Validity and Reliability of the Thai Version of Dysfunctional Voiding Symptom Score (DVSS) Questionnaire

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Background: *Bladder and bowel dysfunction (BBD) is a common problem and a predisposing factor for urinary tract infection in children. Evaluation using the Dysfunctional Voiding Symptom Score (DVSS) questionnaire is widely used. The original English DVSS has been translated to several languages. Thai version of the DVSS would be helpful for early detection and management of BBD in children.*

Objective: *To translate and adapt DVSS to Thai version and evaluate validity and reliability of this questionnaire in children aged 3-10 years.*

Material and Method: *DVSS English version was translated into Thai according to the following methodology: translation, synthesis, back-translation, expert reviews, and pre-testing. Patients aged 3 -10 years with a history of diurnal urinary incontinence, urinary tract infection or abnormal voiding habits, presenting to pediatric nephrology or urology clinic, were recruited as study group. Age-matched children presenting to general outpatient clinic were recruited as control group. Final DVSS-Thai version was tested and re-tested at the following 1 - 2 weeks. The internal consistency and test–retest reliability was assessed with Cronbach's alpha test and intraclass correlation (ICC), respectively. The optimum cutoff score was analyzed using receiver operating characteristics (ROC) curve.*

Results: *The back translation to English of Thai version corresponded to the original English DVSS. Age and sex between the study (n = 22) and control (n = 30) group were not different. Mean total scores of the DVSS were 11.6±4.7 VS 1.9±1.6 ($p<0.001$) in the study and control group, respectively. Cronbach's alpha coefficient was 0.8 and intraclass correlation coefficient (ICC) was 0.906 ($p<0.001$). The optimum cutoff score was 5 (sensitivity 100% and specificity 96.7%) with area under the curve of 0.998 ($p<0.001$).*

Conclusion: *Thai version of the DVSS was completed by proper process and demonstrated an excellent validity and reliability. It should be used to identify BBD in Thai children.*

Keywords: *lower urinary tract dysfunction, bladder and bowel dysfunction, Thai version, questionnaire, validation*

J Med Assoc Thai 2017; 100 (1): 9-16
Full text. e-Journal : *http://www.jmatonline.com*

The term 'bladder and bowel dysfunction' (BBD) was recently proposed by the International Children's Continence Society to describe the combination of functional bladder and bowel disturbances, replacing the term dysfunctional elimination syndrome or dysfunctional voiding[1]. It can be subcategorized to lower urinary tract dysfunction (LUTD) and bowel dysfunction, which was common in children, particularly in school aged girls[2,3]. Almost half of those with LUTD also had bowel dysfunction[4,5]. Clinical presentation includes daytime incontinence, enuresis, urgency, increase or decrease voiding frequency, dysuria, holding maneuvers, prolonged voiding intervals and abnormal bowel patterns: constipation or fecal incontinence. This clinical entity was also found to be associated with psychological and psychiatric aspects of the patients[1].

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The Dysfunctional Voiding Symptom Score (DVSS), originally developed by Farhat et al., was a validated measurement scale to quantify of abnormal voiding behaviors in children aged 3-10 years old (Appendix-1)[6]. It was widely used as psychometric test to evaluate voiding dysfunction or dysfunctional elimination syndrome in several settings, with potential monitoring after behavioral modification[7-12]. Recent prospective cohort study applied DVSS to identify BBD in children presenting with febrile/symptomatic UTI and found that BBD was a risk factor for recurrent UTI, particularly in children with vesicoureteral reflux (VUR)[13,14].

BBD is a common problem although its prevalence in Thai children is still unknown. The problem might be underestimated due to the lack of non-invasive instrument measuring BBD for Thai children. DVSS has been reliably translated into many languages such as Portuguese, Chinese and Korean[15-17]. The aim of the presented study was to translate DVSS questionnaire into Thai-version, and evaluate for validity and reliability.

Material and Method

The DVSS consists of 10 items and 5 options. The item includes 7 related to voiding, 2 to defecation and 1 to stressful events. The options describe 4 levels of the frequency over the previous month and an option for no available data. Score of each item ranges from 0 to 3 with total score range from 0-30. Permission to translate original DVSS to DVSS-Thai version was obtained from Dr. Walid Farhat. In order to assure the correct translation, the DVSS-English version was independently translated by two Thai translators, and then the summarized forward translation was back translated into English by a native of England who lived in Thailand. Pretesting DVSS version was developed after reviewing both forward translation and back translation by 3 pediatric nephrologists and 3 pediatric urologists. The DVSS was then pretested in 2 subject groups aged 3-10 years including 5 patients diagnosed voiding dysfunction and 5 healthy children. Subsequently, final DVSS-Thai version was developed with minor adjustment of the options for more understanding.

Validity and reliability test were conducted at Siriraj Hospital, and approved by Siriraj Institutional Review Board. Parents or guardians who participated in the present study were asked to provide written informed consent prior to enrollment. Children aged 7-10 years were also asked for assent. Patients aged 3-10 years old with a history of diurnal urinary incontinence, UTIs or abnormal voiding habits, who presenting to pediatric nephrology or urology clinic, were recruited as the study group. Age-matched children presenting to pediatric general outpatient clinic were recruited as control group. Patients with posterior urethral valve, meningomyelocele or unable to read Thai were excluded. Final DVSS-Thai version was tested and re-tested at the following 1 - 2 weeks. For the re-test, participants could come back to re-test at hospital, or re-test at home and send the questionnaire back by mail.

The present study was approved by the Siriraj Institutional Review Board, certificate of approval (COA) no.Si157/2015.

Statistical analysis

To verify validity of the test in Thai children we used a median symptom score 14 and 4 of the study and control group, respectively[6], significance at 0.05 (type I error = 5%, 2-sided) and power at 90% (type II error = 10%). The sample size was calculated to be at least 21 subjects in each group. Ages and sex were compared with unpaired t-test and Chi-square test, respectively. Difference of each item and total scores between study and control groupswere statistical analysis with Mann-Whitney U test. The optimum cutoff score was analyzed using receiver operating characteristics (ROC) curve. To test the reliability, Cronbach's coefficient alpha was used to verify internal consistency. Intraclass correlation coefficient (ICC) was used to verify reliability with reference to the stability of the instrument (test-retest).All statistical analyses were performed using PASW statistics 18.0 (SPSS Inc., Chicago, IL, USA), with p-values<0.05 considered statistically significant.

Results

Translation of original DVSS into DVSS-Thai version

According to aforementioned translation process, there was a good correspondence between the original English version and back translation from Thai to English version. A pretest of translated questionnaire

Appendix-1. Original Dysfunctional Voiding Symptom Score

Over the last month	Almost never	Less than half the time	About half the time	Almost every time	Not available
1. I have had wet clothes or wet underwear during the day.	0	1	2	3	NA
2. When I wet myself, underwear is soaked.	0	1	2	3	NA
3. I miss having a bowel movement every day.	0	1	2	3	NA
4. I have to push for my bowel movements to come out.	0	1	2	3	NA
5. I only go to the bathroom one or two times each day.	0	1	2	3	NA
6. I can hold onto my pee by crossing my legs, squatting or doing the "pee dance ".	0	1	2	3	NA
7. When I have to pee. I cannot wait.	0	1	2	3	NA
8. I have to push to pee.	0	1	2	3	NA
9. When I pee it hurts.	0	1	2	3	NA
10. Parents to answer. Has your child experienced something stressful like to example below?		No (0)			Yes (3)
Total					

- New baby
- New home
- New school
- School problems
- Abuse (sexual/physical)
- Home problems (divorce/death)
- Special events (birthday)
- Accident/injury
- Others

was performed to verify the cultural and conceptual adequacy and 4 guardians provided some feedback of the item 3 "I miss having a bowel movement every day." and item 5 "I only go to the bathroom one or two times each days." They wondered what should be the answer for having a bowel movement every 2-3 days or going to the bathroom more than 2 times each days? However, all ultimately understood and abled to answer the questions. A few verbal were adjusted for more understanding in frequency of each item and the final Thai version of the DVSS was developed (Table 1).

Validity and reliability of DVSS-Thai version

Twenty-two patients (10 females and 12 males) and 30 aged matched children (14 females and 16 males) were recruited as study group and control group, respectively. There were no differences in age and sex between the study and control group. Mean

Table 1. Thai version of the Dysfunctional Voiding Symptom Score (DVSS)

	แบบสอบถามอาการขับปัสสาวะผิดปกติในเด็ก คณะแพทยศาสตร์ศิริราชพยาบาล	วันที่ ….. /….. /…….

โปรดให้ข้อมูล ในช่วงหนึ่งเดือนที่ผ่านมาว่าเกิดขึ้นมากน้อยเพียงใด โดยเติมเครื่องหมาย √ ในช่องว่างเพียงช่องใดช่องหนึ่งของแต่ละข้อ
- หากไม่เข้าใจหรือมีข้อสงสัยในคำถาม โปรดสอบถามแพทย์หรือเจ้าหน้าที่
- หากไม่ทราบหรือไม่สามารถตอบคำถามด้วยสาเหตุใดๆ ให้เติมเครื่องหมาย √ ในช่องไม่มีคำตอบ

"ในช่วงหนึ่งเดือนที่ผ่านมา"	แทบไม่เคย (0)	เป็นน้อยกว่าครึ่งหนึ่ง(1)	เป็นประมาณครึ่งหนึ่ง(2)	เป็นตลอดหรือเกือบทุกครั้ง/วัน (3)	ไม่มีคำตอบ
1. หนูฉี่ราดรดเสื้อผ้าหรือฉี่รดกางเกงในตอนกลางวัน					
2. กางเกงในเปียกโชก เวลาหนูฉี่ราด					
3. หนูไม่อึทุกวัน					
4. หนูต้องเบ่งอึ กว่าจะอึออก					
5. หนูไปห้องน้ำเพียงแค่หนึ่งถึงสองครั้งต่อวัน					
6. หนูอั้นฉี่ด้วยการไขว้ขา นั่งยองๆ งอตัว หรือ เขย่าขา					
7. เวลาหนูปวดฉี่ หนูรอไม่ได้					
8. หนูต้องเบ่งเวลาฉี่					
9. หนูเจ็บเวลาฉี่					

10.สำหรับผู้ปกครองตอบ : ลูกของคุณประสบความเครียดในสถานการณ์ดังต่อไปนี้หรือไม่เช่น - มีน้องคนใหม่ - ย้ายบ้าน - ย้ายโรงเรียน - มีปัญหาที่โรงเรียน, - ถูกทำร้าย (ทางเพศ/ทางร่างกาย), - ปัญหาในครอบครัว (ปัญหาหย่าร้าง/มีคนในครอบครัวเสียชีวิต), - โอกาสสำคัญต่างๆ (วันเกิด), - อุบัติเหตุ/การบาดเจ็บ - อื่นๆ	ไม่ใช่ (0)	ใช่ (3)

ages of the study group was 6.1±2.3 years and control group was 6.3±2.2 years (p = 0.736). Proportions of female in each group were equal (45.5% VS 46.7%, p = 0.931). Difference mean total scores of the DVSS was found, the study group was 11.6±4.7 (range 5 - 24) and control groups was 1.9±1.6 (range 0 - 6) (p<0.001). Mean symptom scores of each item were also different between the study and control groups in most items, except for item 3 and 4 which involve defecation (Table 2).

Table 2. Comparisons of age, gender and Dysfunctional Voiding Symptom Scores (DVSS) between the study and control groups

Parameters	Case (n = 22)	Control (n = 30)	*p*-value*
Age (years)	6.1±2.3	6.3±2.2	0.736
Gender (male/female)	12/10	16/14	0.931
Item1 (urine incontinence)	2.1±0.9	0±0.0	<0.001
Item 2 (wetting amount)	2.0±0.9	0±0.0	<0.001
Item 3 (low defecation frequency)	0.6±1	0.4±0.7	0.756
Item 4 (difficult defecation)	0.9±1.2	0.5±0.7	0.520
Item 5 (infrequent voiding)	1.2±1.3	0.3±0.6	0.012
Item 6 (curtysing)	1.8±1.2	0.1±0.3	<0.001
Item 7 (urgency)	1.6±1.2	0.2±0.4	<0.001
Item 8 (voiding difficulty)	0.4±0.8	0.1±0.3	0.039
Item 9 (dysuria)	0.3±0.8	0±0.0	0.016
Item 10 (stressful events)	0.8±1.4	0.2±0.8	0.044
Total score	11.6±4.7	1.9±1.6	<0.001

* Significant *p*-value<0.05

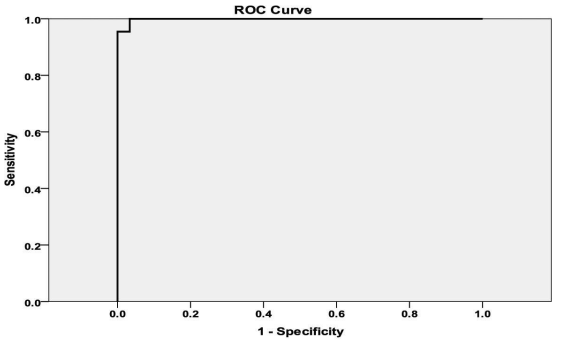

Fig. 1 Receiver operating characteristics (ROC) curve analysis of Thai version of Dysfunctional Voiding Symptom Score (DVSS), with the sensitivity of 100%, specificity of 96.7%, and area under the curve (AUC) 0.998 (p<0.001).

Female and male had the same optimum cutoff score of 5 (sensitivity 100% and specificity 96.7%) with area under the curve (AUC) of ROC curve of 0.998 (p<0.001) as Fig. 1. Using reference cut off scores according to the original DVSS at 6 for female and 9 for male, the sensitivities were considerably decreased (92.5% and 72.2% respectively), but specificities were slightly increased to 100%.

Cronbach's alpha coefficient was 0.8, showing a good internal consistency, and ICC for test-retest reliability was 0.906 (p<0.001; 95% Confidential Interval: 0.841 - 0.945) indicating an excellent reliability.

Discussion

DVSS is a questionnaire commonly used to evaluate LUTD, dysfunctional elimination syndrome or currently termed BBD. It is a non-invasive measurement scale which is self-reported by guardians and children. DVSS was used worldwide and translated from English version into different languages e.g. Portuguese, Chinese and Korean[15-17]. Authors completed the process of translation, validation and test for reliability, and accomplished Thai version of the DVSS.

The translation of theThai version was carefully performed in semantic, cultural and conceptual equivalences to the original DVSS. DVSS Chinese and Korean versions[16,17], experienced confusion of some items and were adapted for those items. For example, the item 3 "I miss having a bowel movement every day." combined with the option "almost never" may cause confusion initially. Korean version of DVSS was modified the items 3 to "I do not have a bowel movement more than once every day." The item 5 in Chinese version of the DVSS was made more clearly by changing "I only go to the bathroom one or two times each day" to "I only go to the bathroom for urine one or two times each day". During the pretesting stage in our study, this also occurred. However, we did not change the item after pretesting, but added only a few verbal differences to some options for more understanding of frequency in the final DVSS-Thai version.

The Thai version of DVSS was reliable and valid to distinguish patients with LUTD/BBD from normal subjects. The internal consistencywas as good as Portuguese and Korean versions[15,17], and correlation coefficient of the test-retest was excellent similar to other language versions[15-17]. Although the Thai version of DVSSwas studied in children with the same inclusion criteria mentioned in the original DVSS, total scores of patients and controls (mean 11.6 vs1.9) were less than the original DVSS (median 14vs 4)[6]. With the AUC of ROC curve of 0.998, the cutoff score of 5 (for both female and male) was able to identify children with LUTD/BBD.

The optimum cutoff score in the present study was lower than the original DVSS (6 for female and 9 for male). This may be due to the lower mean scores of both study and control groups. However, the optimum cutoff score in the Chinese version was also different from the original DVSS. The chosen cut-off point for Chinese female and male was 6.7 (sensitivity 81.7%, and specificity 82.6%), with a mean total scores of the case and control groups of 9.7±3.9 and 4.1±2.6, respectively[16]. It seemed that there was variation range of the optimum cutoff score in different population.

Limitation of the present study was the lack of urodynamic study to confirm the diagnosis of LUTD and determine the abnormality of bladder involving storage and voiding functions. In addition, mean symptom scores of the items involving defecation (item 3, 4) were not significantly different between the study and control groups. This might be due to the inability of the items or low prevalence of bowel dysfunction in the present study. Furthermore, the DVSS itself did not include all symptoms of lower urinary tract, e.g. enuresis, urinary frequency, and bowel-related items, such as fecal soiling or large fecal masses. Nevertheless, DVSS has several advantages. It is a short questionnaire regarding the common abnormal voiding symptoms and bowel habit, and a non-invasive tool, self-reporting by guardians and children.

Application of the DVSS has been widely used for identification of BBD in children[18-20]. BBD was shown as a risk factor for UTI, as well as recurrent UTI in young children presenting with febrile/symptomatic UTI with or without VUR[13,14]. The child with a lower urinary tract symptom, with history of UTI or suspected of abnormal voiding habit should be evaluated for BBD. In general practice, BBD was probably underdiagnosed and undertreated, so Thai version of the DVSS would be helpful in early diagnosis and management of BBD in Thai children. Proper toilet training may be helpful in this group of patients in order to avoid further complications.The potential use for monitoring a clinical change after behavioral modification should be further studied.

Conclusion

Thai version of the DVSS was completed by proper process and demonstrated an excellent validity and reliability to identify BBD in Thai children. At the optimum cutoff score of 5, the DVSS Thai version has a high sensitivity, specificity and discriminative ability with the lower optimum cutoff score than the original DVSS. Higher score (6 or over) may show more specificity to diagnose BBD. This non-invasive measurement would be useful to early diagnosis and management of BBD in Thai children.

What is already known on this topic?

Ability of bladder and bowel control is an essential developmental skill of young children. BBD is a common problem shown as a risk factor for UTI and also associated to psychological and psychiatric problems. The DVSS is a questionnaire used to evaluate BBD in children worldwide, and translated into several languages with reliability.

What is this study adds?

Thai version of the DVSS was translated, and tested for validity and reliability to be a measurement for BBD for Thai children. The optimum cutoff score was lower than the original DVSS. The score of 5 or over has been shown to identify BBD with a high sensitivity and specificity. The authors suggest that the Thai version of the DVSS should be used to identify BBD in Thai children. The potential use for monitoring a clinical change after behavioral modification should be further studied.

Acknowledgement

The study was supported by a grant (R015831038) from the Research Division, Faculty of Medicine Siriraj Hospital, Mahidol Univer-

sity.The authors thank Mrs. Tanida Apivisuttirux for facilitation in translation process, pediatric urologists (Phichai Sujijantararat, Bansithi Chaiyaprasithi and Kittipong Pintusopol, MD.) and pediatric nephrologists (Anirut Pattaragarnfrom and Suroj Supavekin, MD.) for reviewing pretest version of the DVSS, and Ms.Julaporn Pooliam for statistical analysis.

Potential conflict of interest

None.

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ความตรงและความเที่ยงของแบบสอบถามอาการขับปัสสาวะผิดปกติ (DVSS) ในเด็กฉบับภาษาไทย

นันทวัน ปิยะภาณี, สลิลทิพย์ ศิริกันทรมาศ, อัจฉรา สัมบุณณานนท์, Walid A Farhat

ภูมิหลัง: *ความผิดปกติของการขับปัสสาวะและการขับถ่ายพบได้บ่อย และเป็นปัจจัยเสี่ยงของการติดเชื้อทางเดินปัสสาวะในเด็ก การประเมินอาการขับปัสสาวะผิดปกติในเด็กโดยแบบสอบถามชื่อว่า Dysfunctional Voiding Scoring System (DVSS) ฉบับภาษาอังกฤษมีใช้ทั่วไปและมีการแปลหลายภาษา การมี DVSS ฉบับภาษาไทยน่าจะช่วยให้ตรวจพบและรักษาความผิดปกติเบื้องต้นในผู้ป่วยเด็กไทยให้ดียิ่งขึ้น*

วัตถุประสงค์: *เพื่อแปลแบบสอบถาม DVSS จากภาษาอังกฤษเป็นภาษาไทยอย่างเหมาะสม และทดสอบความตรงและความเที่ยงของแบบสอบถาม เพื่อนำไปใช้ประเมินอาการขับปัสสาวะผิดปกติสำหรับเด็กไทยอายุ 3-10 ปี*

วัสดุและวิธีการ: *แปล DVSS ฉบับภาษาอังกฤษเป็นภาษาไทยตามขั้นตอนดังนี้คือ การแปลเป็นภาษาไทย การแปลกลับเป็นภาษาอังกฤษ ทบทวนโดยผู้เชี่ยวชาญและทดสอบความเข้าใจเบื้องต้น กลุ่มศึกษาคือผู้ป่วยเด็กอายุ 3-10 ปีที่มีประวัติการขับปัสสาวะผิดปกติ ติดเชื้อทางเดินปัสสาวะ หรือนิสัยขับปัสสาวะผิดปกติ กลุ่มควบคุมคือเด็กทั่วไปที่มีอายุ 3-10 ปี ทดสอบ DVSS ฉบับภาษาไทยที่ปรับปรุงแล้วกับกลุ่มศึกษาและกลุ่มควบคุม ทำการทดสอบซ้ำห่างจากครั้งแรกนาน 1-2 สัปดาห์ ทดสอบความตรงและความเที่ยงของแบบสอบถามด้วยวิธีทางสถิติ*

ผลการศึกษา: *DVSS ฉบับแปลกลับเป็นภาษาอังกฤษมีความถูกต้องทางภาษา ความหมาย และความเข้าใจเหมือนกับ DVSS ฉบับภาษาอังกฤษดั้งเดิม อายุและเพศระหว่างกลุ่มศึกษา (22 คน) และกลุ่มควบคุม (30 คน) ไม่แตกต่างกัน ค่าเฉลี่ยคะแนนรวม DVSS ฉบับภาษาไทยของกลุ่มศึกษา และกลุ่มควบคุม คือ 11.6±4.7 และ 1.9±1.6 คะแนน ($p<0.001$) ตามลำดับ ค่าสัมประสิทธิ์แอลฟาของคอร์นบาค (Cronbach's alpha coefficient) เท่ากับ 0.8 ค่าสัมประสิทธิ์สหสัมพันธ์ภายในกลุ่ม (intraclass correlation coefficient: ICC) เท่ากับ 0.906, ($p<0.001$; 95% Confidential Interval: 0.841-0.945) การวิเคราะห์ receiver operating characteristics (ROC) curves พบค่าจุดตัด (cutoff point) ของคะแนนแบบสอบถาม DVSS ฉบับภาษาไทยเท่ากับ 5 ทั้งเพศหญิงและชาย (ความไวเท่ากับร้อยละ 100 และความจำเพาะเท่ากับร้อยละ 96.7) โดยมีพื้นที่ใต้เส้นโค้งมีค่าเท่ากับ 0.998 ($p<0.001$)*

สรุป: *แบบสอบถาม DVSS ฉบับภาษาไทยได้รับการแปลอย่างเหมาะสม มีความตรงและความเที่ยงสำหรับการนำมาใช้เป็นแบบประเมินอาการขับปัสสาวะผิดปกติในเด็กไทย*
