Development and Psychometric Testing of the Safer Sex Behavior for Thai Women Scale

Wanna Sa-nongdej, Wantana Maneesriwongul, Manee Arpanantikul, Pisamai Orathai*

Abstract: This study used a mixed method sequential explanatory design to develop and test the psychometric properties of the Safer Sex Behavior for Thai Women Scale. The conceptual model and content domains were derived from a comprehensive literature review. Five domains and 70 items of safer sex behaviors for Thai women were generated through in-depth interviews from 20 Thai women. The first draft instrument was verified for content validity by 7 experts and examined for the clarity by 6 Thai women. Out of 70 items, 53 items remained.

The construct validity of the revised scale was tested by exploratory factor analysis and confirmatory factor analysis. The participants were 298 and 354 Thai women, respectively. The results revealed that scale was composed of 9 factors and accounted for 50.17 % of the variances. Confirmatory factor analysis revealed that only 8 factors (42 items) fitted the empirical data, namely: avoiding having sex with a partner who has multiple-partners; negotiating with partners for condom use; avoiding alcohol drinking and drug use; avoiding having sex with a partner who has sexual transmitted infection; protecting when partner has sexual transmitted infections; using condom; avoiding having sexual intercourse; and reducing sexual risk behavior. The Cronbach's alpha coefficient of the overall scale was 0.89. Thus the instrument has good construct validity and reliability. This instrument has potential to monitor and evaluate a nursing intervention to promote safer sex behavior among Thai women.

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Introduction

In Thailand, sexually transmitted infections (STIs) are significant women health problems, with the overall prevalence of 37.2 cases per 100,000 populations (MOPH, 2011).[1] The prevalence tends to increase between 15 and 44 years, and might be a result of unsafe sexual behaviors, such as not using a condom or having sex with multiple partners.[2]

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Promoting safer sex practice is necessary for women to reduce the risk of STIs. Safer sex is the practice that reduces the risk of STIs and limits body fluid exchange by using barrier devices.[3] For example, using condoms has been shown to decrease the risk of STIs about 20 fold; choosing insertive fellatio rather than insertive anal sex can reduce 13 fold the risk of HIV infection; and choosing a partner who has no sexual risk behavior can reduce 4.7 fold the relative risk of HIV transmission.[3-4] Although safer sex practice is an excellent way for HIV prevention. However, it has not been successfully implemented among Thai women.[5] Such behavior in Thai women is quite complex, as it is under the influence of biological- physiological, intra-psychic, interpersonal, and socio-cultural domains,[6] making it difficult to be promoted, practiced and monitored.

In the biological-physiological domain, female sexual organs and the soft tissue of the reproductive tract make women more vulnerable to infections than men. Thus, strategies used for safer sex practice are different by gender. In the socio-cultural domain, Thai social and cultural norms have treated females as inferior to males, and women have to keep silent surrounding sexuality. Thai culture dictates that good women are expected to be ignorant about sexual behavior and should be passive in sexual interactions. This has affected the interpersonal domain which involves women's ability to interact with partners. It is more difficult for Thai women to become informed about sexual risk reduction. Even when they are well informed, it is still difficult for them to be proactive in negotiating for safer sex.[7] In the intra-psychic domain, personality mediators and cognitive processes are involved in decision making regarding sexual risk-taking for STIs. Thai women are unable to make decisions about safer sex independently, as using or not using condoms mostly depends on a male partner's decision.[8] Moreover, the belief that condoms must always be used with commercial sex workers (CSWs)[9] has negative influences on the safer sex behavior of Thai women, and increases risk of HIV transmission from their steady partners.[10] Thus, these four domains must be taken into considerations in promoting safer sex behavior among Thai women.

When promoting safer sex behavior among Thai women, valid and reliable measures that more specific to the Thai context are needed. Although, there are several existing instruments, they do not represent all domains, as none of them specifically concern gender differences. As seen in a study by Dilorio and colleagues,[11] the Safer Sex Behavior Questionnaire (SSBQ) was used in both men and women; it was found that women responded with scores of half those of men in terms of risk. The researchers suggested that any tool measuring safer sex behavior should be gender specific. Moreover, safer sex has involved various methods: abstinence, monogamy, a couple's mutual fidelity, and a couple's condom use.[7] However, existing instruments used to measure safer sex behavior focus mostly on consistent condom use. These instruments could reveal information about women's safer sex behavior because other safer sex methods aside from condom use have also been employed.[12]

In addition, sexually-related instruments developed in target countries should be more sensitive and better able to capture concepts than those developed in other countries,[13] minimizing measurement errors and increasing validity. Thus, this study aimed to develop and test the psychometric properties of the Safer Sex Behavior for Thai Women Instrument (SSBTW), which can be used to assess, monitor and evaluate the effectiveness of an intervention program.

Conceptual Framework

Sexuality is a natural part of life and an integral aspect in the quality of life, but it lacks theoretical definition, and this has complicated efforts to develop measures that clearly operationalize the construct of human sexuality.[14] However, Wilmoth [15] suggested

that if researchers have to develop a measurement for sexuality, the concept of human sexuality and resultant sexual behavior should measure all biological-physiological, intra-personal, interpersonal, and socio-cultural domains so that an instrument will provide a high degree of construct validity.[15] Safer sex behavior for Thai woman can be measured in terms of behavioral intention and actual behavior. The behavioral intention has been a good proxy measure for predicting of actual safer sex behavior. [16-17]

In the biological-physiological domain, safer sex behavior involves practices to limit body fluid exchange and use barrier devices appropriately for routes of sexual actions. For the intra-personal domain, women should use a decision-making process to reduce risk behavior for STIs. This process involves several psychosocial factors such as personal knowledge, attitude, self-efficacy of safer sex, and perceived risk of HIV/STIs which affect the practice of safe sex behavior.[18] In the interpersonal domain, women successfully have safer sex behavior when they have adequate communication skills to negotiate with their partners for the use of barrier devices, and to refuse unsafe sex.[19-20] In the socio-cultural domain, women have to be concerned about values and social norms within their own context about the intention to avoid risk behavior of HIV and STIs and safer sex practices.[7]

The characteristics of safer sex behavior were synthesized from a review literature under the influence of four domains. They were used to guide the development of the Safer Sex Behavior for Thai Women Scale (SSBTWS). Safer sex behaviors are: a) sexual practices to limit bodily fluid exchange such as abstinence and the practice of monogamy and faithfulness; b) using barrier devices appropriately within the route of sexual activity, such as condom; c) practicing to reduce risk behaviors of STIs including reducing the number of partners, avoidance of alcohol and drug use; and d) negotiating skills for safer sex behavior.

Methods

Design: A sequential mixed method design was used to develop an instrument in two phases:. The first, scale development, began with Step 1-3 to develop the SSBTWS. The second phase, (Step 4-5) was conducted to test psychometric properties of newly developed instrument. (Figure 1)

Ethical Considerations:

Prior to data collection, this study was approved by the Research Ethical Committee, Faculty of Medicine Ramathibodi Hospital, the Research Ethics Committee, Ayutthaya Hospital and Sena Hospital. Before collecting data, information describing the research objectives, potential risks/benefits, confidentiality and anonymity was provided to the participants. The women gave informed consent to participate in the study, and received 300 Thai baht in compensation for their time spent during in-depth interview, and 50 baht in compensation for their time spent on completing a questionnaire.

Settings and participants:

In the scale development (Phase I, Step 1), 20 women were recruited for an in-depth interview. Fourteen women with high-risk sexual behaviors were recruited at obstetric and gynecology clinics (OGC), whereas 6 women with lower-risk sexual behaviors were recruited at family planning clinics (FPC). The high-risk women were purposively recruited based on the following inclusion criteria: 1) aged 18-49 years; 2) sexually active; and 3) having a history of STIs; while, the inclusion criteria of the low-risk woman were similar, except for no history of STIs. The average age of the high-risk women was 25.83 years (SD = 4.50) ranging from 20 to 34 years, and the average age of low-risk women was 28.5 years (SD = 6.20) ranging from 20 to 40 years, respectively. Women with high-risk sexual behaviors had HIV (n=4), candida alblican (n=3), pelvic inflammatory disease (n=3), tichomoniasis (n=1), chalamydia (n=1), herpes simplex (n=1), and genital warts (n=1).

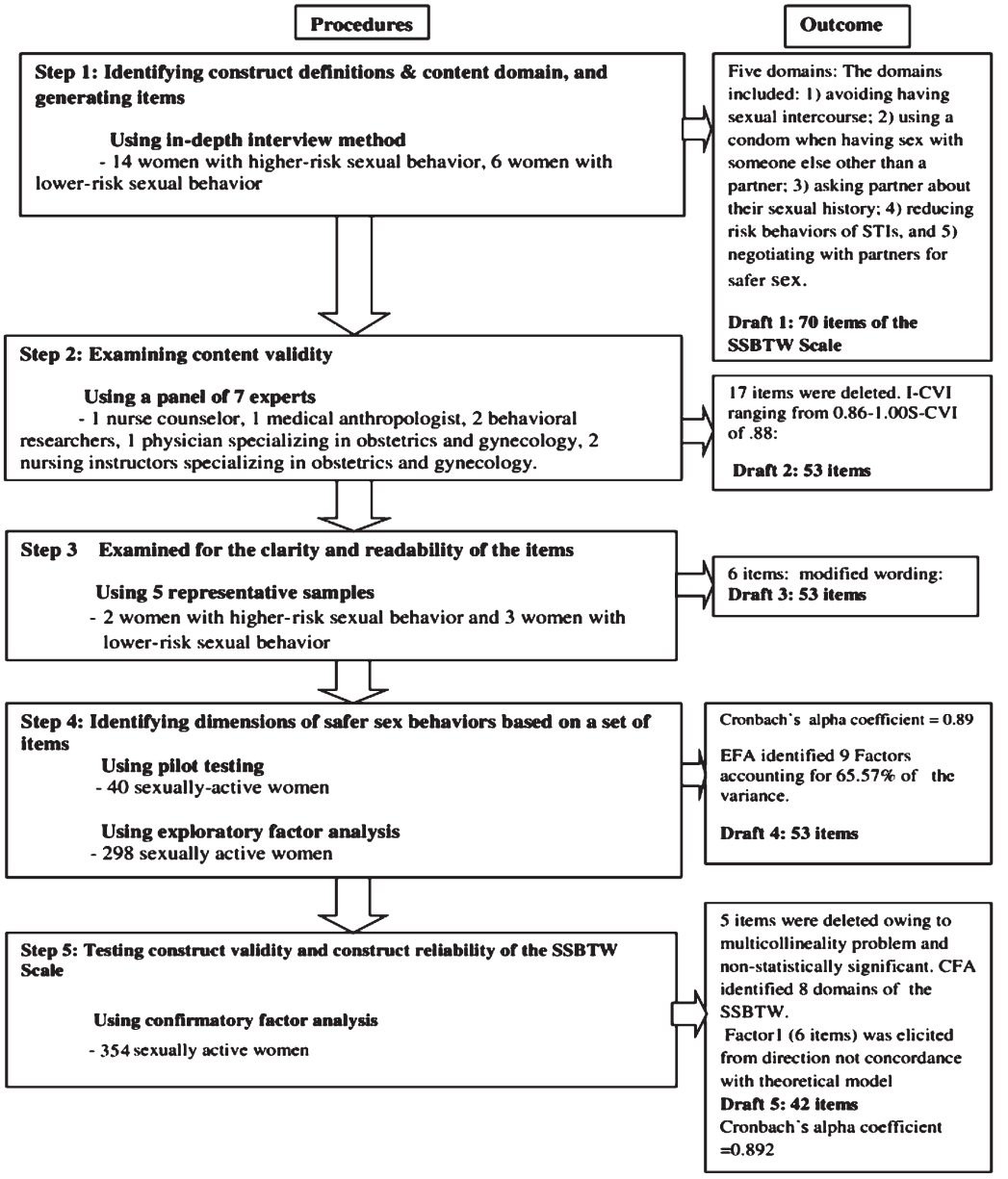

Figure 1 Process of developing the Safer Sex Behavior for Thai Women Scale

In Step 2, seven experts assessed content validity. In Step 3, three women with high-risk sexual behaviors and two women with low-risk sexual behaviors were asked to assess clarity and readability of the first draft.

The second phase of the study involved testing of the psychometric properties of newly-developed instrument (Steps 4-5). These steps involved different consecutive samples of women of reproductive age working in the industrial sector. The inclusion criteria

were: 1) aged 18-49 years; 2) sexually active; 3) able to read Thai; and 4) willing to participate in the study.

In Step 4, a pilot study with 40 sexually-active women was conducted prior to testing psychometric properties by exploratory factor analysis (EFA). For a study using EFA, a sample size is calculated using 5 participants per item; [21-22] thus, 53 items multiplied by 5 equals 265. An additional 30% of participants was added to compensate for incomplete respondents and/or respondents[23] with no sexual intercourse. Actually, 345 sexually-active women participated, but 47 reported never having sex. Finally, data from 298 participants was used for the EFA. The average age of the women was 32.58 years (SD = 7.00) ranging from 20-49 years. Most were married (77.8%) and 11.4% had sex with more than one partner. Nearly 10% of their partners had sex with other women (9.4%), with commercial sex workers (CSWs) (1.3%), and with other men (1.3%). The participants reported that they and their partners used to have a symptom of STIs (12.4% and 1.7 %, respectively).

For confirmatory factor analysis (CFA) (Step 5), the same calculation was conducted with the same 53 items.[21-22] However, the principal investigator (PI) used an addition of 40% to compensate for incomplete responses and those who reported no sexual experience. There were 371 participants, and 17 reported no sexual experience and/or gave an incomplete response. Finally, data from 354 participants were used for CFA. The average age of the women was 32.05 years (SD = 7.68), ranging from 20-49 years, and they were predominantly married (68.7%). They reported sexual risks as they had sexual intercourse with more than one partner (21.5%), their partner having sex with someone else (14.4%), and their partner had symptoms of STIs (1.4 %).

Data Collection and Data Analysis

Phase I: The scale development phase comprised three steps: identifying construct definition, constructing content domain, and generating items (Step 1); examining content validity (Step 2); and assessing the clarity and readability of the instrument (Step 3).

Step 1: Identifying construct definition, constructing content domain, and generating items. Each participant was interviewed for 40-60 minutes in a private area. The PI asked permission to have audio-recording during the interviews, and after finishing the interviews, immediately wrote field notes to be used in analysis of the data.

The verbatim reports from in-depth interview were analyzed using content analysis. There were three interpretive strategies[24]: 1) data reduction: data was the consideration of the particular texts from the interviews relevant to the safer sex behavior and selected into table, 2) data display: the text was linked together and condensed to create sub-categories and themes, and 3) making conclusions and drawing verification: The meaning unit, sub-categories and themes were summarized and confirmed by the interview participants. Themes emerging from the interview content were used in item generation of each domain. The wording or phrases on meaning unit and sub-categories with a high frequency were utilized to generate scale items. There were 70 items generated in Draft 1 with five domains (Figure 1).

Step 2: Examining content validity: Draft 1 was examined for content validity by a panel of 7 experts with consideration as to whether the items taken together adequately provided the full nuance of the construct. The panel comprised a physician specializing in obstetrics and gynecology, a medical anthropologist, two behavioral researchers, a nurse counselor, and two nursing instructors specializing in obstetrics and gynecology. Seventeen items with an I-CVI less than 0.86 were discarded.[25] Subsequently, the 53 items on Draft 2 of the SSBTWS have I-CVIs ranging from 0.86 to 1.00 with an S-CVI of 0.88.

Step 3: Assessing the clarity and readability

Draft 2 of the Scale was examined for the clarity and readability of the items by 5 participants: 3 women with high risk sexual behavior and 2 women

with low-risk sexual behavior. They were asked to comment about words or phrases that they were unable to understand or were unclear to them. Six items were revised to improve semantic content of the SSBTWS (Draft 3).

Phase II: The testing of psychometric properties of the Scale included 2 steps: identifying dimensions of safer sex behaviors based on a set of items (Step 4, Draft 3), and testing construct validity and construct reliability (Step 5, Draft 4).

Step 4: Identifying dimensions of safer sex behaviors

After getting permission from the manager of a private company, recruitment information was posted on an information board in front of an infirmary room. Those women who were interested in participating were given details about the objectives of the study. They received a questionnaire and a consent form contained in an envelope. Those who volunteered to participate signed a consent form, completed the questionnaire, sealed the envelope and returned it directly to the PI. They took about 30-40 minutes to complete the questionnaire.

Demographic data and responding scores of the SSBTWS were analyzed by descriptive statistics. A pilot study of Draft 3, with 40 women revealed a Cronbach's alpha co-efficient of 0.89. Subsequently, this draft was tested by EFA to identify dimension of safer sex behavior for Thai women. The assumptions of EFA were examined including Kaiser-Mayer-Olkin measure of sampling adequacy test (KMO), Bartlett's test of sphericity, and bivariate distributions among variables. KMO was equal to 0.85. Bartlett's test of 53 items was statistically significant (χ^2 = 7977.60, df = 1378, $p < 0.001$). The initial factor analysis was conducted using the principal component analysis (PCA) and orthogonal rotation to summarize the number of underlying dimensions. The criteria set for analyzing and interpreting items were an eigenvalue greater than 1.00, and items loading above 0.30 on each factor.[26]

Step 5: Testing construct validity and construct reliability

In Step 5, Draft 4 was tested by CFA using the LISREL program version 8.80 student edition. Prior to CFA, the assumptions were tested including multicollinearity, univariate and multivariate normality, and the linearity of the relationship. The CFA was used to evaluate the goodness-of-fit of a statistical model of safer sex behavior on individual subscale and overall measurement models of the SSBTW Scale. The goodness-of-fit was evaluated by following guidelines for goodness-of-fit-indices, including: 1) non-significant chi-square; 2) relative or norm chi-square (χ^2/df) less than 2; 3) GFI and AGFI values > 0.90: and 4) SRMR and RMSEA values <0.05.[26] The observed variables were estimated by t-values that exceeded the critical values of ±1.96 at the 0.05 significant levels. The squared multiple correlation (R^2) or variance extracted was used to assess reliability of the measured variable representing a latent construct. R^2 was used to detect the item construct reliability with the acceptable suggestion at the threshold level of 0.50 or higher.[26]

Next, overall measurement models of the SSBTWS were tested for construct validity and reliability. The summed score of each factor on the SSBTWS model was calculated by using a factor score. The summed score of each factor were then analyzed by CFA using the same criterion. Lastly, the Cronbach's alpha coefficient was calculated.

Results

EFA explored the data in terms of how many factors were needed to best represent the data from statistics, not from theory. EFA was tested prior to CFA. The findings from EFA initially suggested 13 factors, with factor loadings that were greater than or equal to 0.30. According to Hair[26] each factor should have at least 3 observed variables. However, there were 4 factors with 1-2 items, including Factors 9, 10,

11 and 12. Items on these factors were conceptually adjusted and re-loaded on Factors 4, 5, and 6. Finally, the SSBTW Instrument retained 9 factors (**Table 1**). Most items had communalities of greater than 0.50. Although the cut of point factor loading was above 0.3, there were 52 items with factor loadings greater than 0.40. The factor extractions of the SSBTWS can explain 50.17% of the variance.

Table 1 Factor loadings and communalities of the SSBTW Scale

Items	Items	Factor Loadings	Communalities (h^2)
	Factor 1: Asking partner about their sexual history (ASKPAR): 7 items		
16	Prior to making a decision to have sex with your partner, you ask him about his STIs history.	.722	.596
17	Prior to making a decision to have sex with your partner, you ask him about having sexual intercourse with other women in the past.	.824	.680
18	Prior to making a decision to have sex with your partner, you ask him about having sexual intercourse with CSWs in the past.	.845	.714
19	Prior to making a decision to have sex with your partner, you ask him about using a condom when having sexual intercourse with CSWs in the past.	.824	.679
20	Prior to making a decision to have sex with your partner, you ask him about using a condom when have sexual intercourse with other women in the past.	.805	.648
21	Prior to making a decision to live with spouse, you ask him about using condom when having sexual intercourse with other women.	.827	.684
22	If you do not know partner's entire sexual history, you will not have sex with him.	.657	.432
	Percentage of explained variance = 8.36%		
	Factor 2: Reducing sexual risk behavior (RISKBEH): 11 items		
26	At the present time, you have multi-partners.	.773	.597
27	Prior to making a decision to live with this partner, you had sexual intercourse with other men in the past.	.729	.531
28	After you live with your partner, you have sex with other men.	797	.635
29	You have sexual intercourse with commercial sex worker (CSWs)	.465	.216
30	You have sexual intercourse frequently with your partner, you have bleeding per vagina, lower abdominal pain dysuria and hematuria after having sexual intercourse.	.655	.429
31	You have violent sexual intercourse with your partner, as a result of feeling pain.	.610	.372
32	During the menstruation period, you have a sexual intercourse with your partner.	.575	.330
35	You make love to have an orgasm without penetration.	.483	.233
36	You have sex by withdrawal method without penetration.	.534	.285
37	You have oral sex with your partner.	.703	.494
38	You have anal sex with your partner.	.708	.502
	Percentage of explained variance = 8.72%		
	Factor 3: Using condom (CONUSE): 5 items		
7	You have prepared condoms for having sexual intercourse with men.	.846	.716
8	In the past, your partners have made a decision about using or not using a condom.	.753	.567
9	You will get all of partner using a condom if they want to have sex with you.	.798	.636
10	If you will have sex with other temporary partners, you insist on them using a condom when having sex with you.	.678	.459
13	You have symptoms of STIs such as an itching vagina or leucorrhoea; therefore, you get your partner to use a condom when he has sex with you.	.686	.470
	Percentage of explained variance = 5.38%		

Table 1 Factor loadings and communalities of the SSBTW Scale (Cont.)

Items	Items	Factor Loadings	Communalities (h^2)
	Factor 4: Avoiding having sexual intercourse (AVIOD): 7 items		
1	You will not have sex with your partner if he had sex with CSWs.	.843	.711
2	Even if your partner did not use a condom with CSWs, you are still having sex with him as usual.	.322	.104
5	Even though you have symptoms of STIs such as leucorrhoea, itchiness or fungi, you are still having sex with your partner.	.146	.021
44	You can refuse sexual intercourse with partner if you do not want to have sex.	.506	.256
47	You can refuse sexual intercourse with partner if he has STIs such as syphilis, gonorrhoea or AIDS.	.847	.718
52	You can persuade your partner not to visit CSWs.	.799	.639
53	You can persuade partner not to have sex with other women.	.568	.323
	Percentage of explained variance = 5.14%		
	Factor 5: Avoiding alcohol drinking and drug use (USEALCOH): 5 items		
39	You have drunk alcohol before having sex.	.719	.516
40	You have drunk alcohol and had sexual intercourse without condom use.	.755	.601
41	You have drunk alcohol, you have sexual intercourse with other men without condom use.	.697	.485
42	You had used illicit drugs before having sex.	.837	.700
43	You had used illicit drugs before having sex with your partner, so you did not use a condom.	.825	.680
	Percentage of explained variance = 5.62%		
	Factor 6: Negotiating with partners for condom use (NEGOTI): 6 items		
11	You know that your partner had sex with CSWs. You did not get him using condoms when he has sex with you.	.780	.608
45	You cannot persuade your partner to use a condom with you when he has sex with you.	.457	.209
46	You cannot persuade your partner to use condom, when he had sex with other women.	.733	.538
48	You cannot negotiate with your partner for using a condom even though he had sex with CSWs.	.507	.257
49	Even though your partner has sex with other women, you cannot negotiate with him for using a condom when he has sex with you.	.768	.590
51	You do not dare ask partner to use condom because of being afraid of arguing with him.	.627	.393
	Percentage of explained variance = 4.90%		
	Factor 7: Avoiding having sex with a partner who has STIs (PARSTI) : 3 items		
4	You will have sex with your partner as usual, even if your partner has STIs, such as a blister pus or discharge from his penis.	.732	.536
33	In the past, your partner had a symptom of STIs such as dysuria, pus from tip of penis.	.843	.711
34	In the past, your partner had STIs such as herpes, gonorrhoea or syphilis.	.858	.736
	Percentage of explained variance = 3.74%		
	Factor 8: Protecting when partner has STIs (PROTECT): 5 items		
3	You will not have sex with your partner as usual, even though he had sex with CSWs and used a condom.	.668	.446
12	If your partner has symptoms of STIs, such as a blister pus discharge from his penis, you get your partner to wear a condom	.717	.514
14	You will get your partner to use condom with you if he has STIs such as syphilis, gonorrhoea or AIDS.	.735	.540
15	Although your partner had STIs, you did not get him using a condom.	.702	.493

Table 1 Factor loadings and communalities of the SSBTW Scale (Cont.)

Items	Items	Factor Loadings	Communalities (h^2)
50	You persuade your partner to use a condom by helping him put it on.	.669	.448
	Percentage of explained variance = 4.60%		
	Factor 9: Avoiding having sex with a partner who has multi-partners (MULTIPAR): 4 items		
6	If you know that your partner has sex with other women, you are still having sex with him as usual.	.669	.448
23	Even though your partner lives with you, he had sex with other women.	.770	.593
24	Even though your partner lives with you, he had sex with CSWs	.763	.582
25	Even though your partner lives with you, he had sex with men.	.590	.348
	Percentage of explained variance = 3.71%		

Subsequently, CEA was used to finalize and confirm a theoretical factor structure and test for the variance of the factor structure over multiple data sets, and the assumptions of the CFA statistics were tested. There was a pair of items which had a correlation coefficient >0.85 (Item 20 "Prior to making a decision to have sex with your partner, you ask him about using condoms when having sexual intercourse with other women in the past"; and Item 21 "Prior to making a decision to live with a spouse, you ask your partner about using condoms when having sexual intercourse with other women"). This indicates the presence of multicollinearity.[27] Thus, Item 20 was eliminated. The remaining 52 items of the SSBTWS were further tested for psychometric properties by CFA. All variables violated the assumption as they were not distributed by multivariate normal distribution. When the data were not normally distributed, the robust maximum likelihood estimation (RML) was used.[28]

The 52 items of the SSBTW Model were tested to confirm 9 individual measurement models. Four items not statistically significant (Items 2, 29, 42, and 50) were deleted. Nine factors (48 items) were re-analyzed by using CFA. The results of CFA confirmed that each factor (1-9) fitted the empirical data and that they had construct validity (**Table 2**).

Table 2 Fit statistics of an individual measurement models (n = 354)

variables	χ^2	df	χ^2/ df	*p*	GFI	AGFI	CFI	RMSEA	SRMR
1. ASKPAR	5.144	3	1.714	.162	.993	.954	.999	.045	.011
2. RISKBEH	16.634	19	.875	.615	.987	.963	1.000	.000	.029
3. CONUSE	1.164	5	.232	.948	.998	.993	1.000	.000	.011
4. AVOID	2.315	3	.771	.510	.997	.982	1.000	.000	.017
5. USEALCOH	.062	1	.062	.804	1.00	.998	1.000	.000	.003
6. NEGOTI	5.740	6	.956	.452	.991	.969	1.000	.000	.026
7. PARSTI	1.421	1	1.421	.233	.994	.965	.997	.034	.038
8. PROTECT	.167	1	.167	.683	1.00	.997	1.000	.000	.006
9. MULTIPAR	1.820	2	.910	.403	.995	.976	1.000	.000	.022

Note: Asking partner about their sexual history (ASKPAR), Reducing sexual risk behavior (RISKBEH), Using condom (CONUSE), Avoiding having sexual intercourse (AVOID), Avoiding alcohol drinking and drug use (USEALCOH), Negotiating with partners for condom use (NEGOTI), Avoiding having sex with a partner who has STIs (PARSTI), Protecting when partner has STIs, Avoiding having sex with a partner who has multiple-partners (MULTIPAR).

Measurement model of the SSBTW fitted to the empirical data (Satorra - Bentler χ^2 = 12.368, df = 8, χ^2/d f = 1.546, p = 0.136, GFI = 0.988, AGFI = 0.933, CFI= 0.966, RMSEA = 0.0393 and SRMR = 0.031). Surprisingly, Factor 1 "Asking partner about their sexual history" had a negative direction with the SSBTW model (standardized factor loading = -.150) and be considered not to be a practical indicator for the theoretical model. Thus, Factor 1 was eliminated. Finally, the SSBTWS retained 8 factors with 42 items. It was re-analyzed and we found that the measurement model of the SSBTWS fitted with empirical data (Satorra - Bentler χ^2 = 6.326, df = 8, χ^2/df = 0.790, p = 0.611, AGFI = 0.966, GFI= 0.993 CFI= 1.000, RMSEA = 0.021 and SRMR = .000) (**Figure 2**).

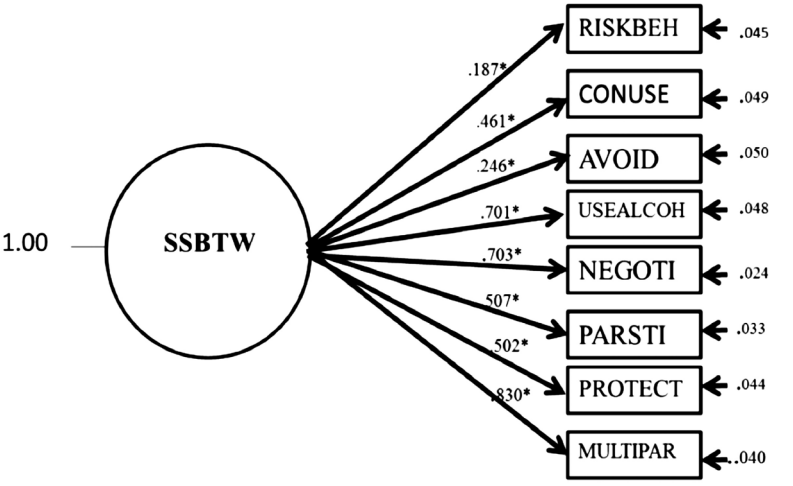

Figure 2 Standardized factor loadings and measurement errors for indicators of the SSBTW model

χ^2= 6.326, df = 8, χ^2/df = 0.790, p = 0.611, AGFI = 0.966, GFI= 0.993 CFI= 1.000, RMSEA = 0.021, SRMR = 0.00.

Note: 1) chi-square goodness of fit (χ^2); 2) a ratio of the chi-square/degree of freedom (χ^2/df); 3) the goodness of fit index (GFI); 4) adjusted goodness of fit index (AGFI); 5) comparative fit index (CFI); 6) root mean square error of approximation (RMSEA); and 7) standardized root mean square residual (SRMR).

The standardized factor loadings ranged from 0.187 to 0.830 (***Table 4***). The standardized factor loadings of 42 items were in the range of 0.149 - 0.912. Square multiple correlations (R^2) were in the range of 0.049 - 0.832. The most important indicator of the SSBTW model was Factor 9: Avoiding having sex with a partner who has multiple-partners (MULTIPAR), followed by Factor 6: Negotiating with partners for condom use (NEGOTI), Factor 5: Avoiding alcohol drinking and drug use (USEALCOH), Factor 7: Avoiding having sex with a partner who has STI(s) (PARSTI), Factor 8: Protecting when partner has STIs (PROTECT), Factor 3: Using a condom (CONUSE), Factor 4: Avoiding having sexual intercourse (AVOID), and Factor 2: Reducing sexual risk behavior (RISKBEH), respectively. In terms of internal consistency, Cronbach's alpha coefficients (α) of the overall Scale was 0.892 (42 items). The alphas for subscales were .75 for RISKBEH, .79 for CONUSE, .66 for AVOID, .71 for USEALCOH, .74 for NEGOTI, .61 for PARSTI, .73 for PROTECT, and .66 for MULTIPAR subscale (**Table 4**).

Table 3 Standardized factor loading and construct reliabilities of observes in SSBTW measurement model (n=354)

Variable	Factor Loadings					Factor Score Regression
	b	B	SE(b)	t	R^2	
Measurement model of SSBTW						
RISKBEH	.141*	.187*	.045	3.161	.035	.021
CONUSE	.417*	.461*	.049	8.504	.213	.085
AVOID	.220*	.246*	.050	4.366	.060	.002
USEALCOH	.580*	.701*	.048	12.017	.491	.244
NEGOTI	.344*	.703*	.024	14.378	.494	.481
PARSTI	.215*	.507*	.033	6.437	.257	.266
PROTECT	.496*	.502*	.044	11.270	.252	.106
MULTIPAR	.738*	.830*	.040	18.682	.689	.508

Note: b = Unstandardized factor loading, B = Standardized factor loading, SE (b) = Standard error, R^2 = construct reliability, *p < 0.05. Asking partner about their sexual history (ASKPAR), Reducing sexual risk behavior (RISKBEH), Using condom (CONUSE), Avoiding having sexual intercourse (AVOID), Avoiding alcohol drinking and drug use (USEALCOH), Negotiating with partners for condom use (NEGOTI), Avoiding having sex with a partner who has STIs (PARSTI), Protecting when partner has STIs, Avoiding having sex with a partner who has multiple-partners (MULTIPAR).

Table 4 Cronbach's alpha of observed variables in SSBTW Scale (n=354)

variable	A number of items	Cronbach's alpha
RISKBEH	10	.759
CONUSE	5	.796
AVOID	6	.660
USEALCOH	4	.711
NEGOTI	6	.749
PARSTI	3	.616
PROTECT	4	.731
MULTIPAR	4	.668
Overall	42	.892

Note: Asking partner about their sexual history (ASKPAR), Reducing sexual risk behavior (RISKBEH), Using condom (CONUSE), Avoiding having sexual intercourse (AVOID), Avoiding alcohol drinking and drug use (USEALCOH), Negotiating with partners for condom use (NEGOTI), Avoiding having sex with a partner who has STIs (PARSTI), Protecting when partner has STIs, Avoiding having sex with a partner who has multiple-partners (MULTIPAR).

Discussion

The SSBTWS is a newly-developed instrument to measure safer sex behavior in Thai women. It measures both actual safer sex behaviors and the intention to practice safer sex and was developed by using a quantitative method in accordance with the conceptual framework. This reflects that it can capture the targeted construct accurately and support validity of the Scale. The initial items were generated from open-ended interviews of Thai women with higher and lower sexual risk behaviors. Item generation from the population of interest was able to provide insights into construct definition and measurement. Thus, these enhance the validity of the instrument.[22]

The SSBTWS is composed of 9 subscales. There are 4 subscales similar to existing instruments measuring sexual behaviors: Factor 1: Asking partner about their sexual history, Factor 2: Reducing sexual risk behavior, Factor 6: "Negotiating with partners for condom use", and Factor 5: "Avoiding alcohol drinking and drug use". Five new subscales are: "Protecting when partner has STIs", "Avoiding having sex with a partner who has multiple partners", "Avoiding having sexual intercourse" and "Avoiding having sex with partner who has STIs". The new subscales were derived from this study from this study are also essential components of safer sex in women. The most important indicator of the SSBTW model is Factor 9 "Avoiding having sex with a partner who has multiple-partners". However, this factor has not been included in any other existing instruments measuring sexual risk behavior. This subscale is essential to evaluate whether women protect themselves when their partner has multiple partners because men may have premarital sex with girlfriends and/or their acquaintance, and do not protect themselves with permanent partner. Factor 6, "Negotiating with partners for condom use", is an important skill to reduce sexual risk for women. They can protect themselves from STIs by negotiating with their partner to reduce sexual risk for example by using a condom. Most Thai women have sexual risk behavior because of their partners. [29] Thus, success in safer sex depends on their negotiating skills.[30] Negotiating with partners for safer sex is an essential component of successful safer sex behavior for Thai women. The "Using condom" subscale of the SSBTWS has added items to assess about: women's decision making for condom use (Item 7) and availability of condoms (Item 8) which have strong direct effects on condom use. [30]

The item content about condom use was in accordance with the Thai context. Next, Factor 5 "Avoiding alcohol drinking and drug use" is similar to items in a "mode of risk sexual behaviors" in some existing instruments such as the SSBQ and the **Behavioral Surveillance Survey (BSS)**. The SSBTWS has 2 additional items about the use of methamphetamine since it is commonly-used among female drug users in Thailand.[31] Lastly, Factor 8 "Protecting when partner has STIs" is a subscale that will add benefit to measuring women's protection when their partner has STIs.

The SSBTWS was tested for psychometric properties by EFA. Most items on the 9 factors had communalities of 0.50 or better. This was a reasonable estimation of communality. It represents the proportion of variance of observed variables able to account for substantial variance on all factors. Most items had factor loadings greater than 0.30 which indicated fair measure of the subscales. The index for the overall solution explained 50.17% of the total variance. When total variance explained was >50%, it was accepted as an accounting variance in social science.[21-22]

The SSBTWS has good construct validity and reliability of the overall SSBTW model by CFA. Nevertheless, the final model retained 8 factors. Factor 1, "Asking partner about their sexual intercourse" was deleted due to negative variance in the SSBTW model. It is not a good indicator of safer sex behavior among Thai women, since "Asking partner about

sexual intercourse" is not common among them. In Thai society, a culture of silence surrounding sexuality dictates that good women are expected to be ignorant about sexual behavior and passive in sexual interaction.[32] Asking partner about sexual intercourse will affect relationships between partners. Respondents' scores for items on Factor 1 are low (not do = 45-50%, sometimes 15-30%) causing low variability leading to a negative estimated parameter.[33] These unexpected results may occur due to sampling homogeneity, low random variability, and violation of regression assumption. For this study, a negative variance might resulted from a homogeneous sample and low random variability.[33-34]

The overall Cronbach's alpha coefficient of the SSBTWS was 0.89, which is acceptable for a newly-developed instrument.[35] Five subscales had coefficients >0.70 which is acceptable for preliminary research,[22,35] while 3 subscales had coefficients <0.70 including: "Avoiding having sexual intercourse", "Avoid sex with partner who has STIs", and "Avoid having sex with a partner who has multiple partners". This might be due to having only 3-4 items in each subscale.[27] Some items on these subscales, "Asking about sexual risk behaviors of partners" which the respondents may not know accurately, may cause measurement errors, for example, Item 2 "Even though your partner did not use a condom with CSWs, you are still having sex with him as usual?". Some participants did not know whether their partners visit CSWs, thus they might not be sure of the answer.

Items on some subscales need to be modified to improve semantic wording and enhance construct reliability and construct validity. The revised version of the SSBTWS needs to be re-tested for psychometric properties in a more heterogeneous samples of women. However, the Scale will be useful in both nursing practice and research. The SSBTW model presented "Negotiating with partners for condom use" in second order significant next to "Avoiding having sex with a partner who has multiple-partners". In case of not being able to avoid several sexual risks, women's negotiation skills are an important predictor of a partner's condom use.[36] Negotiation skills can help women decrease STIs, thus it should be promoted in Thai women to achieve safer sex behavior. The SSBTW model and Scale can be used in research to assess nursing intervention for promoting safer sex behavior among Thai women. Finally, this instrument should be tested and used with different population which have similar cultures, and interpreted safer sex behavior. It may also have applicability in other Asian cultures.

Limitations and Future Research

The samples used in this study were recruited using non-probability sampling. All participants were female factory workers from only one setting. Using homogenous samples might not offer adequate information to generalize to all Thai women in general. Thus, the SSBTWS has fair generalizability. However, probability sampling is needed for model testing to enhance its psychometric properties and individual items should also be further ameliorated to improve the psychometric properties.

Implications for nursing practice

The SSBTWS will be useful for measuring and assessing safer sex behaviors among Thai women in general as well as women who have sexual risks. It has the potential to assess these women before and after giving them information. Health professionals can use it to assess and screen women whose partner had symptoms in the past, and it will help health professionals plan appropriate advice on safer sex. When Thai women know that their partner has a risk of STIs, they will increase self-protection consistently.[7,36]

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การพัฒนาและทดสอบคุณสมบัติทางจิตมิติของเครื่องมือวัดพฤติกรรมการมีเพศสัมพันธ์ที่ปลอดภัยในผู้หญิงไทย

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บทคัดย่อ: การศึกษานี้มีวัตถุประสงค์เพื่อพัฒนาและทดสอบคุณสมบัติทางจิตมิติของเครื่องมือวัดพฤติกรรมการมีเพศสัมพันธ์ที่ปลอดภัยในผู้หญิงไทย โดยใช้การวิจัยแบบผสมผสาน กรอบแนวคิดของเครื่องมือได้มาจากการทบทวนวรรณกรรม ข้อคำถามถูกสร้างจากข้อมูลการสัมภาษณ์เชิงลึกผู้หญิงไทย จำนวน 20 คน ผลการวิเคราะห์เนื้อหาพบว่าพฤติกรรมการมีเพศสัมพันธ์ที่ปลอดภัยสำหรับผู้หญิงไทยมี 5 มิติ สร้างข้อคำถามทั้งหมด 70 ข้อ ข้อคำถามถูกตรวจสอบความตรงเชิงเนื้อหาโดยผู้เชี่ยวชาญ 7 ท่าน ผลการตรวจสอบความชัดเจนของคำถามโดยผู้เข้าร่วมการวิจัย 6 ท่าน พบว่าความตรงเชิงเนื้อหาจากข้อคำถามจำนวน 53 ข้อ มีค่า I-CVI อยู่ระหว่าง 0.86-1.00 และ S-CVI = 0.88

การตรวจสอบความตรงเชิงโครงสร้างของเครื่องมือทำโดยใช้การวิเคราะห์องค์ประกอบเชิงสำรวจในกลุ่มตัวอย่าง 298 คน และวิเคราะห์องค์ประกอบเชิงยืนยันในกลุ่มตัวอย่าง 354 คน ผลการวิเคราะห์องค์ประกอบเชิงสำรวจ พบว่าพฤติกรรมการมีเพศสัมพันธ์ที่ปลอดภัยในผู้หญิงไทยประกอบด้วย 9 องค์ประกอบร่วม มีร้อยละความแปรปรวนสะสมเท่ากับ 50.17 ผลการวิเคราะห์องค์ประกอบเชิงยืนยัน พบว่าโมเดลมีความตรงเชิงโครงสร้างเพียง 8 องค์ประกอบหลัก (42 ข้อ) ที่สอดคล้องกลมกลืนกับข้อมูลเชิงประจักษ์ คือ การหลีกเลี่ยงการมีเพศสัมพันธ์กับคู่ที่มีเพศสัมพันธ์กับหลายคน การเจรจากับคู่เพื่อให้ใช้ถุงยางอนามัย การหลีกเลี่ยงการดื่มสุราและการใช้สารเสพติด การหลีกเลี่ยงมีเพศสัมพันธ์กับคู่ที่เป็นโรคติดต่อทางเพศสัมพันธ์ การป้องกันตนเองเมื่อคู่มีโรคติดต่อทางเพศสัมพันธ์ การใช้ถุงยางอนามัย การหลีกเลี่ยงการมีเพศสัมพันธ์ และการลดพฤติกรรมเสี่ยงทางเพศ เครื่องมือมีค่าสัมประสิทธิ์แอลฟาของ ครอนบาค 0.89 คุณสมบัติการวัดด้านความตรงและความเที่ยงเชิงโครงสร้างของเครื่องมืออยู่ในเกณฑ์ดี สามารถนำไปใช้ในการติดตามและประเมินผลการให้กิจกรรมทางการพยาบาลเพื่อส่งเสริมการมีเพศสัมพันธ์ที่ปลอดภัยในผู้หญิงไทย

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คำสำคัญ : พฤติกรรม การพัฒนาเครื่องมือ ทดสอบคุณสมบัติทางจิตมิติ เพศสัมพันธ์ที่ปลอดภัย ผู้หญิงไทย

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