previous surgery.

The content validity was analyzed with item correlation for all categories ofthe m-YPAS-Th. The results were more than 0.5 for all items. The construct validity was determined by comparing the means of the m-YPAS-Th scores during the two phases; the anxiety score for the induction phase was significantly higher than that for the waiting phase (59.52 vs. 37.94, $p<0.01$). The concurrent validity was tested to determine the relationship between the anxiety scores of the m-YPAS-Th full and short versions; there was found to be a very strong, positive correlation and this correlation was statistically significant ($r_s = 0.98$, $p = 0.01$).

The inter-rater and intra-rater reliability of the m-YPAS-Th by intraclass correlation (95% CI) were demonstrated in Table 1. As for the inter-rater (R1, R2, N1, N2) reliability, the agreement between the four raters ranged from 0.75 (0.63 to 0.84) in activity and use of parents category to 0.88 (0.80 to 0.93) in emotional expressivity category. In the case of the intra-rater (R1, R2) reliability assessed by the same rater for the same category, the correlation ranged from 0.88 (0.72 to 0.93) to 0.97 (0.94 to 0.98) for R1, and from 0.78 (0.63 to 0.88) to 0.94 (0.89 to 0.97) for R2. The Cronbach's alphas of the full and short versions of the m-YPAS-Th were 0.98 and 0.97, respectively.

Characteristics of twenty children related with the m-YPAS-Th full version was shown in Table 2. The results showed that children who were younger than 3.5 years had significantly higher median anxiety scores

Table1. Inter-rater and intra-rater reliability of m-YPAS-Th

m-YPAS-Th	Intra-class correlation(95% CI)		
	Inter-rater reliability R#1, R#2, N#1, N#2	Intra-rater reliability R#1	Intra-rater reliability R#2
Activity	0.75 (0.63 to 0.84)	0.88 (0.72 to 0.93)	0.83 (0.70 to 0.90)
Emotionalexpressivity	0.88 (0.80 to 0.93)	0.95 (0.90 to 0.97)	0.94 (0.89 to 0.97)
State of arousal	0.80 (0.70 to 0.87)	0.97 (0.94 to 0.98)	0.78 (0.63 to 0.88)
Vocalization	0.76 (0.64 to 0.85)	0.93 (0.88 to 0.97)	0.82 (0.69 to 0.90)
Use of parents	0.75 (0.63 to 0.84)	0.90 (0.81 to 0.94)	0.89 (0.79 to 0.94)

Table 2. Characteristics of 20 children related with the m-YPAS-Th full version

Characteristics	n = 20	Waiting phase		Induction phase	
		Median (min, max)	*p*-value	Median (min, max)	*p*-value
Age<3.5 years					
Yes	6	59.6 (26.4, 97.8)	<0.01	94.7 (76.9, 100.0)	<0.01
No	14	28.5 (23.3, 41.1)		36.1 (23.3, 88.6)	
Fear of stranger					
Yes	4	80.0 (33.6, 97.8)	<0.01	98.8 (90.8, 100)	<0.01
No	16	26.8 (23.3, 41.9)		37.9 (23.3, 88.6)	
Fear of hospital					
Yes	9	33.6 (24.4, 97.8)	0.11	88.6 (23.3, 100.0)	0.01
No	11	26.9 (23.3, 41.1)		34.7 (23.3, 85.3)	
Anesthesia experience					
Yes	6	28.8 (23.3, 41.1)	0.44	72.9 (24.2, 100.0)	0.54
No	14	28.5 (24.4, 97.8)		37.9 (23.3, 98.9)	

than the children aged ≥3.5 years in the waiting phase (59.6 vs. 28.5, $p<0.01$), and their anxiety score rose dramatically during the induction phase (median 94.7). Those children who feared strangers had significantly higher anxiety scores in both waiting (80.0 vs. 26.8, $p<0.01$) and induction (98.8 vs. 37.9, $p<0.01$) phases than children who did not fear strangers. As for children who feared hospitals, they had significantly higher anxiety scores than children who did not fear hospitals during the induction period only (88.6 vs. 34.7, $p<0.01$). In the case of children who had previous anesthesia experience, they did not have a higher anxiety score than children who were anesthesia-naive. The m-YPAS-Th scores during the waiting and induction phases were demonstrated in Fig. 1. In both phases, children younger than 3.5 years had higher m-YPAS-Th scores than the older children.

Discussion

The present study demonstrated that the m-YPAS-Th was of good validity in all areas. Firstly, experts in pediatrics judged it to have good content validity. In addition, good construct validity was shown by the significantly higher level of the anxiety scales in the induction phase than in the waiting phase. Moreover, there was an excellent correlation between the full and the short versions of m-YPAS-Th. The reliability of the m-YPAS-Th was also excellent, as were the inter-rater and intra-rater reliabilities (despite the raters having no experience in taking care of children). Children 3.5 years of age had significantly high anxiety levels in the waiting phase, and their anxiety levels increased to nearly the maximum during the induction phase.

Children aged between 2 and 5 years who had a high incidence of preoperative anxiety cannot report their anxiety. Kain ZN et al proved that the m-YPAS was an appropriate tool for assessing children's anxiety during the perioperative period, with good to excellent validity and reliability[10]. P Skovby et al showed a good content validity in the m-YPAS Danish version via focus group agreement[12]. The study stated that the content of the m-YPAS questionnaire identified the major characteristics of preoperative anxiety in children, and that the specified attributes were recognizable in, and relevant to, clinical practice. In the m-YPAS Thai version, agreement among the experts also showed good content validity.

The m-YPAS Swedish version showed good reliability and validity among experienced assessors[13], while the m-YPAS Thai version had excellent construct validity and reliability among both experienced and non-experienced assessors. Jenkins BN. et al created the short version of the m-YPAS to improve its ease of use in a busy, operating-room setting[14]. The short version of the m-YPAS not only retained the accuracy of the measure but was also easier to use. The authors also demonstrated excellent concurrent validity of the m-YPAS-Th between the full and the short versions as they had a very strong correlation. Therefore, the m-YPAS-Th short version can be used to assess children's preoperative anxiety.

Children who were younger than 3.5 years or had a history of fearing strangers had a significantly high m-YPAS score in both the waiting and the induction phases; this characteristic may remind health care

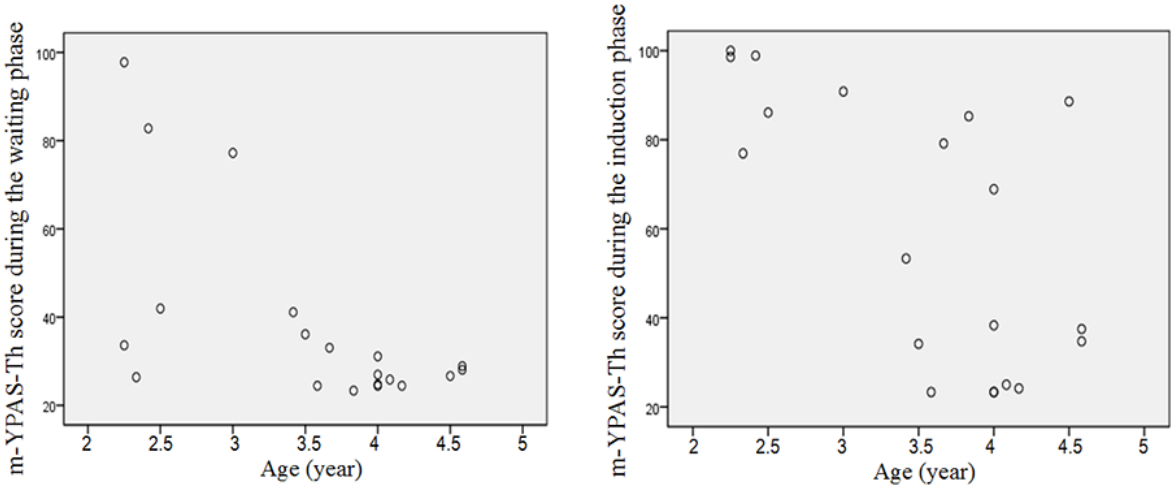

Fig. 1 Age and m-YPAS-Th score during waiting and induction phases.

providers to consider assessment, recognition, prevention and action early, before high anxiety develops. In our normal operating theater setting, various non-pharmacological techniques are used to alleviate anxiety; these include giving toys, using a video as a distraction and having a parent present during the induction of anesthesia. Nevertheless, in the holding area, children younger than 3.5 years had a high anxiety score, while during induction, the score reached maximum levels (Fig. 1). Pharmacological intervention may be crucial in this age group.

There were some limitations of this study. The sample size was not large enough to find the cutoff point for a high anxiety score. The cut off point for a high anxiety level differs between studies. Kein ZN et al[10] demonstrated a score over 30, while Jung K et al[15] showed that scores over 49 were rated as high anxiety in similar age groups (5 to 12 years). These disparities may be the result of cultural differences affecting the cutoff point. Although the age range in this study was 2 to 5 years, it was easy to distinguish the low-anxiety score children from the high-anxiety children by using the Korean cutoff point, as shown at Fig. 1.

Conclusion

The modified Yale Preoperative Anxiety Scale in the Thai language was excellent in terms of its reliability and validity, and it corresponded well with the short version.

What is already known in this topic?

The incidence of preoperative anxiety is high in children especially in 2 to 5 years old.

What this study adds?

Children younger than 3.5 year had high anxiety in both waiting and induction phase although parent present.

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Trial registration

ClinicalTrials.in.th: TCTR20170519002.

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Potential conflicts of interest

None.

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ความน่าเชื่อถือและความเที่ยงตรงของแบบประเมินความวิตกกังวลก่อนการผ่าตัดของเยลที่แปลเป็นภาษาไทยฉบับเต็มและฉบับย่อในกลุ่มเด็กเล็ก

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วัตถุประสงค์: *เพื่อตรวจสอบความน่าเชื่อถือและความเที่ยงตรงของแบบประเมินความวิตกกังวลในเด็กก่อนการผ่าตัดของเยลที่แปลเป็นภาษาไทยในฉบับเต็ม และแบบประเมินฉบับย่อมีความสัมพันธ์กับฉบับเต็มหรือไม่*

วัสดุและวิธีการ: *แบบประเมินต้นฉบับได้รับการแปลเป็นแบบประเมินฉบับภาษาไทยโดยใช้เทคนิคมาตรฐานแบบ forward-back-forward หลังจากนั้นได้มีการตรวจสอบความเที่ยงตรงตามเนื้อหา และถ่ายวิดีโอบันทึกพฤติกรรม ของผู้ป่วยเด็กในช่วงรอนอกห้องผ่าตัด และช่วงนำสลบทดสอบความเที่ยงระหว่างผู้ประเมิน ความเที่ยงภายในผู้ประเมิน โดยให้แพทย์ประจำบ้าน 2 คน และพยาบาล 2 คน ประเมินความกังวลของเด็กในวิดีโอที่ถ่ายไว้ 40 ตอน โดยใช้แบบประเมินฉบับภาษาไทยโดยไม่ปรึกษากัน หลังจากนั้นทดสอบความเที่ยงตรงของโครงสร้าง และความเที่ยงตรงตามสภาพของแบบประเมิน*

ผลการศึกษา: *แบบประเมินมีความเที่ยงตรงตามเนื้อหาและความเที่ยงตรงของโครงสร้างดี ค่าความเที่ยงระหว่างผู้ประเมิน โดยใช้สหสัมพันธ์ภายในกลุ่มได้ผลตั้งแต่ 0.75, 95% CI 0.63 ถึง 0.84 ในหัวข้อการปฏิบัติต่อผู้ปกครองจนถึง 0.88, 95% CI 0.80 ถึง 0.93 ในหัวข้อการแสดงออกทางอารมณ์ค่าความเที่ยงภายในผู้ประเมิน, ได้ผลตั้งแต่ 0.88, 95% CI 0.72 ถึง 0.93 ถึง 0.97, 95% CI 0.94 ถึง 0.98 ในแพทย์ประจำบ้านคนที่ 1 ส่วนแพทย์ประจำบ้านคนที่ 2 ได้ผลตั้งแต่ 0.78, 0.63 ถึง 0.88 ถึง 0.94, 95% CI 0.89 ถึง 0.97 แบบประเมินฉบับเต็มและฉบับย่อมีค่าสัมประสิทธิ์อัลฟาของครอนบาคเท่ากับ 0.98 และ 0.97 ตามลำดับ และเมื่อเปรียบเทียบผลคะแนนโดยใช้แบบประเมินฉบับเต็มและฉบับย่อทั้งในช่วงรอผ่าตัดและนำสลบ พบว่ามีความสัมพันธ์กันอย่างชัดเจนจากค่าความสัมพันธ์ (r_s = 0.98, p = 0.01)*

สรุป: *แบบประเมินความวิตกกังวลในเด็กก่อนการผ่าตัดของเยลที่แปลเป็นภาษาไทยมีความน่าเชื่อถือและความเที่ยงตรงสูง และแบบประเมินฉบับย่อมีความสัมพันธ์กับฉบับเต็มชัดเจน*