






Development and Validation of a Sexual Health Literacy Measurement Tool for Pregnancy Prevention Among Adolescents (SHL-PPA)

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Purpose: Several measurement tools have been developed for health literacy. However, little emphasis has been placed on the development of sexual health literacy (SHL) in adolescents. This paper describes the development and validation of an SHL measurement tool for pregnancy prevention among adolescents (SHL-PPA).

Methodology: This study explores research and development (R&D) and presents three stages of R&D, including a literature review, the Delphi approach, and a valid and reliable questionnaire. Three groups were used for the population and sampling: 18 experts, five competent people, and 654 adolescents. An online self-assessment tool was used. The data analysis methods used were median, interquartile range, content validity index, Cronbach's alpha coefficient, and exploratory factor analysis.

Results: The results show that the definition of SHL for adolescents was "cognitive, social, and cultural skills that determine the motivation and ability of an adolescent to access and sufficiently understand sexual health information and services, which results in them being capable of sexual health assessment and making decisions to prevent pregnancy". The final devised SHL-PPA included 33 items and the three following components: 1) accessibility to sexual health information and services, 2) an understanding of sexual health information and services and appraisal of sexual health to prevent pregnancy, and 3) applying the obtained sexual health information and skills to prevent pregnancy.

Conclusion: This study proves that the SHL-PPA is appropriate for Generation Z teenagers, particularly for online self-assessment of SHL. An online self-evaluation using the SHL-PPA demonstrated that related organizations should develop online activities or programs to improve teenage girls' pregnancy-prevention behavior.

Keywords: sexual health literacy, instrument, pregnancy, school health, student, youth

Introduction

In 2022, according to the United Nations International Children's Emergency Fund, the number of adolescents globally was 1.3 billion, which was 16% of the global population.¹ Adolescents face sexual risk behaviors, including unwanted pregnancy.^{2,3} Adolescent pregnancy is an important problem in low- and middle-income countries, with half of unintended pregnancies resulting in pregnancy-related morbidity and mortality, such as preterm birth, low birth weight, and severe neonatal condition.⁴⁻⁶ Today's adolescents are part of Generation Z (Gen Z), which has the following characteristics:

High consumers of technology and cravers of the digital world, individualistic, underdeveloped social and relationship skills, increased risk for mental health concerns, lack of attention span, desiring convenience and immediacy, pragmatic, cautious and concerned with emotional, physical and financial safety, sedentary activism, open-minded, diverse and comfortable with differences.⁷

In addition, Gen Z has higher levels of sexual risk behaviors than millennials, the preceding generation.⁸ Some studies have pointed out that adolescents with higher sexual health literacy (SHL) are more likely to have preventive sexual behavior than those with lower SHL.^{9,10} Moreover, SHL is imperative for decreasing adolescent pregnancy.^{11–13} However, various definitions of SHL and different numbers of SHL components have been presented.^{13–27} Additionally, there are few sexual health literacy measurement tools for preventing adolescent pregnancy.^{18,28,29} Therefore, this study aimed to define the definition and components of SHL for preventing pregnancy for adolescents. Additionally, a qualified SHL measurement tool for pregnancy prevention among adolescents (SHL-PPA) was developed. This tool can be used to assess adolescents' levels of SHL for pregnancy prevention so that individual groups and related organizations can improve existing SHL-PPAs.

Materials and Methods

Study Design

The development and validation of an SHL-PPA was a research and development (R&D) study conducted from August to November 2022.

Development of a Tool for Pregnancy Prevention Among Adolescents

The three steps involved in developing the SHL-PPA are as follows:

Step 1: After a literature review,^{10,13–27,30,31} a definition and the components of SHL among adolescents were developed and sent to six policy experts, six academic experts, and six practice experts for their opinion and suggestions regarding the appropriate definition and components of SHL for pregnancy prevention among adolescents.

Step 2: The Delphi technique was applied in this step. Based on 18 experts' opinions and suggestions, the researchers produced an outline draft of the SHL-PPA questionnaire. The questionnaire was sent to 18 experts to review and provide comments on improving the questionnaire, which took place in three rounds. Then, the questionnaire was tested for its Content Validity Index (CVI) score based on the 18 experts. The five competent people in measurement and evaluation who work as biostatistician, public health worker, and adolescent sexual health worker evaluated the item objective congruence (IOC), which total was greater than 0.5. The reliability based on 60 adolescents with qualifications similar to those of the 654 samples in this study.

Step 3: The questionnaire, which was found to be valid and reliable, comprised 33 questions and was tested among 654 adolescents using exploratory factor analysis (EFA).

Population Sample and Sampling Technique

The samples were divided into two groups.

Group 1: Based on the Delphi technique, the number of experts was determined by the researchers to be 18. A purposive sampling technique was used to recruit experts. The inclusion criteria for the 18 experts^{32,33} were health-related experts with at least five years' experience in the designated field of interest. The selective inclusion criteria for each group were 1) six policy-making experts from the Department of Health, Regional Health Promotion Center Office, Provincial Health Office, or Regional Health Security Office; 2) six academic experts from university staff working with adolescents or in health literacy teaching and research; and 3) six members from among high school teachers working with adolescents and the sexual health field and frontline health workers in government organizations, non-governmental organizations, and local government organizations.

Group 2: The appropriate sample size for EFA should be 10 times the number of question items or more than 500 samples.³⁴ The number of respondents in this study was 654, which included both male and female adolescents who were students in junior school, high school, or university or who were studying for their vocational or high vocational certificate in the 2022 school year. In this study, three steps of multi-stage sampling were applied to recruit the respondents who were 13–19 years old as following: 1) purposive sampling for a province with high incidence of sexual transmitted diseases and adolescence pregnancy, 2) simple random sampling by computer software for educational institutes at provincial level, 3) simple random sampling by computer software for

classrooms at educational institutes level. Respondents were required to be capable of interacting with an online questionnaire. Pregnant female adolescents were excluded from this study. The number of respondents from junior school was 123, from high school was 125, studying for vocational certificate was 114, studying for high vocational certificate was 107, and from university was 185.

Data Collection and Data Analysis

Step 1: The online questionnaire regarding expert opinions on the definition and components of SHL was produced and distributed to 18 experts in the first round. The questionnaire included three parts: 1) expert demographic, 2) expert opinion on the definition of SHL for pregnancy prevention among adolescents, and 3) expert opinion on the components of SHL for pregnancy prevention among adolescents. They had to agree or disagree with the given definition and components of SHL for pregnancy prevention among adolescents provided by the researchers. If experts did not agree with the researchers, they needed to give their opinion on what the definition and components of SHL for pregnancy prevention among adolescents should be. Descriptive statistics were used for analyzing the experts' comments.

Step 2: The researchers used the results from the first round to construct a questionnaire framework and drafted 36 close-ended question items. CVI analysis was applied in this step. In the second round, the online questionnaire was sent to the 18 experts to provide scores on a five-point Likert scale for their opinion on the level of relevancy that each question had to the item objective. The scale was as follows: 1 = highly irrelevant, 2 = irrelevant, 3 = somewhat relevant, 4 = quite relevant, and 5 = highly relevant. The proportion of expert scores or 4–5 was analyzed for each question item. If the proportion was less than 0.83, the item needed to be improved. However, the total proportion of the questionnaire based on CVI should not be less than 0.8. All experts' opinions were analyzed for median and interquartile range (IQR) for each item; a median score of at least 4.5 meant that experts gave the highest relevancy level for this item. A median score of 3.50–4.49 meant that this question had a high relevancy level. To determine the accordance of the experts' opinions with both the high and highest relevancy levels, the IQR should not exceed 1.5. An improved questionnaire was sent in the third round to the 18 experts to determine the CVI, as was done in the second round. If there were any unclear comments, the researchers directly contacted that expert to comprehend and correct the questionnaire. The final online questionnaire had 33 items and was conducted

Table 1 Experts' Evaluation Based on CVI for Item Development of a Sexual Health Literacy Measurement Tool for Pregnancy Prevention Among Adolescents in Rounds 2 and 3

Item	Round 2		Round 3		CVI	Consensus
	Mean (SD)	Median (IQR)	Mean (SD)	Median (IQR)		
Accessibility to sexual health information and services						
Q1. I am able to find information about sexual health and pregnancy prevention by myself.	5.0 (0.0)	5.0 (0.0)	5.0 (0.22)	5.0 (0.0)	1.0	Very strong agreement
Q2. I am able to question the information about pregnancy prevention from friends/ guardian/ health professional/ teacher/ qualified online media.	4.28 (1.32)	5.0 (1.25)	4.3 (1.26)	5.0 (1.0)	1.0	Very strong agreement
Q3. I am open to receiving information about pregnancy prevention from multiple sources.	4.72 (0.57)	5.0 (0.25)	4.72 (0.57)	5.0 (0.25)	0.94	Not clear
Q4. I receive information and news about pregnancy prevention by listening to others.	4.44 (0.78)	5.0 (1.0)	4.44 (0.78)	5.0 (1.0)	0.89	Very strong agreement

(Continued)

Table 1 (Continued).

Item	Round 2		Round 3		CVI	Consensus
	Mean (SD)	Median (IQR)	Mean (SD)	Median (IQR)		
Q5. If I have a problem with accessing pregnancy prevention information, I am able to immediately consult a reliable person.	4.67 (1.19)	5.0 (0.0)	4.67 (1.19)	5.0 (0.0)	1.0	Very strong agreement
Q6. I recognize health service sources for pregnancy prevention.	4.44 (0.51)	4.0 (1.0)	4.50 (0.51)	4.50 (1.0)	1.0	Very strong agreement
Q7. I am able to see a doctor or health professional for pregnancy prevention services.	4.94 (0.24)	5.0 (0.0)	4.95 (0.22)	5.0 (0.0)	1.0	Very strong agreement
Q8. I am able to choose sources of health services to receive pregnancy prevention services as I need.	5.00 (0.00)	5.0 (0.0)	5.00 (0.00)	5.0 (0.0)	1.0	Very strong agreement
Q9. I am confident in choosing sources of health services that are correctly related to my pregnancy prevention problem.	4.72 (0.57)	5.0 (0.25)	4.65 (0.67)	5.0 (0.75)	0.94	Not clear
Q10. I am confident that I am able to choose sources of health services that are correctly and appropriately related to my pregnancy prevention problem.	4.85 (0.37)	5.0 (0.0)	4.89 (0.32)	5.0 (0.0)	1.0	Very strong agreement
Q11. I recognize a hotline of pregnancy prevention, such as 1663 (unwanted pregnancy hotline).	4.75 (0.72)	5.0 (0.0)	4.83 (0.71)	5.0 (0.0)	1.0	Very strong agreement
Q12. I am able to access health services for pregnancy prevention online, such as on Facebook, Line, etc.	4.90 (0.31)	5.0 (0.0)	4.94 (0.24)	5.0 (0.0)	1.0	Very strong agreement
Understanding of sexual health information and services						
Q13. I am able to provide my sexual health information to others.	4.56 (1.20)	5.0 (1.0)	4.50 (0.61)	5.0 (0.25)	0.94	Very strong agreement
Q14. I am able to read and easily understand the information and services regarding sexual health that may be published in a handbook, documents, or other media for the public.	4.50 (0.62)	5.0 (1.0)	4.60 (0.94)	5.0 (0.75)	0.94	Very strong agreement
Q15. I am able to listen to and understand the information and services regarding sexual health to prevent pregnancy that are passed on to me by any person or any media.	4.61 (0.98)	5.0 (0.0)	4.70 (0.47)	5.0 (1.0)	1.0	Very strong agreement
Q16. I am able to read and understand information about pregnancy prevention from any source.	4.40 (1.18)	5.0 (1.0)	4.67 (0.49)	5.0 (1.0)	0.94	Not clear
Q17. I am able to explain to others information and services regarding sexual health to prevent pregnancy.	4.33 (1.24)	5.0 (1.0)	4.35 (1.27)	5.0 (1.0)	0.94	Very strong agreement
Q18. I am able to explain how to access safe sexual health care in a way that friends can comprehend.	4.56 (0.78)	5.0 (1.0)	4.75 (0.44)	5.0 (0.75)	1.0	Very strong agreement
Appraisal of sexual health to prevent pregnancy						
Q19. I am able to assess reliable sources of sexual health information for pregnancy prevention.	4.78 (0.43)	5.0 (0.25)	4.70 (0.73)	5.0 (0.0)	1.0	Very strong agreement
Q20. I am able to check for assessment and confirmation of correct sexual health information for pregnancy prevention.	4.50 (0.83)	5.0 (1.0)	4.72 (0.75)	5.0 (0.0)	0.94	Very strong agreement

(Continued)

Table 1 (Continued).

Item	Round 2		Round 3		CVI	Consensus
	Mean (SD)	Median (IQR)	Mean (SD)	Median (IQR)		
Q21. I am able to compare information about effective and safe pregnancy prevention.	4.89 (0.32)	5.0 (1.0)	4.90 (0.31)	5.0 (0.0)	1.0	Very strong agreement
Q22. I consider the choices for appropriate methods for pregnancy prevention myself.	4.50 (0.89)	5.0 (1.0)	4.61 (0.85)	5.0 (0.25)	1.0	Very strong agreement
Q23. I compare the information from many sources before I believe in or follow that information.	4.35 (1.04)	5.0 (1.0)	4.39 (1.04)	5.0 (1.0)	0.94	Very strong agreement
Q24. I am courageous enough to inquire about sexual health information on pregnancy prevention from a reliable person/ guardian/ or health professional with no doubts.	4.83 (0.51)	5.0 (1.0)	4.85 (0.49)	5.0 (0.0)	0.94	Very strong agreement
Applying the obtained sexual health information and skills to prevent pregnancy						
Q25. I am able to plan for appropriate pregnancy prevention by myself.	4.75 (0.44)	5.0 (0.75)	4.78 (0.43)	5.0 (0.25)	1.0	Very strong agreement
Q26. I am able to use the information to make decisions for pregnancy prevention by myself.	4.65 (0.67)	5.0 (0.75)	4.67 (0.69)	5.0 (0.25)	1.0	Very strong agreement
Q27. If I am facing a risk of pregnancy, I am able to seek the appropriate methods of prevention.	4.78 (0.43)	5.0 (0.25)	4.80 (0.41)	5.0 (0.0)	1.0	Very strong agreement
Q28. I am able to avoid a pregnancy risk situation.	4.65 (1.18)	5.0 (0.0)	4.72 (1.18)	5.0 (0.0)	0.94	Very strong agreement
Q29. I participate in training or activities to increase my knowledge and skills about pregnancy prevention.	4.85 (0.37)	5.0 (0.0)	4.89 (0.32)	5.0 (0.0)	1.0	Very strong agreement
Q30. Talking with friends or others about pregnancy prevention has helped me better handle situations that may occur.	4.94 (0.24)	5.0 (0.0)	4.95 (0.22)	5.0 (0.0)	1.0	Very strong agreement
Q31. I am regularly aware of pregnancy risks.	4.89 (0.32)	5.0 (0.0)	4.90 (0.31)	5.0 (0.0)	1.0	Very strong agreement
Q32. I am able to say no to unprotected sexual intercourse.	4.89 (0.32)	5.0 (0.0)	4.90 (0.31)	5.0 (0.0)	1.0	Very strong agreement
Q33. If I have unavoidable sexual intercourse, I can use or convince my partner to use products for pregnancy prevention, such as condoms and contraceptive pills.	4.28 (1.60)	5.0 (1.0)	4.35 (1.53)	5.0 (0.75)	0.89	Very strong agreement
Q34. From the information that I have, I can perceive the risk situation, and I can plan to avoid situations that put me at risk of pregnancy.	4.35 (1.31)	5.0 (1.0)	4.44 (1.34)	5.0 (0.25)	1.0	Very strong agreement
Q35. I have no time, and I think it is unnecessary to seek methods of pregnancy prevention.	4.25 (1.62)	5.0 (0.75)	4.44 (1.34)	5.0 (0.25)	0.89	Very strong agreement
Q36. I am able to prevent pregnancy as I intend.	4.78 (0.43)	5.0 (0.25)	4.80 (0.41)	5.0 (0.0)	1.0	Very strong agreement

Table 2 Rotated Factors Matrix

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16
Q1	1.000															
Q2	0.634	1.000														
Q3	0.617	0.620	1.000													
Q4	0.577	0.655	0.635	1.000												
Q5	0.472	0.511	0.572	0.519	1.000											
Q6	0.558	0.595	0.573	0.640	0.652	1.000										
Q7	0.558	0.579	0.640	0.630	0.725	0.765	1.000									
Q8	0.586	0.617	0.617	0.632	0.651	0.757	0.782	1.000								
Q9	0.390	0.469	0.505	0.481	0.622	0.619	0.651	0.630	1.000							
Q10	0.560	0.566	0.574	0.588	0.609	0.679	0.678	0.724	0.654	1.000						
Q11	0.461	0.478	0.496	0.475	0.540	0.536	0.540	0.548	0.563	0.549	1.000					
Q12	0.546	0.532	0.553	0.510	0.527	0.590	0.587	0.644	0.537	0.633	0.671	1.000				
Q13	0.560	0.515	0.555	0.509	0.529	0.570	0.588	0.614	0.493	0.643	0.589	0.736	1.000			
Q14	0.461	0.480	0.523	0.468	0.555	0.557	0.572	0.582	0.585	0.584	0.716	0.738	0.676	1.000		
Q15	0.527	0.506	0.583	0.516	0.519	0.557	0.601	0.595	0.569	0.608	0.685	0.711	0.705	0.745	1.000	
Q16	0.526	0.525	0.561	0.504	0.578	0.552	0.584	0.600	0.571	0.639	0.623	0.699	0.701	0.697	0.702	1.000
Q17	0.529	0.544	0.549	0.522	0.580	0.577	0.622	0.614	0.615	0.643	0.604	0.648	0.668	0.682	0.711	0.838
Q18	0.547	0.524	0.569	0.513	0.602	0.585	0.635	0.667	0.610	0.650	0.606	0.660	0.683	0.664	0.716	0.821
Q19	0.564	0.509	0.567	0.511	0.557	0.568	0.606	0.639	0.508	0.647	0.593	0.710	0.724	0.661	0.685	0.758
Q20	0.544	0.519	0.543	0.486	0.507	0.525	0.542	0.566	0.466	0.576	0.563	0.673	0.671	0.615	0.629	0.714
Q21	0.478	0.540	0.542	0.551	0.530	0.570	0.578	0.583	0.542	0.589	0.630	0.601	0.594	0.634	0.659	0.672
Q22	0.596	0.518	0.552	0.510	0.504	0.540	0.571	0.598	0.460	0.571	0.530	0.629	0.637	0.579	0.573	0.640
Q23	0.579	0.483	0.539	0.530	0.500	0.548	0.585	0.588	0.468	0.605	0.502	0.607	0.648	0.542	0.583	0.622
Q24	0.536	0.489	0.521	0.496	0.533	0.545	0.563	0.600	0.472	0.603	0.511	0.627	0.665	0.620	0.597	0.646
Q25	0.545	0.489	0.461	0.476	0.390	0.503	0.465	0.526	0.382	0.542	0.465	0.563	0.631	0.508	0.529	0.571
Q26	0.499	0.492	0.512	0.508	0.476	0.553	0.568	0.541	0.526	0.550	0.574	0.585	0.560	0.575	0.584	0.587
Q27	0.549	0.480	0.546	0.476	0.512	0.521	0.552	0.542	0.488	0.572	0.553	0.620	0.639	0.586	0.590	0.653
Q28	0.539	0.495	0.485	0.450	0.418	0.479	0.495	0.535	0.401	0.521	0.456	0.554	0.643	0.483	0.489	0.555
Q29	0.449	0.400	0.407	0.370	0.337	0.400	0.377	0.448	0.303	0.466	0.420	0.456	0.498	0.422	0.465	0.468
Q30	0.548	0.472	0.487	0.430	0.422	0.490	0.486	0.523	0.395	0.527	0.458	0.593	0.605	0.505	0.524	0.569
Q31	0.570	0.500	0.518	0.476	0.467	0.485	0.519	0.552	0.411	0.558	0.489	0.599	0.663	0.506	0.568	0.618
Q32	0.587	0.500	0.508	0.469	0.478	0.524	0.546	0.557	0.476	0.581	0.512	0.586	0.656	0.572	0.581	0.620
Q33	0.571	0.474	0.508	0.493	0.463	0.512	0.536	0.528	0.411	0.546	0.465	0.573	0.633	0.507	0.542	0.580

and randomly tested on 60 adolescents. Cronbach's alpha was calculated to determine the reliability of the questionnaire.

Step 3: Based on factor analysis, the Kaiser-Meyer-Olkin measure (KMO) was used to determine whether each question item met the assumption (the result should be at least 0.6). The maximum likelihood was used to extract the factor analysis through the rotation of the varimax. To decide the number of components were determined by eigenvalue which was greater than 1. IBM SPSS Statistics version 23×86 (through the Burapha University license) was used for the data analysis.

Informed Consent Statement

Ethical approval for this study under the Helsinki Declaration was approved by Ubon Ratchathani University (certification code: UBU-REC-106/2565) and Burapha University (certification code: HU 098/2565). The

Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28	Q29	Q30	Q31	Q32	Q33
1.000																
0.787	1.000															
0.746	0.752	1.000														
0.719	0.713	0.757	1.000													
0.638	0.673	0.682	0.604	1.000												
0.619	0.655	0.711	0.669	0.548	1.000											
0.606	0.621	0.707	0.657	0.570	0.808	1.000										
0.628	0.673	0.706	0.676	0.584	0.779	0.750	1.000									
0.544	0.570	0.665	0.659	0.539	0.723	0.739	0.740	1.000								
0.586	0.591	0.564	0.540	0.622	0.664	0.675	0.639	0.615	1.000							
0.618	0.659	0.663	0.680	0.588	0.722	0.742	0.741	0.724	0.723	1.000						
0.544	0.587	0.642	0.650	0.552	0.754	0.731	0.727	0.776	0.668	0.723	10.000					
0.497	0.487	0.523	0.550	0.449	0.583	0.604	0.598	0.651	0.523	0.627	0.619	1.000				
0.555	0.609	0.678	0.688	0.542	0.718	0.729	0.750	0.753	0.610	0.738	0.790	0.658	1.000			
0.596	0.641	0.695	0.698	0.549	0.743	0.741	0.731	0.753	0.626	0.769	0.761	0.671	0.796	1.000		
0.652	0.692	0.686	0.674	0.548	0.737	0.722	0.746	0.706	0.661	0.751	0.775	0.609	0.782	0.792	1.000	
0.576	0.618	0.686	0.672	0.535	0.749	0.754	0.752	0.765	0.628	0.758	0.770	0.666	0.776	0.824	0.794	1.000

participants were informed of the details of this research, and their privacy was protected via confidentiality. Then participants signed informed consent.

Results

The findings were divided into three steps based on the research objectives.

Step I: Definition and Components of SHL

The 18 experts who gave their opinions on the definition and components of SHL for pregnancy prevention among adolescents had an average age of 46.83 years (SD = 11.03) and had an average 10.50 years (SD = 8.50) of SHL-related experience. All agreed with the proposed definition and components of SHL for pregnancy prevention among

adolescents. However, 13 experts provided recommendations for defining the definition. In terms of components, they provided suggestions to improve 1) accessibility to sexual health information and services (8 experts), 2) understanding of sexual health and services (13 experts), 3) appraising sexual health to prevent pregnancy (13 experts), and 4) applying the obtained sexual health information and skills to prevent pregnancy (11 experts).

Eventually, the definition of SHL for pregnancy prevention among adolescents was drafted as

Cognitive, social, and cultural skills that determine the motivation and ability of adolescents to access and sufficiently understand sexual health information and services, which results in them being capable of sexual health assessment and making decisions to prevent pregnancy.

Four components were determined: 1) accessibility to sexual health information and services, 2) understanding sexual health information and services, 3) appraising sexual health to prevent pregnancy, and 4) applying the obtained sexual health information and skills to prevent pregnancy. Overall, experts suggested revising the Thai language to be more easily comprehended by adolescents. Additionally, three of the experts recommended that interpretation and spreading the word should be included in Component 2.

Step 2: Results of the Content Validity Index (CVI) Analysis

The total number of items drafted for the SHL-PPA questionnaire was 36, comprising 12 items on accessibility to sexual health information and services, six items on understanding sexual health information and services, six items on appraising sexual health to prevent pregnancy, and 12 items on applying the obtained sexual health information and skills to prevent pregnancy. The results of a CVI analysis after three rounds of Delphi technique approval were at least 0.83 for all questions with the highest relevancy level. The CVI for scale (S-CVI) was 0.97, but two questions were deemed unclear, so both were deleted (Q3 and Q16). Furthermore, Q8 was similar to Q9; therefore, Q9 was also deleted.

The final draft of the SHL-PPA had 33 items: 10 items on accessibility to sexual health information and services, five items on understanding sexual health information and services, six items on appraising sexual health to prevent pregnancy, and 12 items on applying the obtained sexual health information and skills to prevent pregnancy (Table 1). The range of IOC from five competent people approval was between 0.6–1.0. Then, the reliability of this questionnaire was tested in 60 adolescents, resulting in a Cronbach's alpha of 0.97.

Step 3: Results of the Exploratory Factor Analysis (EFA)

The total sample size for the EFA was 654. All assumptions of the EFA were met. The correlation of items was between 0.30 and 0.84 (Table 2). The KMO revealed that the statistical value was 0.98, which was more than 0.6. Based on Bartlett's test, $p < 0.001$. Using maximum likelihood for the extraction of factor analysis with varimax

Table 3 The Statistics of Each Component

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	19.938	60.417	60.417	19.598	59.388	59.388	9.364	28.377	28.377
2	2.334	7.071	67.488	2.052	6.217	65.605	6.911	20.943	49.320
3	1.292	3.916	71.404	0.948	2.874	68.479	6.322	19.159	68.479
4	0.799	2.421	73.826						
5	0.687	2.081	75.906						
–	0.564	1.710	77.616						
–	0.517	1.565	79.181						
–	0.482	1.459	80.640						
32	0.127	0.386	99.650						
33	0.116	0.350	100.000						

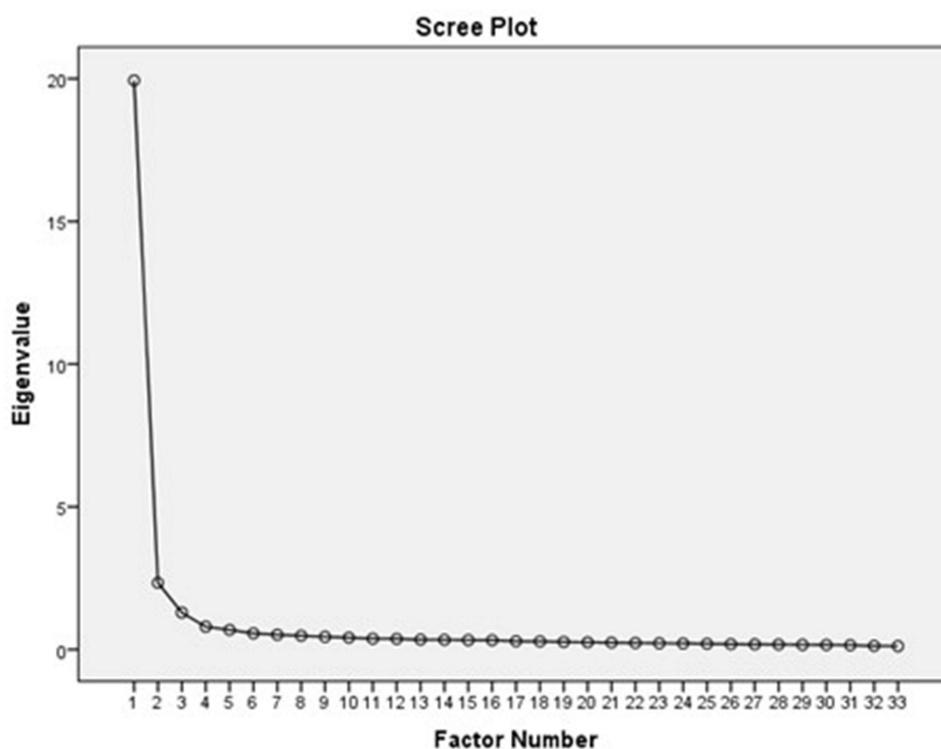


Figure 1 Scree plot of eigenvalue.

rotation, the 33 SHL-PPA items were determined to have sufficient relationships for according to EFA by using maximum likelihood for extraction of factor analysis with varimax rotation. After that, the eigenvalue and scree plot were used to determine the number of components. The analysis found that the eigenvalue of components from one to three were 19.938, 2.334, and 1.292, respectively, which all three values were greater than one.³⁵ Additionally, the scree plot presented eigenvalue which started at almost twenty for component one, then it dramatically dropped to slightly greater than one for component three. However, there were a few changes of eigenvalue for factor four to thirty-three. According to the result of [Table 3](#) and [Figure 1](#), the appropriate number of components for SHL-PPA was three. Component 1 had 12 items on applying the obtained sexual health information and skills to prevent pregnancy (Q22–Q33), with a 0.56–0.81 correlation; Component 2 comprised 10 items on accessibility to sexual health information and services (Q1–Q10), with a 0.50–0.78 correlation; and Component 3 comprised five items on understanding sexual health information and services (Q11–Q15) and six items on appraising sexual health to prevent pregnancy (Q16–Q21), with a 0.53–0.75 correlation ([Table 4](#)). The variance of the three components for use

Table 4 The Relationship of Exploratory Factor Analysis

Items	Mean (S.D.)	Factor Loading	Communality
Q1 I am able to find information about sexual health and pregnancy prevention by myself.	4.22 (0.91)	0.498*	0.515
Q2 I am able to question the information about pregnancy prevention from friends/ guardian/ health professional/ teacher/ qualified online media.	4.06 (0.92)	0.587*	0.517
Q3 I receive information and news about pregnancy prevention by listening to others.	3.96 (0.94)	0.584*	0.550
Q4 If I have a problem with accessing pregnancy prevention information, I am able to immediately consult a reliable person.	3.93 (0.96)	0.651*	0.563
Q5 I recognize health service sources for pregnancy prevention.	3.75 (1.11)	0.646*	0.597

(Continued)

Table 4 (Continued).

Items	Mean (S.D.)	Factor Loading	Communality
Q6 I am able to see a doctor or health professional for pregnancy prevention services.	3.84 (1.00)	0.767*	0.734
Q7 I am able to choose sources of health services to receive pregnancy prevention services as I need.	3.85 (0.98)	0.781*	0.778
Q8 I am confident that I am able to choose sources of health services that are correctly and appropriately related to my pregnancy prevention problem.	3.90 (0.98)	0.747*	0.760
Q9. I recognize a hotline of pregnancy prevention, such as 1663 (unwanted pregnancy hotline).	3.67 (1.08)	0.591*	0.567
Q10. I am able to access health services for pregnancy prevention online, such as on Facebook, Line, etc	3.90 (0.99)	0.616*	0.660
Q11 I am able to provide my sexual health information to others	3.71 (0.97)	0.574**	0.564
Q12 I am able to read and easily understand the information and services regarding sexual health that may be published in a handbook, documents, or other media for the public.	3.83 (0.92)	0.578**	0.665
Q13 I am able to listen to and understand the information and services regarding sexual health to prevent pregnancy that are passed on to me by any person or any media.	3.99 (0.93)	0.537**	0.669
Q14 I am able to explain to others information and services regarding sexual health to prevent pregnancy.	3.78 (0.94)	0.662**	0.674
Q15 I am able to explain how to access safe sexual health care in a way that friends can comprehend.	3.80 (0.95)	0.655**	0.694
Q16 I am able to assess reliable sources of sexual health information for pregnancy prevention.	3.90 (0.90)	0.747**	0.811
Q17 I am able to check for assessment and confirmation of correct sexual health information for pregnancy prevention.	3.89 (0.88)	0.703**	0.769
Q18 I am able to compare information about effective and safe pregnancy prevention.	3.89 (0.90)	0.659**	0.766
Q19 I consider the choices for appropriate methods for pregnancy prevention myself.	3.94 (0.91)	0.586**	0.752
Q20 I compare the information from many sources before I believe in or follow that information.	4.01 (0.91)	0.544**	0.695
Q21 I am courageous enough to inquire about sexual health information on pregnancy prevention from a reliable person/ guardian/ or health professional with no doubts.	3.82 (0.95)	0.530**	0.593
Q22 I am able to plan for appropriate pregnancy prevention by myself.	4.06 (0.88)	0.712***	0.739
Q23 I am able to use the information to make decisions for pregnancy prevention by myself.	4.04 (0.89)	0.717***	0.738
Q24 If I am facing a risk of pregnancy, I am able to seek the appropriate methods of prevention.	3.99 (0.90)	0.700***	0.737
Q25 I am able to avoid a pregnancy risk situation.	4.09 (0.92)	0.782***	0.739
Q26 I participate in training or activities to increase my knowledge and skills about pregnancy prevention.	3.87 (0.93)	0.556***	0.578
Q27 Talking with friends or others about pregnancy prevention has helped me better handle situations that may occur.	3.98 (0.93)	0.711***	0.733
Q28 I am regularly aware of pregnancy risks.	4.15 (0.91)	0.809***	0.772
Q29 I am able to say no to unprotected sexual intercourse.	3.99 (1.06)	0.667***	0.530

(Continued)

Table 4 (Continued).

Items	Mean (S.D.)	Factor Loading	Communality
Q30 If I have unavoidable sexual intercourse, I can use or convince my partner to use products for pregnancy prevention, such as condoms and contraceptive pills.	4.12 (0.92)	0.810***	0.780
Q31 From the information that I have, I can perceive the risk situation, and I can plan to avoid situations that put me at risk of pregnancy.	4.04 (0.93)	0.800***	0.797
Q32 I have no time, and I think it is unnecessary to seek the methods of pregnancy prevention.	4.07 (0.90)	0.748***	0.762
Q33 I am able to prevent pregnancy as I intend.	4.08 (0.92)	0.814***	0.802

Notes: Remark: *Accessibility to sexual health information and services factor; **an understanding of sexual health information and services and appraisal of sexual health to prevent pregnancy factor; ***applying the obtained sexual health information and skills to prevent pregnancy factor.

in predicting SHL in adolescents was 28.38%, 20.94%, and 19.16%, respectively. All three component variances can predict SHL in adolescents at a rate of 68.48%.

Discussion

This was an R&D study that had three main steps.

Step 1: Definition and Components of SHL

The 18 multidisciplinary experts were composed of three groups comprising policy makers, academic staff, and healthcare workers. They had longtime experience in working with adolescents and health literacy. Therefore, the experts provided reliable opinions for the researchers to determine the definition and components of SHL in order to create an SHL-PPA questionnaire. In addition, there was a sufficient number of experts, which decreased error by 0.02^{32,33} for the Delphi technique. There were four components of SHL-PPA. In contrast, Thai studies have 5–7 components.^{16,18,19,22,23,27} However, non-Thai studies have two components,^{20,24,25} three components,^{14,30} four components,^{10,15,17,21,26,31} or five components.¹³ Whether the component was four or not, the definitions in other studies were nearly similar to the definition in this study.^{10,15–17,21,22,27} However, the abovementioned studies were about SHL and reproductive health literacy, while this study specifically focused on SHL for pregnancy prevention among adolescents. EFA was used to define the number needed for components of SHL for pregnancy prevention among adolescents.

Step 2: Results of the Content Validity Index (CVI) Analysis

The results revealed that, using the Delphi technique, the Item content Validity Index (I-CVI) had three values (4 items = 0.89, 7 items = 0.94, and 22 items = 1.00), with all I-CVI values for each item meeting the acceptable standard of 0.83.³⁶ Furthermore, the S-CVI of this study was 0.97, which shows excellent validity. Generally, the acceptable value of opinion agreement should not be less than 0.80.³⁶ Although Q3, Q16, Q8, and Q9 had a CVI value of 0.94, three experts suggested deleting Q3 and Q16 because they were unclear. Since Q8 had a meaning similar to Q9, two experts recommended deleting one of them. According to multidisciplinary experts and the highest relevancy levels for both I-CVI and S-CVI, the SHL-PPA was found to be excellently valid and suitable in terms of content for adolescents to do self-assessment.

Step 3: Results of the Exploratory Factor Analysis (EFA)

The EFA resulted in three components relevant to the definitions of this study. In Component 2, understanding and appraising were merged. Three of the 18 experts recommended three components at the beginning as well. The 654 samples were from Gen Z, who have grown up with access to the internet and portable digital technology.³⁷ Moreover, they have a smaller attention period and a desire for convenience and instantaneity.⁷ Thus, the 33 questions with three components from the EFA analysis may be appropriate for Gen Z. Although the SHL-PPA is

not the gold standard tool for measuring SHL among adolescents, adolescents themselves, schools, universities, and organizations may use this tool for primary assessment and follow-up of the sexual health prevention pregnancy behavior of adolescents.⁷

Conclusion

This study defined the definition of SHL, and three components of SHL to prevent pregnancy for adolescents were found (accessibility, understanding and apprising, applying). To develop SHL-PPA, three steps were taken: 1) determining the definition and components of SHL, 2) deriving the results of the CVI analysis, and 3) deriving the results of the EFA. The SHA-PPA in this study comprised 33 items, and this tool was found to be appropriate for adolescents, especially Gen Z, to perform an online self-assessment of SHL for pregnancy prevention. Moreover, educational institutions may provide this tool to evaluate SHL for pregnancy prevention, and to design the appropriate intervention for decrease of pregnancy rate among adolescents.

Strengths and Limitations

This study provided quality expert opinion in terms of their number and multidisciplinary professionalism; consequently, the SHL-PPA was valid, reliable, relevant, and suitable for adolescents. This tool can be useful in determining SHL to prevent pregnancy for Gen Z. In addition, the tool can be used in both normal circumstances and crisis events, such as the COVID-19 pandemic, because it is an online self-assessment tool. However, those who do not have a mobile phone or who cannot access the internet are limited in performing the self-assessment. This tool may not be appropriate for another generation.

Suggestions

The SHL-PPA should be explored using EFA and should be used to widely survey SHL to prevent pregnancy. Then, an appropriate SHL intervention should be created, and its effectiveness tested to improve the SHL level in the target adolescents.

Abbreviations

CVI, Content Validity Index; EFA, Exploratory Factor Analysis; IOC, Index of Item-Objective Congruence; IQR, Interquartile Range; KMO, Kaiser-Meyer-Olkin measure; R&D, Research and Development; S-CVI, Content Validity Index for Scale; I-CVI, Item Content Validity Index; SHL, Sexual Health Literacy; SHL-PPA, Sexual Health Literacy measurement tool for Pregnancy Prevention among Adolescents.

Ethics

Ethical approval for this study under the Helsinki Declaration was approved by Ubon Ratchathani University (certification code: UBU-REC-106/2565) and Burapha University (certification code: HU 098/2565). The participants were informed of the details of this research, and their privacy was protected via confidentiality. Then participants signed informed consent.

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Disclosure

The authors declare that there are no conflicts of interest in this research.

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