The Journal of Behavioral Science
2024, Vol. 19, Issue 1, 124-139

ISSN: 1906-4675 (Print), 2651-2246 (Online)

The Journal of Behavioral Science (TJBS)

Systematic Review

Digital Reproductive Health Literacy Intervention for Enhancing the Service Behavior: A Systematic Literature Review

Kirana Dheva-aksorn[1], Pitchada Prasittichok[2], and Ungsinun Intarakamhang[3*]

Author Affiliation

Ph.D. student at Behavioral Science Research Institute, Srinakharinwirot University, Thailand.
[2] Assistant Professor, Behavioral Science Research Institute, Srinakharinwirot University, Thailand.
[3] Associate Professor, Behavioral Science Research Institute, Srinakharinwirot University, Thailand.

* Corresponding author e-mail: ungsinun@gmail.com

Article Information

Received: 01.05.23
Revised: 17.05.23
Accepted for review: 18.05.23

Keywords

Reproductive health, health literacy, digital literacy, behavior, adolescent and youth.

Abstract

The World Health Organization has long recognized that reproductive health literacy skills development for service providers is important to ensure safe sexual health behaviors and to guide appropriate sexual decisions and equality for adolescents and youths through digital services. The purpose of this research was to examine interventions for digital reproductive health literacy (DRHL) to enhance service behavior among service providers. In this study, the PRISMA guidelines was used to conduct a systematic literature review involving 622 studies, with five selected for final analysis. The results indicated that firstly, the DRHL intervention can encompass on-site, online, and group activities, accompanied by learning materials, to enhance skills in six areas: (1) promoting reproductive health knowledge among service providers; (2) developing the digital adaptation skills of service providers; (3) cultivating creative communication skills on reproductive health with adolescents through digital channels; (4) shaping the attitudes towards reproductive health in digital age service providers; (5) providing services to adolescents and youth through digital channels; and (6) enhancing team and network management skills. Secondly, DRHL was assessed based on four components; (1) accessing reproductive health information; (2) understanding reproductive health information; (3) applying reproductive health information; (4) appraising reproductive health information. Thirdly, most studies were evaluated to three phases: pretest, posttest, and follow-up assessment. The study finding demonstrated improvements in health behaviors and service behaviors in three key areas; (1) DRH knowledge, (2) skills, and (3) attitude toward service delivery.

The World Health Organization (WHO, 2018) emphasizes the importance of service behavior in reproductive health with a specific focus on promoting reproductive health literacy among patients. This involves providing effective access to rights and treatment through appropriate learning methods (Nair et al., 2015; Panichkriangkrai et al., 2020; Pechkwang et al., 2019; Shah et al., 2020; WHO, 2021). However, while there is control over service provision, a lack of assessment remains in terms of reproductive health literacy (Abel et al., 2015; Phromprapat, 2018; Vila-Candel et al., 2020) This leads to a deficiency in the knowledge and skills required for the work, especially in preparation for advancements in digital technology, which in turn, affects the number of young people seeking services through digital channels (Phromprapat, 2018). In line with this, the WHO (2016) highlights the importance of promoting digitization in healthcare as a safe and cost-effective means of accessing service facilities. This aligns with the WHO

(2019), which emphasizes the necessity of developing digital reproductive health literacy (DRHL) for service providers. The reports on reproductive health in adolescents and youths found that service providers in health clinics still lack reproductive health literacy, including skills, knowledge, and proficiency in technology utilization, focusing directly on the customers and the actual behaviors of service delivery personnel (Department of Health, 2021; WHO, 2021). This corresponds with various studies indicating that service providers do not receive adequate training in utilizing online media and technology to effectively communicate with adolescents and youths, thereby improving reproductive health literacy and service attitudes.

Furthermore, healthcare providers struggle to recommend online healthcare services exhibiting quality, equity, and user-friendliness. In the past, limited works have focused on DRHL literacy among service providers in health clinics for adolescents and youths. Most studies have primarily explored reproductive health literacy through surveys and comparisons (Harris et al., 2021; Jafree et al., 2021; Kleegesorn, 2022; Pechkwang et al, 2019; Phromprapat, 2018; Shrestha & Wærdahl, 2020; Vamos et al., 2020). Therefore, this study aimed to identify interventions for DRHL that enhance service behavior among service providers in health clinics for adolescents and youths. The goal is to enhance the service behavior of service providers to strengthen safe sexual health practices, raise awareness of the fundamental right to make appropriate sexual decisions, and promote equality for adolescents and youths.

This study uses a systematic literature review methodology to collect and synthesize relevant research results. The results could provide valuable insights into the design and implementation of effective DRHL intervention that aims to enhance service behavior among service providers in health clinics for adolescents and youths. Ultimately, these insights could contribute to promoting safe sexual health behaviors and positive attitudes toward service provision, while achieving equality for adolescents and young individuals accessing reproductive health services, both within health clinics and through digital platforms.

Literature Review

The objective of this research was to conduct a systematic literature review (SLR) that synthesizes the existing research on DRHL intervention to enhance the service behavior of service providers in health clinics for adolescents and youths. The finding revealed an existing research gap direct reproductive health education among providers in adolescent and youth health clinics. Although a previous study examined DRHL among health providers in adolescent clinics, the knowledge gaps were primarily related to general health literacy rather than focusing on digital channels. The study emphasized the importance of investigating reproductive health literacy among adolescents, particularly in promoting the skills and competencies of healthcare providers in adolescent clinics. To address this gap, a SLR was suggested to provide a more comprehensive analysis.

Digital Reproductive Health Literacy

The definition of reproductive health literacy is derived from the concept of reproductive health, which refers to a state of physical and mental well-being stemming from the process and capability of achieving optimal fertility for both men and women throughout all stages of life, thus enabling them to lead fulfilling lives within society (Department of Health, 1997). Everyone should be able to read a state of complete physical, mental, and social well-being, with the ability to reproduce and be free to have a safe and satisfying sex life. (WHO, 2011). Starting from giving birth with quality care before and during pregnancy until a safe birth (Panichkriangkrai et al., 2020). Besides, health literacy is a skill affecting an individual's motivation and ability to access, understand and use information to promote good health and maintain good health (WHO, 1998). Individuals should ability to understand basic health care information

and essential health services (American Medical Association, 1999), analyze and make appropriate health decisions (Institute of Medicine (US) Committee on Health Literacy et al., 2004; U.S. Department of Health and Human Services, 2000), choose health products, and adjust their health behaviors for good health at all ages (Department of Health, 1997). A certain a level of intellectual skills, thinking, and social interaction is required to enable people to access, understand, and evaluate health information from various media as well as health services received from medical and public health personnel. This creates the self-motivation to be mindful of health and self-care for disease prevention and maintaining good health (Intarakamhang, 2017). The concept of health literacy has been improved from the original concept of the Integrated model of health literacy framework implemented during the year 2000 to 2009 and consists four aspects: access, understand, appraise, and apply (Sørensen et al., 2012). In summary, reproductive health literacy refers to the skills and abilities of personnel in understanding and accessing information from listening to messages, giving advice, reading text, tables, graphs, and writing data, as well as providing the basic services necessary for reproductive health, comprehensive knowledge, and skills in evaluating and making decisions on the appropriate use of reproductive health information that can be cultivated and promoted through education and assessed through the reproductive health literacy scale (Ma et al., 2021).

Reproductive health literacy is evidenced by previous research papers. The most commonly used meaning refers to an individual's skills in finding, understanding, evaluating, and applying health-related information to improve their quality of life and reduce health risks (Freedman et al., 2009; Zarcadoolas et al., 2003, 2006). These skills are crucial for making informed health judgments and decisions within specific contexts (Paasche-Orlow & Wolf, 2007), benefiting both individuals and the community by enabling the assessment and management of information needed for decision-making (Freedman et al., 2009). Health literacy involves utilizing skills, abilities, and strategies to seek information that promotes, develops, and maintains good health throughout one's life (Adkins & Corus, 2009; Mancuso, 2008) various settings, including home, work, community, and market, thereby increasing information-seeking skills and public health awareness (Kickbusch et al., 2005). These concepts align with Sørensen's (2012) synthesis, which conceptualized health literacy between 2000 and 2009. Nutbeam's (2000) rating scale further defined health literacy as a combination of individual skills and social skills in recognizing, understanding, and applying information to promote and maintain good health. Nutbeam's framework categorized health literacy into three levels: 1) basic level, which involves listening, speaking, reading, and writing health information; 2) interaction level, which encompasses advanced skills in research, selection, communication, self-management; and 3) the critical level, which includes the ability to critically analyze, compare, and verify health information to make informed decisions and perform tasks. Subsequently, Sørensen (2012) expanded on this concept through an SLR using content analysis, which identified four aspects; 1) access to health information, encompassing listening, speaking, reading, and writing skills necessary for recognizing and comprehending various forms of information and communication; 2) understanding health information, involving skills in applying knowledge and participating in health care; 3) appraising health information, consisting of critical thinking, data selection for improved health behaviors and communication, and; 4) applying health information, including the assessment and application of data to support long-term health maintenance.

However, the DRHL definition from electronics health literacy or eHealth states that DHRL refers to skills in using technology to search, seek knowledge, and understand telehealth information, including electronic medical records for good health care and convenience for clients (Kampmeijer et al., 2016) in a cost-effective way for patients and underprivileged populations (WHO, 2016). The ability to assess health information from electronic sources and can apply the knowledge gained to solve health-related problems by using computer knowledge skills and relevant technology to achieve better health (Norman & Skinner, 2007). Therefore, DRHL refers to the knowledge and skills for accessing, understanding and processing health information from electronic sources using search engines. It involves making informed decisions

related to reproductive health and applying the knowledge gained to solve related problems. Utilizing computer knowledge and technology, DRHL provides personalized health advice to families and communities, contributing to the goal of sustaining good health among service recipients. Furthermore, the concept of digital health literacy can be defined as the ability to assess health information from electronic sources, utilize search engines to address health concerns, and employ skills, knowledge, and technology literacy to evaluate a wide range of data sources and achieve better health outcomes (Norman & Skinner, 2007). Digital health literacy aims to engage clients in health services, reduce inequalities, and overcome limitations relating to electronic health literacy, adhering to universal guidelines and measures that ensure equitable service design for all recipients (Gordon & Hornbrook, 2016). Through an exploration of the related concepts, theories, articles, and research, both domestic and international, it has been observed that the relationship between digital health literacy and reproductive health knowledge among service providers is a contributory factor in improving provider competence (Chen et al., 2020; Coleman, 2011; Kountz, 2009; Rademakers & Heijmans, 2018; Rowlands et al., 2015). Enhancing provider literacy has secondary goals, including increasing fertility rates, improving productivity at work, enhancing the quality of life for personnel, and fostering effective communication and coordination within the organization. Hence, DRHL plays a vital role in driving behavior change towards better health outcomes (Institute for Population and Social Research, 2017). It encompasses the ability to access, understand, appraise, and apply information effectively, enabling individuals to make informed decisions and actively engage in activities that promote a healthy lifestyle and important behaviors related to health promotion and disease prevention by accessing appropriate treatment services and implementing practical solutions (Kaeodumkoeng & Junhasobhaga, 2021). This research aimed to examine the effect of DRHL intervention enhancement on the service behavior of service providers service behavior in adolescent and youth health clinics.

Service Behavior

Service behavior refers to the actions displayed towards service recipients, influencing their satisfaction and, in turn, shaping their evaluation of service the encounters (Winsted, 2000). While many researchers have investigated the components of service quality and related findings, few have delved into what service behavior means to consumers (Boulding et al., 1993). However, some studies have indicated that healthcare workers or service providers should exhibit qualities such as politeness, understanding, helpfulness, and attentiveness to meet customers' needs and enhance satisfaction. Healthcare service delivery is perceived as a professional endeavor, usually involving a long-term formal relationship with patients (Bitner et al., 1990). Nevertheless, communication issues with patients have been reported to be on the rise (Danaher & Mattsson, 1998). In general, healthcare workers or service providers are considered to be more significant and carry inherent risks (Ostrom & Lacobucci, 1995). Among these service behaviors, those most associated with satisfaction can serve as valuable metrics for effective training and assessment programs. Some studies have found that if a person has knowledge and a good attitude toward motivating action, they will be more likely to act than someone with a bad attitude (Liu et al., 2015). In particular, there must be social support in the field of care, stimulating and monitoring self-care behavior (Suka et al., 2015). When an individual falls ill, it has a significant impact on their life, prompting them to seek care or services for recovery or health maintenance (Andersen, 1968). Health-seeking behavior refers to the decision-making process individuals undertake to select healthcare options available within the community context, based on their assessment of the illness an explanatory model that encompasses beliefs about illness, culture, tradition, and personal experiences (Stoll-Kleemann, 2019). Alternatively, they may choose to utilize the existing healthcare service system in their community. The use of medical staff is influenced by three main factors: 1) demographic and social characteristics; 2) satisfaction with the services received; and 3) characteristics of the available service sources. Therefore, a relationship between DRHL and service behaviors suggests that the basic information on synthesizing strategies and guidelines for developing health knowledge precisely and efficiently will lead to appropriate health behaviors, reducing the instances of diseases and premature death and affecting also affects the quality of service for adolescents and youths (Kleinman, 1980; von Lengerke et al., 2014).

Method

Research Design and Procedures

This study applies the SLR approach to address the research objective of a DRHL intervention for service behavior enhancing the service providers in health clinics for adolescents and youths. The preferred reporting items for SLR and PRISMA technique are used to be considered in terms of the specific study characteristics published from 2013 to 2023 from the abstract and citation databases. The data extraction form complied by the Joanna Briggs Institute (JBI) (Munn et al., 2014) was used for a selection based on the title, author, publication year, research method, population, selection criteria, data storage, technique, intervention, duration, measurement tool, and the result.

Literature Search

The literature search systematically examines the research relating to digital reproductive health literacy for service behavior enhancement in health clinics for adolescents and youths published from 2013 to 2023 on the abstract and citation database including SAGE, Emerald, Scopus, and Science Direct, using keywords. The relevant articles are synthesized using the critical appraisal form and data extraction form based on JBI (Munn et al., 2014) to reach the complete results based on this research objective. Detail of the keywords are provided in Table 1.

Table 1
Search String for Databases

Databases	Keywords
SAGE	reproductive health AND health literacy OR digital health literacy OR e-health literacy AND healthcare professional OR healthcare worker OR healthcare provider AND youth clinic OR adolescent Clinic AND competency AND behavior
Emerald	literacy OR digital health literacy AND clinic AND youth OR adolescent AND competency AND behavior AND healthcare worker
Scopus	reproductive AND health AND TITLE-ABS-KEY health AND literacy AND ALL digital AND health AND literacy OR ALL e-health AND literacy AND ALL healthcare AND provider OR ALL healthcare AND worker OR ALL healthcare AND professional OR ALL clinic AND for AND adolescent AND youth OR ALL competency OR ALL behavior
Science Direct	reproductive health AND health worker AND digital health literacy AND adolescent AND clinic AND competency AND behavior

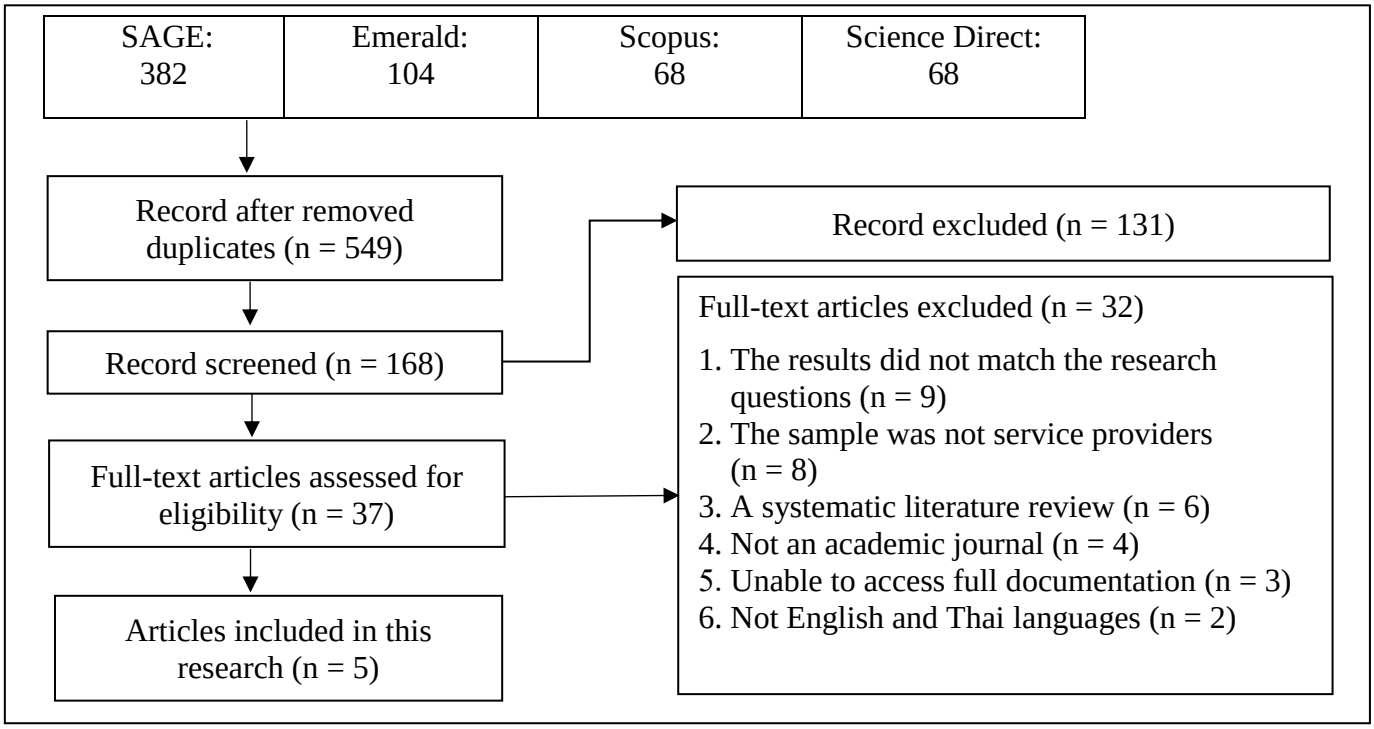
Inclusion and Exclusion Criteria

The SLR process was based on the guidelines devised by the JBI and the Cochrane (Higgins et al., 2019), with the research articles were selected based on inclusion and exclusion criteria. The inclusion should specify criteria based on PRISMA framework were as follows: 1) the research papers must be selected based on the title and abstract using the research screening form; 2) the article must focuses on the key terms mentioned in the title and abstract; 3) the design must encompasses a true experimental study, and quasi-experimental study; 4) the population must comprise medical personnel and public health service providers working in an adolescent and youth health facility or clinic, as well as village volunteers who are involved in activities relating adolescents and youth; 5) the article must involve the implementation interventions or actions; 6) it must contain a comparison is made, either before and after the intervention or between the experimental group and the control group; and 7) outcomes must relates to digital reproductive

health literacy or service behavior. Exclusion criteria we applied to ensure consistency with the inclusion criteria and the PRISMA guidelines. The effect size and the intraclass correlation coefficient were taken into consideration after screening the articles and the data using the data extraction form. The extracted data were then compared, in cooperation with experts, to reach a conclusion. If the event that any conflict between the author and the expert that could not be resolved, the third expert would be brought in for inter-rater agreement. This article achieved an inter-rater reliability of 0.97, indicating a high level of quality. Descriptive statistics were used in this study to analyze the general characteristics of the articles, as well as content analysis to examine the quality of the methods and interventions. as shown in Figure 1.

Figure 1

Inclusion Strategy using PRISMA Guidelines



Of the five articles selected, two articles related to health literacy and behavior, two concerned digital health literacy, and one article was about reproductive health. The population consisted of medical doctors, nurses, healthcare staff, health specialists, other relevant medical staff, service providers, community health volunteers, adolescents and youths.

Ethical consideration

This research was certified for human research ethics from Srinakharinwirot University. Project No. SWUEC-G- 015/2023, certification date, February 3, 2023.

Results

The study employed the PRISMA method for Systematic Reviews, utilizing SAGE, Emerald, Scopus, and Science Direct databases. Over the period from 2013 to 2023, a total of 622 articles were identified, aiming to address the research objectives effectively. The initial screening yielded 382 articles from SAGE, 104 from Emerald, 68 from Scopus, and 68 from Science Direct. Subsequently, 549 duplicate articles were excluded, leaving 131 articles eliminated due to irrelevance to the research context, 37 due to inaccessibility in full-texts, and 32 redundant articles lacking essential information on research procedures or statistical data. Ultimately, the study proceeded with the analysis of five eligible articles in the final stage.

The Guideline of DRHL Intervention

The SLR identified the concepts and theories regarding DRHL to enhance the service behavior enhancement of service providers in health clinics for adolescents and youths. These consisted of the health literacy concept by Sørensen et al. (2012), the concept of cultural health capital (Shim, 2010), the life course theory (Elder Jr. & Caspi, 1988) and the self-efficacy theory by Bandura (2000), which were applied in the intervention designing phase. Through a SLR, this study examined the strategies for promoting service behavior from DRHL in service providers who working with adolescents and youth in health clinics. The discussion revolves around the potential impact of enhancing knowledge and skills related to various aspects, such as by accessing information through digital channels, understanding complex information, assessing and applying information effectively, interacting appropriately with service recipients, working collaboratively as a team, maintaining a positive attitude towards reproductive health practices, and receiving adequate digital reproductive health training. The exploration of these improvements could lead to increased access to services, better meeting the needs of service recipients, and ensuring appropriate access to resources in alignment with the study's objectives.

Effect of the Program on Service Behavior

Out of the 622 articles identified, five articles were selected for the SLR. The results revealed three studies on the assessment of the program outcomes assessment according to service providers. The paper aims to assess service providers' behavior in implementing a newborn screening program for newborns with congenital hypothyroidism in Perak, Malaysia, and its associated factors using a cross-sectional study design and validated self-administered questionnaires. The study found that a quarter of service providers (25.70%) partially intended to adhere to the protocol of congenital hypothyroidism screening implementation. A weak attitude, low perceived behavior control score, and low knowledge score were associated with partial intention to adhere to protocol. The theory of planned behavior (TPB) and the attitude, social norms, self-efficacy models were applied in assessing the behavior of healthcare providers in this study. The paper recommends that a training module should be made available to focus on improving knowledge, attitude, and behavioral perception in implementing the program activities to improve program performance (Hamzah et al., 2021). According to a study covering the impact of a community health worker utilizing a mobile health application on maternal health knowledge and behavior in Jharkhand state, India. The study found that the mHealth intervention led to higher levels of maternal health knowledge, increased attendance of antenatal care attendance, and delivery at a health facility among the participants. However, the study also found that sociocultural factors such as caste and educational status played a significant role in the uptake of recommended maternal health practices. The study concludes that while mHealth holds promise for maternal health, implementers and policymakers must address health system and sociocultural factors to improve maternal health outcomes (Ilozumba et al., 2018). These findings concur with a 320 health experts in Kilombero and Ulanga, Republic of Tanzania, which revealed that the training program could improve the knowledge and behavior of the medical staff compared to the control group, Consultants were also given unconditionally higher ratings in terms of proficiency, reputation, and care in the management of sexual violence (Abeid et al., 2016).

Meanwhile, a study in Thailand conducted among 30 pregnant women under 20 years old on self-care knowledge and behavior, found that pregnant adolescents had exhibit greater knowledge of self-care behaviors and wanted service providers or physicians to educate them during pregnancy (Kokkaew et al., 2022). Likewise, a study undertaken in Pakistan revealed that 35.90% of reproductive-age women suffered from reproductive diseases. Program participating led to a positive and statistically significant impact on the promotion of health awareness, in addition to in-depth self-monitoring information, skills, and techniques and improved health, emotion, and behavior with statistical significance (Jafree et al., 2023), which concurred with the study. The study emphasized the need to comprehensively improve reproductive health, as well as family planning and access to safe abortion for the promotion of health equality. These findings concurred with a study on underprivileged women in underdeveloped regions in Pakistan, which aimed to operate a smartphone-based digital health literacy program that targeted smartphone users with

knowledge about health app downloading. Through the program, users could access online teleconsultations, and health records, and manage their data. The study took three months to conduct a survey and run the program, revealing that the basic healthcare program (covering reproductive health, nutrition, communicable and non-communicable disease, and mental health) for underprivileged women would improve the self-care performance related to health behaviors of the patients, as well as the socioeconomic potential of the country, as detailed in Table 2.

Table 2

Summary of Searching Information and Screening Results

Author	Population	Intervention	Comparison	Outcomes
Jafree et al. (2023)	820 women of community service providers aged 15-45 years from low socio-economic backgrounds from 6 districts in Pakistan	Randomized Control Trials and the Digital Health Literacy intervention for 4 weeks	The baseline and pre and post-test data were analyzed using descriptive statistics and bivariate odds ratios (OR). The control group did not receive any additional services provided to the intervention group, such as health literacy videos and live video consultancy with specialists.	The digital health literacy intervention delivered by trained community service providers showed higher odds of confidence in managing health behavior concerning skill and technique acquisition, self-monitoring, and insight, as well as sanitation and hygiene.
Kokkaew et al. (2022)	Adolescent pregnant women aged not over 20 years old on the day of delivery come to the antenatal care clinic from Kanchanaburi province, Thailand	Quasi-experimental design and the Health Promotion intervention on knowledge and self-care behavior in 3.5 hours, self-care in 1st -3rd trimester and follow-up in 2nd-4th week	A comparison of knowledge about behavior during pregnancy of adolescent pregnant women before and after using a health promotion program. Educate 30 minutes using a knowledge test.	Self-care behavior after receiving the program was higher than before. Therefore, the program should be encouraged to increase knowledge and self-care behavior of adolescent pregnant women and use it as a guideline for other groups.
Hamzah et al. (2021)	421 service providers from 12 government hospitals and 20 health clinics in the Perak state, Malaysia	A cross-sectional study and the newborn screening program for congenital hypothyroidism in pathology, pediatric and health clinics in 3 months	The purposive sampling method and the multistage random sampling method were used, self-administered questionnaires were used to gather the demographics, providers' characteristic, occupational profile, attitude, perceived behavior control (PBC), knowledge, behavioral intention, and adherence to protocol.	The study found that weak attitude, low perceived behavior control (PBC) score, and low knowledge score were associated with partial intention to adhere to the protocol. The authors suggest that interventions to improve service providers' knowledge, attitude, and perceived behavior control may be necessary to improve adherence to the protocol and ensure the success of the newborn screening program.

Table 2 *(Continued)*

Author	Population	Intervention	Comparison	Outcomes
Ilozumba et al. (2018)	2,200 women 18 – 45 years from Deoghar and Jharkhand in India who gave birth in the past 1 year, 2nd or 3rd trimester of pregnancy and who were receiving care from Accredited Social Health Activists (ASHAs)	Quasi-experimental design and the mHealth intervention (Mobile for Mothers: MFM) on maternal health knowledge in 3 months.	The MfM was implemented among pregnant women in the intervention group, while the control group received routine care. The study used a pre- and post-test design and collected data through face-to-face interviews with participants at baseline and six months after the intervention.	The mHealth intervention had a significant effect on higher levels of maternal health knowledge, increased attendance of antenatal care, influence adherence and practice of recommended maternal health behaviors. and delivering at a health facility among the participants. The study suggests that mHealth holds continued promise for maternal health.
Abeid et al. (2016)	320 health professionals at the primary health care level involved 151 health professionals at baseline and 169 in the final assessment Morogoro, Tanzania.	Quasi-experimental design and the Service providers Intervention on knowledge, attitude, and clinical practice toward sexual violence in 5 days, 6- to 10-month follow-ups.	The assessment involved the use of a structured questionnaire, and the intervention effect was estimated as the difference between intervention and comparison groups regarding changes in proportions from baseline to end line.	The study found that the training program did significant improved service providers' knowledge and behavior but not attitudes toward sexual violence. The proportion of participants who exhibited an accepting attitude toward violence declined in the intervention area but increased in the comparison area. The study concluded that training on the management of sexual violence is feasible and requires commitment from those at strategic levels within the health service to ensure that adequate resources are made available.

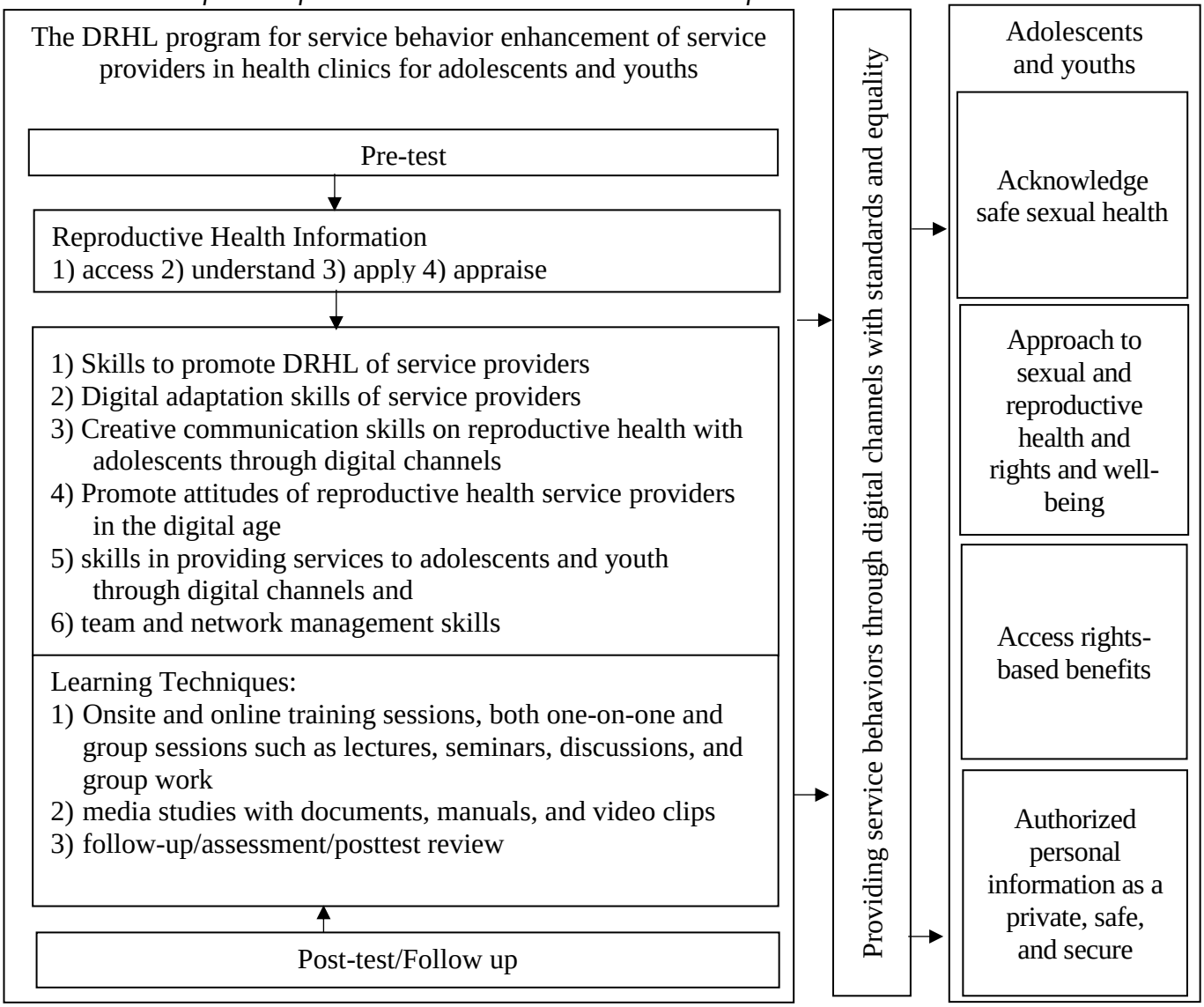
Designing the DHRL intervention for enhancing the service behavior enhancement of service providers in health clinics for adolescents and youths consisted of the objectives, training contents, techniques, tools, media and equipment, duration, activities, and assessment methods. The contents used the health literacy concept by Sørensen et al. (2012), the concept of *cultural health capital* (Shim, 2010), the life course theory (Elder Jr. & Caspi, 1988), and the self-efficacy theory of Bandura (2009) were applied to the content. The results of the synthesis process, techniques, and skills for enhancing DRHL from SLR revealed that the structure of the intervention should contain two important aspects as explained.

1) Education: The findings of the five studies indicated that the impact of knowledge limitations on patient-provider encounters or the service providers' ignorance could have a negative effect on the patient, such as knowledge of their condition, risk to disease-specific populations, and traditional practices as well as patient. There is evidence to suggest that training affected the knowledge and behaviors of service providers, such as through the knowledge reviewed, shared experiences, and exchange knowledge with stakeholders or communities for the recognition process, understanding the meaning and importance of the relevant digital reproductive health information used in practice and everyday life.

2) Training: Three studies revealed a training program relating to health service delivery influenced service behavior. as well as patient. In term of service providers' attitudes, two studies have found that training programs affected the health knowledge of service providers. The most common attitude was self-efficacy which could potentially enhance the confidence of learners in knowledge and behaviors relating to service provision.

Figure 2

The Assessment of DRHL for Service Providers in Health Clinics for Adolescents and Youths



As a result, selecting an effective personnel development intervention should be an activity, discussion, sharing experiences, role play, and reflection using media consisting of video clips, worksheets, or games. The structure of the intervention consists of 6 skills, namely: 1) reproductive health literacy skills

of service providers; 2) skills for adapting to the digital age of service providers; 3) creative communication skills on reproductive health with adolescents and youth through digital channels; 4) promoting the attitudes of reproductive health for service providers in the digital age; 5) skills in providing services to adolescents and youth through digital channels; 6) team and network management skills. In addition, providing positive reinforcement through rewarding participation or answering questions correctly, the use of video clips to help the participants review what they learn, and involving participants in games or role-plays through dialogue or writing to exchange experiences would be better access to the context of each area. Moreover, an online intervention might draw more participants because the participants can still operate on-site while participating in the program, although some are overworked and might not be able to stay for the entire intervention. Besides, there should be an assessment before and after joining the intervention as well as follow-ups as necessary.

The Assessment of Digital Reproductive Health Literacy

The assessment was measured using four components: 1) access to reproductive health information through listening, speaking, reading, and writing skills to promote the perception and understanding of youths and adolescents' concerning their rights and benefits as youths and adolescents; 2) understanding reproductive health information such as processing and skills; 3) applying reproductive health information such as communication and critical thinking skills. For example, the selection of information to adjust health behavior in the youths and adolescents toward safer sexual well-being, and explaining their rights and sexual decisions; and 4) appraise reproductive health information such as data appraisal skills and the application of comparative data for decision making and performance improvement as shown in Figure 2. Most research is assessed under three appraisal phases: before, during, and after participation in the program and also follow-up. The results showed that there was a statistically significant increase in service behaviors, as detailed is provided in Figure 2.

Discussion and Conclusion

Discussion of Main Results

Through an SLR of five articles, the study explores the effectiveness of a DRHL intervention aimed at enhancing service behavior among service providers in health clinics for adolescents and youths. The findings revealed that the workshops required a duration ranging from 3.5 hours to three months. (Abeid et al., 2016; Hamzah et al., 2021; Ilozumba et al., 2018; Jafree et al., 2021; Kokkaew et al., 2022). The top three techniques preferred for the intervention consisted of an onsite program with one-on-one and group sessions (such as lectures, seminars, discussions, and group work), recommended media, documents, and guidelines, and the provision of pretest-posttest and follow-up assessments, as well as home visits (Abeid et al., 2016; Hamzah et al., 2021; Ilozumba et al., 2018; Jafree et al., 2021; Kokkaew et al., 2022). Behavioral intention refers to the likelihood of workers intending to adhere to the protocol during the implementation of program activities (Hamzah et al., 2021) Therefore, the program was structure in a workshop style with on-site, online one-on-one, and group training at least 3.5 hours minutes in length. The techniques consisted of lectures, discussions, experience exchange, storytelling, or role-playing, as well as reflection using worksheets or games, along with the opportunity to discuss and share experiences, existing knowledge, and theories. In addition, tools such as video clips, documents, and guidelines or manuals were also used to provide pretest-posttest and follow-up assessments, home visits, and operational methods. These tools aimed to enhance the knowledge of digital reproductive health literacy and service behaviors among service providers, fostering greater care readiness within the framework of significant complexity theory and organizations. The DRHL intervention, derived from SLR, encompass six areas: 1) promoting reproductive health knowledge among service providers; 2) developing digital adaptation skills of service providers; 3) cultivating creative communication skills on reproductive health with adolescents through digital channels; 4) shaping the attitudes towards reproductive health in the digital age; 5) providing services to adolescents and youth through digital channels; and 6) enhancing team and network management skills.

The DRHL components was assessed based on four aspects: 1) access to reproductive health information; 2) understanding reproductive health information; 3) applying of reproductive health information; and 4) appraising reproductive health information. The most studies were evaluated in three phases: pretest, posttest, and follow-up assessment. In addition, the results demonstrated that service providers exhibited significantly improved service behaviors in three main components: 1) DRH knowledge; 2) skills; and 3) attitude in delivering services. All these studies collectively reinforce the importance of various components in promoting health and understanding health-related information across different contexts. This is consistent with a study by Morony et al. (2018), which revealed that service personnel who receive training on understanding digital information can work efficiently, particularly during milling periods. According to the study by Klinman and Rujirudtirakul (2021) similarly demonstrated that insufficient reproductive health training adversely impacted sexual and reproductive health services for adolescent and youths, and aligning with a study conducted by Freedman et al. (2009), which emphasizes that comprehending, assessing, and applying pertinent information is crucial in making decisions related to public health, ultimately influencing well-being at individual, group, and community levels.

Limitations

There were few studies relating to DRHL intervention for service behavior enhancement, especially in the context of service providers in health clinics for adolescents and youths. This study holds continued promise for digital reproductive health literacy but implementers and policymakers must additionally address the health system and sociocultural factors that playing a significant role in the uptake of recommended service behavior practices.

Implications for Behavioral Science

This study aims to identify a DRHL intervention that enhances the service behavior of service providers in health clinics for adolescents and youths. It has therefore turned to behavioral science to apply the DRHL intervention to promote safe sexual health and awareness, shape reproductive health habits, and influence the diffusion of reproductive health knowledge, sexual decisions, attitudes, and practices for service providers by using the DRHL intervention. This study examines interventions designed to develop service behavior for health practitioners, health agencies, and service providers in private and government organizations to expand their repertoires and develop the service behavior of their members, patients, constituents, and customers.

Conclusion

The DRHL intervention is employed to enhance the service behavior enhancement of healthcare providers in health clinics catering to adolescents and youths. This intervention is often utilized to promote knowledge and induce behavioral change among service providers. Three aspects that should be emphasized: 1) knowledge of digital reproductive health among the service providers, gained through the information, facts, or situations resulting from the study observations and experiences that comprise personality, factual, and professional; 2) attitude, which refers to the feelings, behavior, and beliefs of the service providers; and 3) skills, which referring to the actions resulting from the accumulation of experience to achieve expertise, consisting of awareness, familiarity, and understanding to help personnel achieve success in performing their duties with efficiency, high standards, and increasing accessibility and equality for all adolescents youth.

Acknowledgments

This study has been fully supported by scholarships under the project "70 Years, 70 Scholarships, Srinakharinwirot University." I would like to express my gratitude to the Graduate School of Srinakharinwirot University for awarding me this scholarship.

References

Abeid, M., Muganyizi, P., Mpembeni, R., Darj, E., & Axemo, P. (2016). Evaluation of a training program for health care workers to improve the quality of care for rape survivors: A quasi-experimental design study in Morogoro, Tanzania. *Global Health Action, 9*(1), 31735. https://doi.org/10.3402/gha.v9.31735

Abel, T., Hofmann, K., Ackermann, S., Bucher, S., & Sakarya, S. (2015). Health literacy among young adults: A short survey tool for public health and health promotion research. *Health Promotion International, 30*(3), 725–735. https://doi.org/10.1093/heapro/dat096

Adkins, N. R., & Corus, C. (2009). Health literacy for improved health outcomes: Effective capital in the marketplace. *Journal of Consumer Affairs, 43*(2), 199–222. https://doi.org/10.1111/j.1745-6606.2009.01137.x

American Medical Association. (1999). Ad hoc committee on health literacy for the Council on Scientific Affairs. *JAMA, 281*(6), 552–557. https://doi.org/10.1001/jama.281.6.552

Andersen, R. (1968). *A behavioral model of families' use of health services* (Research series No. 25). University of Chicago. https://www.scirp.org/reference/ReferencesPapers?ReferenceID=1028772

Bandura, A. (2000). Self-efficacy: The foundation of agency. In Walter J. P., & Alexander, G. (Eds.), *Control of human behavior, Mental processes, and consciousness: Essays in honor of the 60th birthday of August flammer* (p.16). Erlbaum.

Bitner, M. J., Booms, B. H., & Tetreault, M. S. (1990). The service encounter: Diagnosing favorable and unfavorable incidents. *Journal of marketing, 54*(1), 71–84. https://doi.org/doi.org/10.2307/1252174

Boulding, W., Kalra, A., Staelin, R., & Zeithaml, V. A. (1993). A dynamic process model of service quality: from expectations to behavioral intentions. *Journal of Marketing Research, 30*(1), 7–27. https://doi.org/10.2307/3172510

Chen, A. M., Cailor, S. M., Wicker, E., Harper, N. G., Franz, T. T., & Pahl, B. (2020). Integrating health literacy and cultural competency concepts across the doctor of pharmacy curriculum. *American Journal of Pharmaceutical Education, 84*(10), ajpe7764. https://doi.org/10.5688/ajpe7764

Coleman, C. (2011). Teaching health care professionals about health literacy: A review of the literature. *Nursing outlook, 59*(2), 70–78. https://doi.org/10.1016/j.outlook.2010.12.004

Danaher, P. J., & Mattsson, J. (1998). A comparison of service delivery processes of different complexity. *International Journal of Service Industry Management, 9*(1), 48–63. https://doi.org/10.1108/09564239810199941

Department of Health. (2021). *The report presents the findings of an analysis conducted to assess the current live birth rate among women aged 15-19 years.* https://rh.anamai.moph.go.th/web-upload/7x027006c2abe84e89b5c-85b44a692da94/tinymce/kpi64/1_14/1_14_1-1.pdf

Elder, G. H., Jr., & Caspi, A. (1988). Human development and social change: An emerging perspective on the life course. In N. Bolger, A. Caspi, G. Downey, & M. Moorehouse (Eds.), *Persons in context: Developmental processes* (pp. 77–113). Cambridge University.

Freedman, D. A., Bess, K. D., Tucker, H. A., Boyd, D. L., Tuchman, A. M., & Wallston, K. A. (2009). Public health literacy defined. *American Journal of Preventive Medicine, 36*(5), 446–451. https://doi.org/10.1016/j.amepre.2009.02.001

Gordon, N. P., & Hornbrook, M. C. (2016). Differences in access to and preferences for using patient portals and other eHealth technologies based on race, ethnicity, and age: A database and survey study of seniors in a large health plan. *Journal of Medical Internet Research, 18*(3), e5105. https://doi.org/10.2196/jmir.5105

Hamzah, H., Sutan, R., Mohd Tamil, A., Mohd Kassim, A. B., Mohamed Soid, A., & Hss, A. S. (2021). Assessment of healthcare workers' behavior in implementing a newborn screening program for congenital hypothyroidism in Perak, Malaysia. *Journal of Health Research, 35*(2), 172–185. https://doi.org/10.1108/JHR-08-2019-0198

Harris, B., Ajisola, M., Alam, R. M., Watkins, J. A., Arvanitis, T. N., Bakibinga, P., Chipwaza, B., Choudhury, N. N., Kibe, P., & Fayehun, O. (2021). Mobile consulting as an option for delivering

healthcare services in low-resource settings in low-and middle-income countries: A mixed-methods study. *Digital Health, 7*, 20552076211033425. https://doi.org/10.1177/20552076211033425

Higgins, J. P., Thomas, J., Chandler, J., Cumpston, M., Li, T., Page, M. J., & Welch, V. A. (2019). *Cochrane handbook for systematic reviews of interventions*. John Wiley & Sons.

Ilozumba, O., Van Belle, S., Dieleman, M., Liem, L., Choudhury, M., & Broerse, J. E. (2018). The effect of a community health worker utilized mobile health application on maternal health knowledge and behavior: a quasi-experimental study. *Frontiers in Public Health, 6*, 133. https://doi.org/10.3389/fpubh.2018.00133

Institute for Population and Social Research. (2017). *Empowering vulnerable groups to create a society that is not abandoned.* Mahidol University.

Institute of Medicine Board, O. N., Health, B., & Literacy, C. O. H. (2004). *Health literacy: A prescription to end confusion*. National Academies.

Institute of Medicine (US) Committee on Health Literacy, Nielsen-Bohlman, L., Panzer, A. M., & Kindig, D. A. (Eds.). (2004). *Health literacy: A prescription to end confusion.* National Academies Press.

Intarakamhang, U., Kijthorntham, W., & Peungposop, N. (2017). Causal model of work behaviors in the Narcotics Control Board, Thailand. *The Journal of Behavioral Science, 12*(2), 107–121. https://so06.tci-thaijo.org/index.php/IJBS/article/view/94364

Jafree, S. R., Bukhari, N., Muzamill, A., Tasneem, F., & Fischer, F. (2021). Digital health literacy intervention to support maternal, child and family health in primary healthcare settings of Pakistan during the age of coronavirus: study protocol for a randomised controlled trial. *BMJ Open, 11*(3), e045163. https://doi.org/10.1136/bmjopen-2020-045163

Jafree, S. R., Muzammil, A., Burhan, S. K., Bukhari, N., & Fischer, F. (2023). Impact of a digital health literacy intervention and risk predictors for multimorbidity among poor women of reproductive years: Results of a randomized-controlled trial. *Digital Health, 9*, 20552076221144506. https://doi.org/10.1177/205520762211445

Kaeodumkoeng, K., & Junhasobhaga, J. (2021). A development and testing of health literacy on disease prevention and control assessment form for Public Health Officers. *Romphruek Journal, 39*(2), 193–220. https://so05.tci-thaijo.org/index.php/romphruekj/article/view/251273

Kampmeijer, R., Pavlova, M., Tambor, M., Golinowska, S., & Groot, W. (2016). The use of e-health and m-health tools in health promotion and primary prevention among older adults: A systematic literature review. *BMC Health Services Research, 16*(5), 467–479. https://doi.org/10.1186/s12913-016-1522-3

Kickbusch, I., Wait, S., & Maag, D. (2005). *Navigating health: The role of health literacy*. The ILC-UK. https://ilcuk.org.uk/navigating-health-the-role-of-health-literacy/

Kleegesorn, N. (2022). Health literacy and desirable health behavior of personnel in Ranong Hospital. *Primary Health Care Journal (Northeastern Edition), 38*(1), 56–65. https://thaidj.org/index.php/pjne/article/view/13117 [in Thai]

Kleinman, A. (1980). *Patients and healers in the context of culture: An exploration of the borderland between anthropology, medicine, and psychiatry* (Vol. 3). University of California.

Kokkaew, A., Choolert, P., & Kulaphanich, M. (2022). The Effect of a Health Promotion Program on Knowledge and Self-care Behavior for Pregnant Teenager. *Journal of MCU Nakhondhat, 9*(8), 17–31. https://he02.tci-thaijo.org/index.php/TJONC/article/view/259904

Kountz, D. S. (2009). Strategies for improving low health literacy. *Postgraduate Medicine, 121*(5), 171–177. https://doi.org/10.3810/pgm.2009.09.2065

Liu, Y.-B., Liu, L., Li, Y.-F., & Chen, Y.-L. (2015). Relationship between health literacy, health-related behaviors and health status: A survey of elderly Chinese. *International Journal of Environmental Research and Public Health, 12*(8), 9714–9725. https://doi.org/10.3390/ijerph120809714

Ma, X., Yang, Y., Wei, Q., Jiang, H., & Shi, H. (2021). Development and validation of the reproductive health literacy questionnaire for Chinese unmarried youth. *Reproductive Health, 18*(1), 226. https://doi.org/10.1186/s12978-021-01278-6

Mancuso, J. M. (2008). Health literacy: A concept/dimensional analysis. *Nursing & Health Sciences, 10*(3), 248–255. https://doi.org/10.1111/j.1442-2018.2008.00394.x

Munn, Z., Tufanaru, C., & Aromataris, E. (2014). JBI's systematic reviews: Data extraction and synthesis. *AJN The American Journal of Nursing, 114*(7), 49–54. https://doi.org/10.1097/01.NAJ.0000451683.66447.89

Nair, M., Baltag, V., Bose, K., Boschi-Pinto, C., Lambrechts, T., & Mathai, M. (2015). Improving the quality of health care services for adolescents, globally: A standards-driven approach. *Journal of Adolescent Health, 57*(3), 288–298. https://doi.org/10.1016/j.jadohealth.2015.05.011

Norman, C. D., & Skinner, H. A. (2007). eHealth literacy: essential skills for consumer health in a networked world. *Journal of Medical Internet Research, 8*(2), e9. https://doi.org/10.2196/jmir.8.2.e9

Nutbeam, D. (2000). Health literacy as a public health goal: A challenge for contemporary health education and communication strategies into the 21st century. *Health Promotion International, 15*(3), 259–267. https://doi.org/10.1093/heapro/15.3.259

Ostrom, A., & Lacobucci, D. (1995). Consumer trade-offs and the evaluation of services. *Journal of Marketing, 59*(1), 17–28. https://doi.org/10.2307/1252011

Paasche-Orlow, M. K., & Wolf, M. S. (2007). The causal pathways linking health literacy to health outcomes. *American Journal of Health Behavior, 31*(1), S19–S26. https://doi.org/10.5555/ajhb.2007.31.supp.S19

Panichkriangkrai, W., Topothai, C., Saengruang, N., Thammatach-Aree, J., & Tangcharoensathien, V. (2020). Universal access to sexual and reproductive health services in Thailand: Achievements and challenges. *Sexual and Reproductive Health Matters, 28*(2), 1805842. https://doi.org/10.1080/26410397.2020.1805842

Phromprapat, P. (2018). The development of health services model for non-certified YFHS hospitals. *Journal of Health Education, 41*(2), 128–140. https://he01.tci-thaijo.org/index.php/muhed/article/view/161709 [in Thai]

Qi, W., Li, H., Lian, Q., Zuo, X., Yu, C., Lou, C., & Tu, X. (2019). Knowledge regarding reproductive rights and needs of accessibility to services according to reproductive rights among adolescent in Phayao province. *Journal of Health Research and Innovation, 2*(1), 99–106. https://doi.org/10.1186/s12978-023-01625-9

Rademakers, J., & Heijmans, M. (2018). Beyond reading and understanding: Health literacy as the capacity to act. *International Journal of Environmental Research and Public Health, 15*(8), 1676. https://doi.org/10.3390/ijerph15081676

Rowlands, G., Protheroe, J., Winkley, J., Richardson, M., Seed, P. T., & Rudd, R. (2015). A mismatch between population health literacy and the complexity of health information: An observational study. *British Journal of General Practice, 65*(635), e379-e386. https://doi.org/10.3399/bjgp15X685285

Shah, N., Mohan, D., Agarwal, S., Scott, K., Chamberlain, S., Bhatnagar, A., Labrique, A., Indurkar, M., Ved, R., & LeFevre, A. (2020). Novel approaches to measuring knowledge among frontline health workers in India: Are phone surveys a reliable option?. *PloS ONE, 15*(6), e0234241. https://doi.org/10.1371/journal.pone.0234241

Shim, J. K. (2010). Cultural health capital: A theoretical approach to understanding health care interactions and the dynamics of unequal treatment. *Journal of Health and Social Behavior, 51*(1), 1–15. https://doi.org/10.1177/0022146509361185

Shrestha, S., & Wærdahl, R. (2020). Girls' access to adolescent friendly sexual and reproductive health services in Kaski, Nepal. *Asia and the Pacific Policy Studies, 7*(3), 278–292. https://doi.org/10.1002/app5.305

Sørensen, K., van den Broucke, S., Fullam, J., Doyle, G., Pelikan, J., Slonska, Z., & Brand, H. (2012). Health literacy and public health: A systematic review and integration of definitions and models. *BMC Public Health, 12*, 80. https://doi.org/10.1186/1471-2458-12-80

Stoll-Kleemann, S. (2019). Feasible options for behavior change toward more effective ocean literacy: A systematic review. *Frontiers in Marine Science, 6*, 273. https://doi.org/10.3389/fmars.2019.00273

Suka, M., Odajima, T., Okamoto, M., Sumitani, M., Igarashi, A., Ishikawa, H., Kusama, M., Yamamoto, M., Nakayama, T., & Sugimori, H. (2015). Relationship between health literacy, health information access, health behavior, and health status in Japanese people. *Patient Education and Counseling, 98*(5), 660-668. https://doi.org/10.1016/j.pec.2015.02.013

U.S. Department of Health and Human Services. (2000). *Healthy people 2010: Understanding and improving health* (Vol. 41). Health and Human Services Department. https://eric.ed.gov/?id=ED443794

Vamos, C. A., Thompson, E. L., Logan, R. G., Griner, S. B., Perrin, K. M., Merrell, L. K., & Daley, E. M. (2020). Exploring college students' sexual and reproductive health literacy. *Journal of American College Health, 68*(1), 79–88. https://doi.org/10.1080/07448481.2018.1515757

Vila-Candel, R., Martínez-Arnau, F. M., de la Cámara-de Las Heras, J. M., Castro-Sánchez, E., & Pérez-Ros, P. (2020). Interventions to improve health among reproductive-age women of low health literacy: A systematic review. *International Journal of Environmental Research and Public Health, 17*(20), 7405. https://doi.org/10.3390/ijerph17207405

von Lengerke, T., Gohl, D., & Babitsch, B. (2014). Re-revisiting the Behavioral Model of Health Care Utilization by Andersen: A Review on Theoretical Advances and Perspectives. In Janssen, C., Swart, E., von Lengerke, T. (Eds.), *Health Care Utilization in Germany*. Springer. https://doi.org/10.1007/978-1-4614-9191-0_2

WHO. (1998). The World Health Report 1998: Life in the 21st century a vision for all. In *The world health report 1998: Life in the 21st century a vision for all* (pp. 241-241). https://apps.who.int/gb/archive/pdf_files/WHA51/ea3.pdf

WHO. (2011). *Strategic directions for improving adolescent health in South-East Asia Region*. https://catalog.ihsn.org/citations/86302

WHO. (2016). *Atlas of ehealth country profiles: The use of ehealth in support of universal health coverage* (Vol. 3). World Health Organization. https://www.afro.who.int/publications/atlas-ehealth-country-profiles-use-ehealth-support-universal-health-coverage

WHO. (2018, October 10). *WHO recommendations on adolescent sexual and reproductive health and rights*. https://www.who.int/publications/i/item/9789241514606

WHO. (2021). *Adolescent health in the South-East Asia region*. https://www.who.int/southeastasia/health-topics/adolescent-health

Winsted, K. F. (2000). Service behaviors that lead to satisfied customers. *European Journal of Marketing, 34*(3/4), 399–417. https://doi.org/10.1108/03090560010311920

Zarcadoolas, C., Pleasant, A., & Greer, D. S. (2003). Elaborating a definition of health literacy: A commentary. *Journal of Health Communication, 8*(S1), 119–120.

Zarcadoolas, C., Pleasant, A., & Greer, D. S. (2006). *Advancing health literacy: A framework for understanding and action* (Vol. 17). John Wiley & Sons.