Developing a Substance Literacy Scale for Thai Population

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Objective: *To develop a substance literacy scale for Thai population.*
Material and Method: *The research design was divided into 8 steps as follows: 1) devising the items, 2) exploring construct validity of each factor, 3) validating reliability of each factor, 4) generating construct validity of scale, 5) testing conceptual construct of the scale, 6) constructing alternated rating scales, 7) conducting cognitive test, and 8) conducting pilot test. There were 15 experts involved in the content validation of scale. The research was conducted with 3,824 samples of Thai population aged between 12-65 years old from all over the country using the Stratified Three Stages Cluster sampling technique.*
Results: *Two substance literacy scales were developed. A standard has questionnaire of 37 items. The scale content validity index was 0.65, concurrent validity was 0.648. A short has questionnaire of 32 items. The scale content validity index was 0.86, concurrent validity was 0.667.*
Conclusion: *Both scales are simple and easy to use. Scale characteristics are appropriate to assess the substance literacy of population. It can be beneficial to planners for strategic development to respond to the problem more accurately.*

Keywords: *Substance literacy, Scale development, Substance, Thai population*

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Substance abuse is a dynamic problem that can be traced back in human society for centuries[1] and has been continuously and persistently widespread in human society. According to the United Nations Office of Drugs and Crimes or UNODC, in 2011, the estimated number of world population aged between 15-64 years who has experienced illicit substance use at least once in lifetime has reached 167-315 million or 3.6-6.9% of world population in this age group. Cannabis remained the most widely used illicit substance with the estimation of 198 million or 3.9% followed by 33.8 million amphetamine-type stimulants or ATS users or 0.7% of world population in this age group[2].

In Thailand, a network of academic institutes has conducted a study to assess the prevalence of ten kinds of illicit drugs, namely kratom plant, cannabis, opium, ecstasy/love drug, ketamine, cocaine, heroin, inhalants, amphetamine and ICE; in population aged between 12-65 years old. The study estimated that in 2011, there were 3.5 million Thais experienced at least one kind of illicit drug use once in their lifetime, and 590,000 persons experienced at least one kind of illicit drug within the past 12 months[3]. Moreover, the ratio of new cases of drug user in substance abuse treatment facilities has increased dramatically from 15:100,000 in 2009 to 32:100,000 in 2013[4]. The result, which is conformed to the evaluation of the effectiveness of national narcotics control policy conducted in 2012, indicated that substance abuse prevention was still weak. Attention and immediate actions urgently required are: substance abuse prevention and control in workplaces, and setting up a network of school personnel to monitor risk behaviors of students, a student behavior monitoring officer in schools[5].

Substance literacy applies health literacy concept and principles to promote personal substance abuse protective factors. Health Literacy is an index that reflects and describes the range of health outcomes as a key result from health education and communication activities[6,7]. Furthermore, Health Literacy is one of the five essential skills of the 21st Century[7]. Levels of health literacy vary according to basic variations including gender, age, education, overall health condition, etc.

Although Thailand has declared the substance abuse control as a national policy for the past ten years,

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the problem seems to be increasing still. One weakness is a lack of substance literacy scale to identify the population at risk[8].

Material and Method

This is a descriptive research to develop a substance literacy scale for Thai population. The research design was divided into 8 steps.

Stratified three stages cluster sampling: Thailand was stratified into 10 segments according to the structure of the Office of the Narcotics Control Board (ONCB)[9]. With a simple random sampling technique using a table of random number, one province was picked up from each of the ten segments except for Bangkok Metropolitan. The simple random sampling technique was applied to each sample province using a random number table to select one local administration. Each sample local administration made a list of population aged between 12-65 years old in age order to construct a sampling frame. Subjects were then selected from the sampling frame using systematic sampling technique. For Bangkok: districts, sub-districts, and sample groups were randomly selected.

There were seven steps in this research that required a random sampling for data collection, i.e. step 2 to step 8.

Samples in step 2: Exploring the construct validity of each factor.

Out of 23 items (135 questions), items that could do EFA were item 10 (18 questions) and item 18 (24 questions) totaling 42 questions. Sample size for each question must be 30 samples onward. To enable a proper analysis, the sample size was adjusted to 1,350 to fit the management.

Samples in step 3: Validating reliability of each factor.

Sample size was calculated using the formula for sample size determination for reliability study[10] N = $(Z_{\alpha/2}/CI)^2+3$ and came up with 400 samples.

Samples in step 4: Generating construct validity of scale.

By using the formula for sample size determination for correlation coefficients study[11] $n = \left[\frac{Z\alpha + Z\beta\sqrt{(1-r^2)}}{r}\right]^2 + 2$, the sample size came up at 150 samples.

Samples in step 5: Testing conceptual construct of scale.

By using the formula for sample size determination of Jirawatkul A[12].

$n_0 = \frac{Z^2_{\alpha/2}P(1-P)}{e^2}$, the sample size came up to approximately 400 samples.

Samples in step 6: Constructing alternated rating scale.

Data from step 5 was also used in this step.

Samples in step 7: Cognitive testing.

A cognitive test was conducted with a sample group of 24 persons in a community in Khon Kaen province by Purposive sampling.

Samples in step 8: Conducting pilot test/ consistency test.

The formula $n = \frac{Z^2_{1-\alpha}Pq}{d^2}$ was used to determine the sample size. Because this was a multistage stratified random, the calculated sample size must multiply by design effect value. The design effect adjusted sample size was 157.96 x 6.7[3] = 1,058 samples. After adjusted with 20% non-response, sample size came to 1,270 samples. Therefore, the sample size for the pilot test was approximately 1,500 samples from primary health care units proportional to size of units.

This research completely collected data from the sampling group in each step as planned. The total number was 3,824 samples in 51 provinces (Table 1).

Data collection

Key in data using a double data entry method by different persons and check the data before conducting data analysis.

Table 1. Number of samples in each step of this research

StepNo.	Sample province	Number of study population (aged 12-65)	Intended sample	Actual subjects
Step 2	10	117,595	1,350	1,350
Step 3	10	40,569	400	400
Step 4	10	53,471	150	150
Step 5, 6	10	54,638	400	400
Step 7	1 (Khon Kaen)	24	24	24
Step 8	10	82,987	1,500	1,500
Total	51	349,284	3,824	3,824

Data analysis

SPSS version 16 and Mplus version 7.11 were used to analyze the data in this study. The descriptive statistics, reliability, multiple logistic regressions, construct validity and Second-order Confirmatory Factor.

The process in developing substance literacy rating scale for Thai population was divided into 8 steps. Each step was conducted as follows:

Step 1: devising the items comprised of two main activities

1.1) Review literature to analyze risk factors for substance abuse. It was found that risk factors for substance abuse could be divided into 3 main categories, *i.e.* 1) principal factors, 2) enabling factors, and 3) reinforcing factors[1,13,14].

1.2) Find consensus from 15 experts in two discussions on the first draft of questionnaire basing on findings from Step 1.

Step 2: exploring the construct validity of each factor

This step employed the exploratory factor analysis (EFA) to analyze factors from 23 items in the scale. Item 10 (10 questions) and Item 18 (24 questions) totaling 42 questions.

Step 3: testing reliability of each factor

Each of the 7 factors was tested for reliability indices.

Step 4: generating construct validity of scale

Fifty-one items of 10 variables influencing substance literacy as shown in Table 3 were identified by using the multiple logistic regression technique, weighting and calculating prediction value of each factor.

Step 5: testing conceptual construct of scale

Experts reviewed results of multiple logistic regression analysis of variables. There were 10 variables selected from variables with statistically significant value at 0.05 from all three formula.

Step 6: constructing alternated rating scale

An alternated rating scale was constructed by exploring content validity according to suggestions from experts as face validity.

Step 7: cognitive test

A cognitive test was conducted with a sample group of 24 subjects in a community in Khon Kaen province (2 each groups of 3 age group x 2 gender x high and low education). Language use was modified for better communication and a set of self-administered questionnaire was also developed from the original face-to-face interview form.

Step 8: conducting pilot test

A pilot test of the scale was conducted with 1,500 Thais aged between 12-65 years old.

This research study was approved by the Ethics Committee of Khon Kaen University on Research in Human Subjects as of document number HE551158.

Results

The process in developing substance literacy, rating scale for Thai population was divided into 8 steps. Each step was conducted as follows:

Step 1: devising the items comprised of two main activities

The brainstorming of experts resulted in a set of interview questions as substance literacy scale. The original set of questions consisted 23 items divided into two parts. Part 1 was for general information (personal characteristics) under items 1-7. Part 2 was for substance literacy consisted 16 items from 8-23.

Step 2: exploring the construct validity of each factor 8 questions could be deleted, therefore, there were 34 questions left in this scale as follows:

1) Personality and family-6 questions

2) Experience-9 questions

3) Natural selection-2 questions (one question was deleted)

4) Narcotics belief-7 questions (3 questions were deleted)

5) Treatment belief-5 questions (4 questions were deleted)

6) Addiction belief-3 questions

7) Legal substance belief-2 questions.

Step 3: testing reliability of each factor

Each of the 7 factors was tested for reliability indices (Table 2).

Step 4: generating construct validity of scale

51 items of 10 variables influencing substance literacy as shown in Table 3 were identified by using the multiple logistic regression technique, weighting

and calculating prediction value of each factor (Table 3).

Step 5: testing conceptual construct of scale

Experts agreed to delete five variables, i.e., Q16, Q17.3, Q17.8, Q17.2, and Q17.15. The reasons were that variable in Q16 had low discrimination power while variables in Q17 were substance-specific, therefore, the result would not be comprehensive if some substances were omitted.

Then a second-order confirmatory factor analysis was conducted to the conceptual framework of all components to confirm that latent variables were comprised of appropriate observed variables. Computer program Mplus version 7.11 of ISAN substance abuse network, Khon Kaen University was used in analyzing these factors (Fig. 1).

Fit index	Criterion	Result
X^2/df = 877.848/625 = 1.404	<2.00	Pass
CFI (comparative fit index) = 0.99	>0.95	Pass

Table 2. Reliability index of each factor

Factor	Reliability index
1) Personality and Family	0.880
2) Experience	0.872
3) Natural Selection	n.a. because there were only 2 questions
4) Narcotic Belief	0.702
5) Addiction Belief	0.856
6) Treatment Belief	0.751
7) Legal Substance Belief	n.a. because there were only 2 questions

Data processing showed that Chi-square = 877.848, degrees of freedom = 625, *p*-value = 0.061 and comparative fit index = 0.99, which all passed the criteria.

An analysis of the compatibility of model also showed that,

- Chi-square/df = 877.848/625 = 1.404
- *p*-value more than 0.05, therefore principal assumption could not be defied (model was consistent with empirical data).

Step 6: constructing alternated rating scale

An alternated rating scale was constructed by exploring content validity according to suggestions from experts as face validity. Content validity index or CVI was 0.86. Then an adjusted odds ratio analysis was conducted to calculate the weight for adjusting the scores (Table 4).

Measurement rule is to classify population into two categories by means of score on the test. The cut point was calculated from the total score of 106 and 66 was appropriate with a sensitivity index at 0.773 and specificity at 0.314. Therefore, the measurement rule was set as; from 66 up means having substance literacy and score less than 66 means a lack of substance literacy.

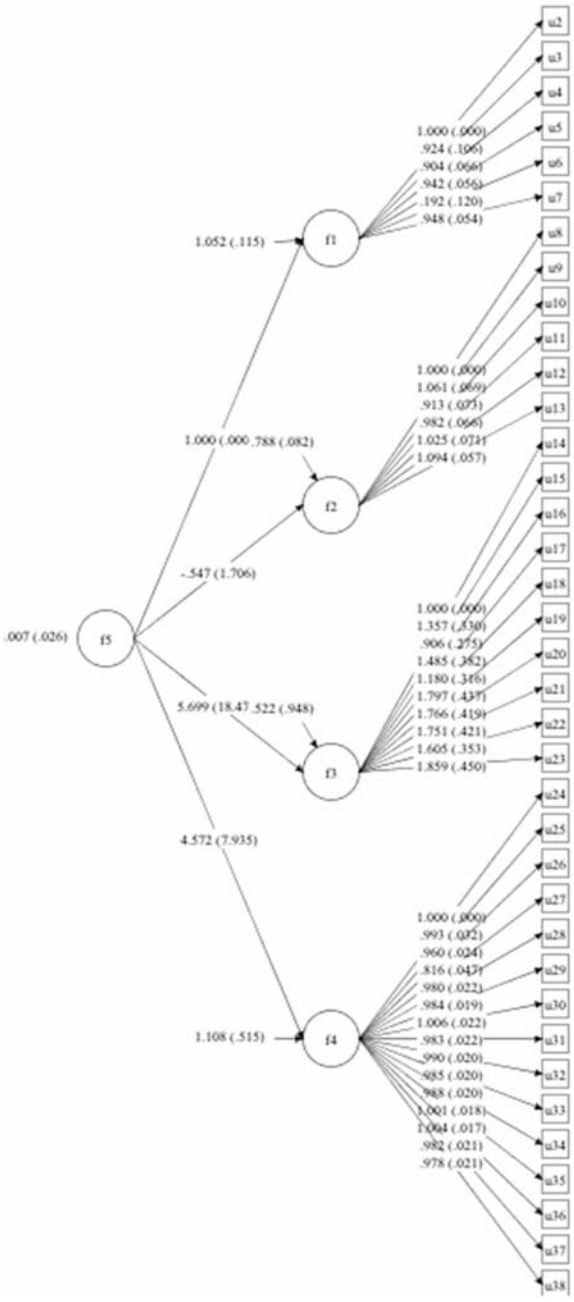
The shorter version of substance literacy scale (the self-administered questionnaire) had the concurrent validity 0.667, which is higher than the standard substance literacy scale (the guided interview), and internal consistency value 0.833 (Table 5).

Step 7: cognitive test

The self-administered questionnaire was more

Table 3. Construct validity of scale

Equation		AOR	95% CI for AOR		*p*-value
			Lower	Upper	
Analysis of literacy level 1	Q16_cut	2.853	1.004	8.106	0.049
	Q17.3_cut	15.163	2.451	93.816	0.003
	Q17.8_cut	8.580	1.157	63.608	0.035
Analysis of literacy level 2	Q8_cut	11.271	1.816	69.936	0.009
	Q18F3_cut	3.285	1.067	10.115	0.038
Analysis of literacy level 3	Q8_cut	30.296	1.659	553.296	0.021
	Q17.2_cut	0.025	0.001	0.448	0.012
	Q17.15_cut	0.053	0.003	0.856	0.039
	Q18F1_cut	61.673	5.067	750.679	0.001
	Q10F1_cut	8.229	1.337	50.630	0.023
	Q21_cut	9.780	1.549	61.766	0.015



f1: Q8; f2: Q10F1; f3: Q18F1, Q18F3; f4: f1-f4

Fig. 1 Second-order confirmatory factor analysis.

economic and cost-saving in conducting a substance literacy survey in Thai populations aged between 12-65 years old. This set of questionnaire covered 11 items divided into 2 parts. Part 1 was for general information (personal characteristics) under items 1-7. Part 2 was for substance literacy assessment under items 8-11.

Step 8: Conducting pilot test

The result showed that from this sample group, 55% has adequate substance literacy and 45% lacks adequate substance literacy. 60.1% of female sample has substance literacy and 39.9% lacks substance literacy, whereas 50.4% of male sample has substance literacy and 49.6% lacks substance literacy. The research also revealed that in Thailand, Region 6 (lower Northern provinces) had the highest number of people without substance literacy at 74% and those who had substance literacy only at 36%, again the lowest number in Thailand. This result corresponded to the report of drugs situation in Thailand in which findings from the epidemic study of yaba or methamphetamine, the most wide-spread drug in Thailand, between 2545-2554 BE by Manop Kanato, also showed that the prevalence rate of yaba users per 100,000 population in the area under ONCB Region 6's supervision was high and the level of addiction (screened with ASSIST questionnaire) also high[9].

The two substance literacy scales that were developed from this research are easy to use and not complicated. Therefore, they are practical for assessing substance literacy of Thai populations to enable a better and more accurate substance abuse prevention strategy development.

Discussion

Substance literacy, rating scales should be used to assess the substance literacy of population in each region so that substance abuse prevention and control strategy can be properly developed and responsive to target population. It can be beneficial to planners for strategic development to respond to the problem more accurately.

A difficulty in conducting the study from Switzerland by Petra was to describe health literacy and its and association with substance use among young men 22% reported having searched the Internet for health information and 16% for information on substance over the past 12 months. At-risk and not at-risk users of alcohol, tobacco and cannabis searched for information about substances significantly more often via the Internet than abstainers. Substance users appear to be more informed and knowledgeable about the risks of substance use than non-users[15].

What is already known on this topic?

Drug abuse seems to be widely epidemic globally. Epidemiological transition demonstrates the variety of substances use, particularly among

Table 4. Weight and adjusted scores

Question No.	Weight	Adjusted score
1. Exposure to substances (Q8_cut)	30.296	Total score 30
2. Correct belief about substances (Q18F1_cut)	61.673	Total score 60
3. Causes of substance use (Q10F1_cut)	5.553	Total score 6
4. What to do if someone you know are lured into using substances (Q21_cut)	9.780	Total score 10

Table 5. Comparison between standard substance literacy scale and the shortened version of scale

Index	Standard substance literacy scale (37 questions)	Shortened substance literacy scale (32 questions)
Content validity index: CVI	0.650	0.860
Concurrent validity	0.648	0.667
Sensitivity	0.714	0.773
Specificity	0.465	0.314
NPV	0.714	0.707
PPV	0.440	0.393
Internal consistency	0.902	0.833

adolescence. It is evidenced that the first onset tends to be decreasing. Drug resistance becomes essential for prevention measures.

What this study adds?

Health literacy is used in research to demonstrate self-awareness to perform appropriate health behavior. This study employed literacy principles to develop a scale reflecting drug resistance, awareness level within individual. Substance literacy scores can be used to determine appropriate prevention measures.

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Potential conflicts of interest

None.

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การพัฒนามาตรวัดความรู้เท่าทันสารเสพติดของคนไทย

กิตติมา โมะเมน, มานพ คณะโต

วัตถุประสงค์: เพื่อพัฒนามาตรวัดความรู้เท่าทันสารเสพติดของคนไทย

วัสดุและวิธีการ: การวิจัยครั้งนี้มี 8 ขั้นตอน ได้แก่ 1) ประมวลข้อคำถาม 2) หาความแม่นตรงตามตัวสร้างปัจจัย 3) ทดสอบความน่าเชื่อถือของแต่ละปัจจัย 4) หาความแม่นตรงตามตัวสร้างของมาตรวัด 5) ทดสอบมาตรวัดตัวสร้างตามกรอบแนวคิด 6) สร้างมาตรวัดใหม่ 7) ปรับภาษา และ 8) ทดลองใช้ โดยมีผู้เชี่ยวชาญ 15 คน ร่วมพิจารณาใช้วิธีการสุ่มตัวอย่างแบบ Stratified three stages cluster sampling ในประชากรอายุ 12-65 ปี จำนวน 3,824 คน ทั่วประเทศ

ผลการศึกษา: *มาตรวัดความรู้เท่าทันสารเสพติดที่พัฒนาขึ้นในครั้งนี้มี 2 ชุด ได้แก่ 1) มาตรวัดความรู้เท่าทันสารเสพติดฉบับมาตรฐานมีคำถาม 37 ข้อ มีค่าดัชนีความแม่นตรงของเนื้อหา 0.650 ค่าความแม่นตรงเสมือน 0.648 และ 2) มาตรวัดความรู้เท่าทันสารเสพติดฉบับย่อมีคำถาม 32 ข้อ มีค่าดัชนีความแม่นตรงของเนื้อหา 0.860 ค่าความแม่นตรงเสมือน 0.667*

สรุป: *มาตรวัดความรู้เท่าทันสารเสพติดที่สร้างขึ้นทั้ง 2 ชุด ใช้งานง่ายไม่ยุ่งยากเหมาะสมที่จะใช้สำรวจความรู้เท่าทันสารเสพติดเพื่อใช้ในการวางแผนยุทธศาสตร์ที่เหมาะสมต่อไป*