

Original Article

A theory-driven, culture-tailored educational intervention for cervical cancer screening among rural Chinese females: A feasibility and pilot study

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Objective: This study aimed to evaluate the feasibility and preliminarily estimate the effects of a theory-driven, culture-tailored, community-based educational intervention promoting cervical cancer screening among rural females.

Methods: An experimental study with the two-arm parallel, nonrandomized control trial design was implemented, followed by individual semi-structured interviews. Thirty rural females between 26 and 64 were recruited, with 15 in each group. Both groups were exposed to the usual care about cervical cancer screening promotion from the local clinics, while participants in the intervention group additionally received five educational sessions in 5 weeks. Data were collected at baseline and immediately postintervention.

Results: All participants completed the study, and the retention rate was 100%. Participants in the intervention group had more significant increments in cervical cancer screening-related self-efficacy ($P < 0.001$), knowledge ($P < 0.001$), and intention levels ($P = 0.003$) than those in the control group. Most participants showed acceptance and satisfaction with this educational intervention.

Conclusions: This study revealed that the theory-driven, culture-tailored, community-based educational intervention was feasible among the rural populations to promote cervical cancer screening. A large-scale interventional study with a prolonged follow-up duration is warranted to explore this educational intervention's effectiveness further.

Introduction

Geography influences cancer control, while urban-rural disparities are prominent in cancer prevention.¹ As a significant global health issue for females,² previous studies demonstrated that the urban-rural gap in the cervical cancer disease burden was noticeable in different countries³⁻⁵. In China, one study identified the urban-rural disease disparities of cervical cancer, demonstrating that after 2005, the cervical cancer mortality rate of rural populations showed a remarkable increase and was significantly higher than that of urban populations.⁶ Hence, rural cervical cancer control needs emphasis to reach health equality in mainland China.

For prevention, cervical cancer screening (including Pap smear, human papillomavirus DNA testing, etc.) is an effective method of early detection.⁷ The urban-rural disparities were also found in the cervical cancer screening uptake rate. Compared with the local urban females, rural females' cervical cancer screening uptake rate was significantly lower.⁸⁻¹⁰ Considering the significance of screening, implementing

interventions to increase the cervical cancer screening uptake rate in rural areas is critical. Besides geographic differences, sociostructural defects in rural areas were also identified compared with urban areas, including lower socioeconomic development levels and insufficient healthcare resources.¹¹⁻¹³ To guarantee rural females' access to cervical cancer screening, the government in mainland China has launched a national screening program to provide free cervical cancer screening services for rural females since 2009.¹⁴ However, the urban-rural gap in the screening uptake rate was still notable after the implementation of this program.^{8,10} Therefore, there is an increasing need to develop a region-specific, rural population-oriented, culturally appropriate intervention to promote cervical cancer screening in rural areas.

Educational interventions could effectively promote cervical cancer screening.¹⁵⁻¹⁷ Previous studies reported that conducting educational interventions could improve cancer screening uptake among rural populations.¹⁸ Regarding the intervention components, evidence identified and emphasized that interventions focused on cervical cancer screening among rural populations were mostly theory-based and community-involved.^{17,19}

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Meanwhile, previous studies also revealed that cultural elements of avoiding discussing sexual-related topics were barriers to cervical cancer screening behavior.^{20,21} Hence, based on the evidence, we developed a theory-driven, culture-tailored, community-based educational intervention to explain cervical cancer screening targeted at rural females in mainland China. To the best of our knowledge, our intervention was the first theory-driven and culture-tailored educational intervention for rural Chinese females on cervical cancer screening. Therefore, a pilot study was warranted to explore the feasibility and effects of this educational intervention in rural Chinese contexts.

This study was conducted through two phases based on the Medical Research Council (MRC) framework for intervention development and evaluation.²² A theory-driven, culture-tailored, community-based educational intervention was developed in Phase I. In Phase II, a feasibility and pilot study was conducted from January to February 2022 among rural Chinese females to evaluate the implementation of the newly developed intervention.

Phase I: Developing a theory-driven and culture-tailored educational intervention

Identifying the intervention delivery mode

Inspired by previous studies^{23,24} and considering the feasibility in real-world settings of rural mainland China, this educational intervention was designed as five weekly-based face-to-face group sessions. Sessions were held at weekends, with each session being proposed for about 45–60 min. The group size of each session was no more than 15 participants. Participants would be divided into subgroups for in-session activities, with no more than five participants in each subgroup.²⁵

Identifying the intervention theoretical framework

Through reviewing and analyzing previous studies,^{24,26,27} in adherence with the identified evidence, the social cognitive theory was adopted as the theoretical framework to construct this educational intervention. The social cognitive theory is a comprehensive behavior-change-related theory developed by Bandura,²⁸ which demonstrates that the individual's behavior change is a complex process.²⁹ Self-efficacy, outcome expectations, sociostructural factors, and goals are four core components of the theory (Fig. 1). Self-efficacy could influence individuals' behavior both directly and indirectly. With a high level of self-efficacy, individuals would have positive expectations toward the outcome behavior and could identify and utilize or overcome the sociostructural impediments or facilitators to set up the goal to complete the behavior.^{30,31} Enhancing individuals' self-efficacy levels could be beneficial to their behavior change.

Four major sources influence the individuals' self-efficacy, including performance accomplishments, vicarious experience, verbal persuasion, and emotional arousal^{28,29,32} (Fig. 2). Performance accomplishments are relevant to individuals' own experience as the most important and

reliable source. Vicarious experience refers to the observation of others, by observing one example's successful performance can increase the individuals' confidence in believing they could achieve the performance. Led by persuasive verbal suggestions and instructions, individuals can be convinced that they can successfully perform behaviors. Emotional arousal is related to individuals' experience of physiological sensations. The negative or positive emotional status would impact an individual's self-efficacy.

Meanwhile, cognitive processing also plays a vital role in enhancing self-efficacy. Only through cognitive processing these four main sources can influence self-efficacy.^{28,29,32} Hence, providing support from these four sources and helping individuals build valid cognition could be conducive to improving self-efficacy.

Constructing self-efficacy enhancing intervention strategies

Considering the direct influence of self-efficacy on individuals' behavior and its indirect influence on behavior by affecting other key determinants in theory, we dictated that of our educational intervention, enhancing rural females' cervical cancer screening self-efficacy should be stressed as the core purpose. The four primary sources of individual self-efficacy were applied as the skeleton for our intervention strategies' construction. Based on this skeleton, we reviewed relevant previous studies to develop specific intervention strategies. Ultimately, lecture, the teach-back strategy, group discussion, simulation-based learning, and experience sharing were applied in our educational intervention.

The lecture was the primary part of each educational session, which aimed to provide relevant information and knowledge for participants and served as the central format of verbal persuasion in our intervention for enhancing participants' relevant self-efficacy. The teach-back strategy is a structural educational method of knowledge recall, which could promote participants' related knowledge level, adherence, and self-efficacy.^{33,34} During knowledge recall, the intervener's check and correction and other participants' performance could serve as verbal persuasion and vicarious experience to enhance the participants' related self-efficacy. Group discussion was arranged in all sessions. During the discussion, participants could share perceptions and learn from each other, and this could enhance their self-efficacy through verbal persuasion and vicarious experience. Previous studies showed that simulation-based learning contributed to rising participants' relevant self-efficacy levels from all four sources: experience accomplishments, vicarious experience, verbal persuasion, and emotional arousal^{35–37}. In our intervention, simulation-based learning was arranged through model display and role-play. A uterine model was adopted to exhibit healthcare professionals' operation of cervical cancer screening. Role-play was arranged to let participants experience seeking and obtaining cervical cancer screening-related services in their local healthcare facilities. Experience sharing would be conducted in the video screening format to enhance participants' self-efficacy through vicarious experience.²⁸ Three rural females with regular cervical cancer screening behavior were invited to record short videos to share their perceptions, feelings, and experiences of cervical cancer screening.

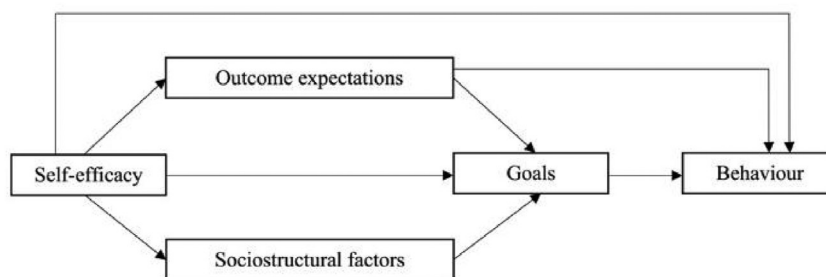


Fig. 1. Structural paths of influence between self-efficacy, outcome expectations, goals, and behavior.

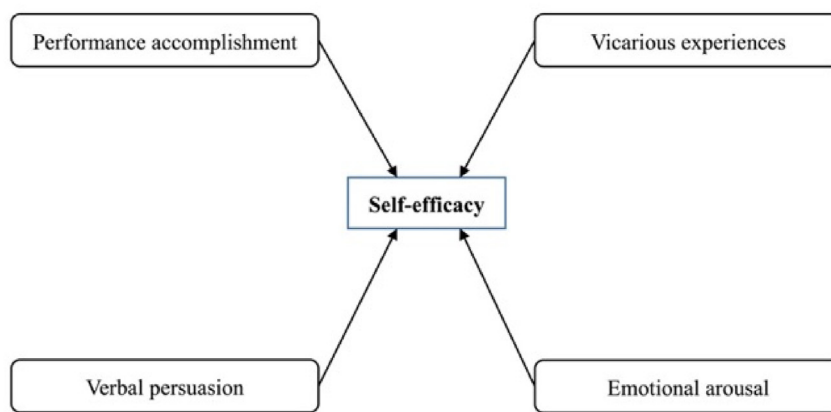


Fig. 2. Four major sources of information that influence self-efficacy.

Stressing the influence of other determinants for behavior change

Considering the influence of other vital determinants showing on individuals' behavior, in our educational intervention, enabling participants to build relevant outcome expectations, become familiar with utilizing facilitators and overcome barriers around the environment, and set up goals for cervical cancer screening was also significant. For application, the benefits of cervical cancer screening would be explained to help participants build related outcome expectations. Then, about facilitators and impediments, available health resources would be introduced for rural females' utilization. Barriers to their screening would be discussed, and overcoming strategies would also be provided. All contents of the educational intervention were designed to realize rural female participants' awareness and help them set goals of completing cervical cancer screening.

Developing evidence-based and culture-tailored intervention contents

Developing the five educational sessions

Contents of the total five educational sessions were developed based on evidence. Meanwhile, culture adaptation was also applied. The content range was identified from evidence, mainly covering basic information about cervical cancer screening, available cervical cancer screening-related resources, and common barriers to cervical cancer screening and overcoming methods.³⁸ Given the cultural influences, all involved contents were tailored according to the contexts of rural areas of China. Considering the content of the curriculum design, we divided all content into the first four sessions on average. In the final fifth session, we designed it as a review session aimed at reviewing and recalling the content of four sessions. The expert panel would evaluate the educational

Table 1

Details of the five educational sessions of the theory-driven, culture-tailored, community-based educational intervention.

Session	Objectives	Content and process	Materials	Teaching strategy
Session 1	<ul style="list-style-type: none"> > Participants can know the basic information about cervical cancer and screening > The relationship between participants and researchers can be built 	<ul style="list-style-type: none"> > Subgroup distribution > Introducing the curriculum of the educational sessions > Introducing basic information about cervical cancer > Answering questions > Quiz section 	<ul style="list-style-type: none"> > Slides > Brochure 	<ul style="list-style-type: none"> > Lecture > Group discussion > Teach-back strategy
Session 2	<ul style="list-style-type: none"> > Participants can understand the necessity of cervical cancer screening > Participants can experience the process of receiving cervical cancer screening by model display 	<ul style="list-style-type: none"> > Review the last session > Introducing different cervical cancer screening methods > Demonstrating the operation process of cervical cancer screening by model display > Answering questions > Quiz section 	<ul style="list-style-type: none"> > Slides > Brochure > Uterine model 	<ul style="list-style-type: none"> > Lecture > Group discussion > Model display > Teach-back strategy
Session 3	<ul style="list-style-type: none"> > Participants can understand the benefits of cervical cancer screening > Participants can be encouraged by others' experience with cervical cancer screening 	<ul style="list-style-type: none"> > Review the last session > Introducing benefits of screening > Experience sharing of receiving screening from rural females > Answering questions > Quiz section 	<ul style="list-style-type: none"> > Slides > Brochure > Video 	<ul style="list-style-type: none"> > Lecture > Video screening > Experience sharing > Group discussion > Teach-back strategy
Session 4	<ul style="list-style-type: none"> > Participants can be clear about the local cervical cancer screening-related resources > Participants can understand how to utilize available cervical cancer screening services 	<ul style="list-style-type: none"> > Review the last session > Introducing the local cervical cancer screening program and services > Introducing utilizing family and community support to overcome barriers to screening > Experiencing the process of receiving cancer screening services in local healthcare facilities 	<ul style="list-style-type: none"> > Slide > Brochure 	<ul style="list-style-type: none"> > Lecture > Group discussion > Role-play > Teach-back strategy
Session 5	<ul style="list-style-type: none"> > Participants can review the critical points of the whole sessions > Participants can complete questionnaires for this study 	<ul style="list-style-type: none"> > Review previous sessions > Answering questions > Completing questionnaires of study 	<ul style="list-style-type: none"> > Slides > Brochure 	<ul style="list-style-type: none"> > Lecture > Group discussion > Teach-back strategy

sessions. The expert panel consisted of two nurse leaders of gynecological cancer, one doctor who specialized in cervical cancer, and one medical director in a local rural hospital. Then, targeted modification was applied. [Table 1](#) shows the overview of the five sessions. A comprehensive introduction to the five sessions is provided in [Appendix A](#).

Developing the supporting educational materials

Evidence showed that audiovisual materials (including videos, films, and movies) and reading materials (including brochures, pamphlets, booklets, and leaflets) were commonly used as supporting materials for³⁸ knowledge delivery.³⁸ Our study used multiform-combined educational materials, including slides, videos, and brochures. Similarly, all materials were developed in an evidence-based and culture-tailored pattern. The expert panel would also evaluate these materials.

Five kits of slides were used for five sessions. Each pack of slides was designed based on the different contents and objectives of the session. A brochure was used as a participants' manual in all five sessions. Based on the evidence, the brochure's content would also cover the basic information on cervical cancer and the screening, psychological issues, barriers and strategies to overcome them, and locally available resources. To accommodate the rural Chinese contexts, the brochure was culture tailored. We designed three fictitious different rural Chinese female characters (Mrs Wang, Mrs Li, and Ms Liu) and used their cervical cancer screening-related stories as examples throughout the whole brochure. Mrs Wang represented a middle-aged rural Chinese female with a positive attitude toward cervical cancer screening. Mrs Li represented a rural Chinese female who was unclear about cervical cancer and felt unnecessary about the screening. Ms Liu represented the young rural Chinese female who was also unclear about cervical cancer and the screening but showed a positive attitude toward learning more about these. Videos were used for the experience-sharing strategy. As introduced above, three representative rural females were the protagonists of the videos to share their experiences, feelings, and perceptions of insisting on cervical cancer screening. Considering to be culture-appropriate and easy-understood, protagonists could freely choose to use dialect or Putonghua. Meanwhile, all videos were edited with Putonghua subtitles.

WeChat application is a popular mobile phone social network platform that shows welcome in mainland Chinese areas. Therefore, to be culturally appropriate, all supporting materials used in our study would be uploaded onto WeChat with E-version for participants' review.

Phase II: Conducting a feasibility and pilot study

Study design

This feasibility and pilot study used a quasi-experimental study with the two-arm parallel nonrandomized control trial design followed by individual semi-structured interviews. This study involved two groups: the intervention group receiving the educational intervention and the control group receiving the usual care (cervical cancer screening-related public health education and promotion) from the local healthcare facilities.

Semi-structured interviews were aimed at receiving participants' feedback on the intervention. All 15 participants in the intervention group were invited and completed the interviews, while the principal investigator conducted all interviews. Content analysis was adopted to analyze the interview results and conclude themes about participants' experiences and feelings about this educational intervention.

Study setting and participants recruitment

The study was community-based and conducted in two administrative villages of Shandong Province, mainland China. Convenience sampling was adopted for participants' recruitment. The research team first connected the directors of two villages, with one village as the intervention group site and one as the control group site. We chose two

villages with similar socioeconomic backgrounds to guarantee comparability among groups. Then, after obtaining the directors' agreement, researchers came to villages to recruit participants. Local healthcare professionals helped to recommend rural females who met the following criteria: (1) not being pregnant; (2) not having a medical diagnosis of any serious physical illness, mental disorders, or cognitive disorders; (3) not having difficulties with verbal expression or communication; and (4) without any cervical cancer screening within 3 years. Phone call invitations and poster promotion were adopted to recruit these rural females who got recommended. The inclusion criteria were as the followings: (1) aged 25–64 years; (2) settled in rural areas with permanent registered rural residence; (3) having experience in sexual activities; and (4) without an existing or previous diagnosis of cervical cancer nor a prior hysterectomy. Informed consent was obtained after rural females agreed to participate.

As suggested, a sample size of 12 participants per group would be adequate for preliminarily estimating the effect size in a pilot study.³⁹ Allowing for some attrition, a total of 30 participants were targeted to recruit, with 15 rural females in each group.

Intervention and control

Both participants in the intervention and control groups were exposed to the usual care about cervical cancer screening promotion from the local clinics, while participants in the intervention group additionally received the educational intervention as developed.

Outcome measurements

The feasibility, acceptability, and preliminary effects of this intervention were evaluated in this study. The feasibility of the intervention was evaluated by the participants' recruitment, retention, and compliance level. The acceptability of the study was summarized by collecting participants' feedback on the intervention.

The intervention aimed to promote cervical cancer screening among rural populations. Regarding the outcome variables, participants' cervical cancer screening self-efficacy and knowledge were included in the evaluation. Due to the time limitation of this study, the follow-up data collection was only conducted immediately after the intervention was completed (at the end of the final session). Considering the short period of the study duration (a total of 5 weeks) and the complicity of human behavior change,²⁸ we did not assess participants' cervical cancer screening uptake behavior in this study. We chose participants' intention of completing the screening as one outcome variable. Meanwhile, whether the participants made appointments to receive cervical cancer screening was also evaluated. Therefore, the preliminary effects of the intervention were evaluated through participants' cervical cancer screening self-efficacy, knowledge, intention, and appointment behavior.

Feasibility

Recruitment and retention. The recruitment of this study was evaluated from the average number of recruited participants per day and the enrollment of all eligible females. The retention rate of the study was evaluated from the proportion of participants who completed the study.

Adherence. The adherence of each participant was evaluated from the following aspects:

1. The number of sessions each participant completed.
2. The duration each participant stayed during each session.
3. The participants' self-reported frequency and duration of reviewing supporting materials each participant completed after each session.

Acceptability. Participants' acceptability of the intervention was evaluated through individual telephone interviews. A semi-structured interview guide developed based on the previous study⁴⁰ was used to collect participants' perceptions and experiences of the intervention. Questions were about barriers and facilitators to participating in this intervention, the most and least favorite part of the educational intervention, the most and least valuable part, and participants' comments and suggestions.

Preliminary effects

In evaluating the intervention's preliminary effects, the outcomes included participants' screening-related self-efficacy, knowledge, and intention in this study.

Self-efficacy. Participants' self-efficacy in completing cervical cancer screening was assessed by the Chinese version of the Cervical Cancer Screening Self-Efficacy Scale.⁴¹ The Cronbach's α of this scale was 0.934.⁴¹ This scale was a 5-point Likert scale revised from the original English version,⁴² including 16 items, with the overall score ranging from 16 to 80. Higher scores indicate lower self-efficacy levels.

Knowledge. A self-developed questionnaire was adopted to evaluate participants' cervical cancer screening-related knowledge. The questionnaire was developed according to this intervention's educational components and contents, referencing previous studies. A total of 10 items were included in the questionnaire, with each item scoring one point for the correct answer. The whole questionnaire scored from 0 to 10.

Intention and appointment behavior. Participants' intention of receiving cervical cancer screening and their behavior of making appointments for cervical cancer screening was assessed by one question, respectively. They were required to choose the answer from "Yes," "No," and "Not sure/Not yet."

Data collection

After participants agreed to participate in the study and signed the hard copies of the informed consent, their sociodemographic information, cervical cancer screening history, self-efficacy, knowledge, intention, and appointment behavior of cervical cancer screening were collected before the educational sessions started. Regarding the follow-up measurement, immediately after the last session ended, participants' self-efficacy, knowledge, intention, and appointment behavior of cervical cancer screening were collected again. Self-report questionnaires in E-versions were adopted to collect data.

During the week after the last session was completed, all 15 intervention group participants were invited to have individual semi-structural interviews to collect their feedback on this educational intervention.

Data analysis

IBM SPSS 26.0 (IBM Corp. Armonk, NY) was used to analyze the quantitative data. Descriptive statistics, such as mean (standard deviation) and frequency (percentage), were used to describe participants' sociodemographic information and cervical cancer screening history and the outcome measures of self-efficacy, knowledge, and intention of cervical cancer screening. Wilcoxon signed-rank test and Mann-Whitney test were used to compare the within-group change and between-group difference in levels of self-efficacy and knowledge. Hedges' g effect sizes (with 95% confidence intervals) were estimated based on the self-efficacy and knowledge change scores between the two groups. For the binary outcome of the intention of cervical cancer screening (Yes vs No/unsure), Fisher's exact test was used to make a between-group comparison, and the risk ratio (with a 95% confidence interval) was calculated to

estimate the effect size at baseline and postintervention. All statistical tests were two-sided, with a level of significance set at 0.05. The qualitative data from interviews, including participants' feedback on the intervention, were analyzed by content analysis.

Ethical considerations

The study received ethics approval from the Joint Chinese University of Hong Kong-New Territories Easter Cluster Clinical Research Ethical Committee (IRB No. 2021.618). Informed consent, anonymity, and voluntary participation and withdrawal were ensured.

Results

Characteristics of participants

In February 2022, 30 rural females were involved in this study. Table 2 shows the sociodemographic information of all 30 participants. No statistically significant differences between intervention and control groups regarding sociodemographic information were found. Thirty rural females aged between 26 and 64 years, and the mean age was 43.70 (± 11.45) years. Most participants (28, 93.3%) were married, and only five (16.7%) had no children. More than half of the participants (19,

Table 2
Sociodemographic information and cervical cancer screening history of participants (N = 30).

Factors	Intervention group (n = 15)	Control group (n = 15)	P-value
Age (years)	41.20 \pm 2.82	46.20 \pm 3.04	0.238
Marital status			
Single	2 (13.3%)	0 (0.0%)	0.483
Married	13 (86.7%)	15 (100.0%)	
Number of children			
0	3 (20.0%)	2 (13.3%)	≈ 1
1	5 (33.3%)	6 (40.0%)	
≥ 2	7 (46.7%)	7 (46.7%)	
Duration of settlement in the village (years)			
≤ 10	1 (6.7%)	3 (20.0%)	0.324
11–15	5 (33.3%)	2 (13.3%)	
≥ 15	9 (60.0%)	10 (66.7%)	
Educational level			
Junior high school or below	2 (13.3%)	3 (20.0%)	≈ 1
Senior high school	10 (66.7%)	9 (60.0%)	
Junior college education	2 (13.3%)	1 (6.7%)	
University/college or high	1 (6.7%)	2 (13.3%)	
Employment			
Staff of companies	7 (46.7%)	4 (26.7%)	0.341
Self-employed laborer	1 (6.7%)	3 (20.0%)	
Famer	1 (6.7%)	0 (0.0%)	
Housewife	6 (40.0%)	6 (40.0%)	
Retired	0 (0.0%)	2 (13.3%)	
Monthly incomes per capita (CNY)			
≤ 3000 (about 445 USD)	5 (33.3%)	9 (60.0%)	0.328
3001–5000 (about 445–740 USD)	8 (53.3%)	4 (26.7%)	
> 5000 (about 740 USD)	2 (13.3%)	2 (13.3%)	
Have a medical insurance			
Yes	15 (100.0%)	15 (100.0%)	
No	0 (0.0%)	0 (0.0%)	
Have religious belief			
Yes	0 (0.0%)	2 (13.3%)	0.483
No	15 (100.0%)	13 (86.7%)	
Screening behavior history			
Never have screening before	8 (53.3%)	5 (33.3%)	0.620
Once, before 3 years or longer	5 (33.3%)	7 (46.7%)	
≥ 2 , before 3 years or longer	2 (13.3%)	3 (20.0%)	

63.3%) settled in the local villages for over 15 years. The educational level of participants varied from primary school to university/college or higher. Most participants (19, 63.3%) had senior high school education levels. Most participants were housewives (12, 40.0%) or worked as company staff (11, 36.7%). Participants' monthly incomes varied, with most participants (26, 86.7%) having less than 5000 RMB (about 740 USD). All participants had medical insurance. Only two participants (6.7%) had religious beliefs.

No statistically significant differences were found between intervention and control groups regarding the screening behavior history. More than half of the participants (17, 56.7%) used to have cervical cancer screening 3 years ago or more. Meanwhile, all these participants with screening history reported that their last screening showed normal. Regarding why they discontinued regular screening, among these 17 participants, 11 reported they did not feel the need to continue because their last cervical cancer screening results were normal. Four reported that they paid the screening fees by themselves. Since they did not get abnormal results, they did not want to spend money on screening again. Two reported they were busy working and had no time to pay attention to screening.

Feasibility

Recruitment and retention. A total of 47 eligible rural females were reached, and 30 rural females agreed to participate and signed the informed consent. The enrollment rate was 63.8%. Among the 17 rural females who did not participate, 11 refused to participate because they were immigrant workers and would not stay in their villages during this study duration, four refused because of no interest, and two refused because of not having sexual experiences. These 30 rural females were recruited for this study in 5 days, with an average of six rural females being recruited daily. All these 30 participants completed the baseline follow-up measurement of the study.

Adherence

The number of sessions each rural female completed. We found that 13 participants in the intervention group (86.7%) participated in all five sessions, while two (13.3%) only attended four sessions. These two participants dropped out of sessions because they did not have enough time, with one reporting being busy with housework and the other busy taking care of her grandchild.

The duration of each session that each rural female participated. The first session lasted 58 min and was the longest of all five sessions. The second session was 47 min, the third was 50 min, the fourth was 52 min, and the fifth was 49 min. Generally, the participants could finish the whole single session.

The frequency and duration of reviewing educational materials each rural female completed after each session. The frequency and duration that participants reviewed educational materials were calculated according to participants' self-report. Eight participants in the intervention group (53.3%) reported that they did not review educational materials after each session ended, and five participants (33.3%) only read the brochures once after the first session, no longer than 10 min. Two participants (13.3%) read the brochures once and watched the audiovisual materials on WeChat after the first session, no longer than 10 min.

Preliminary effects of the educational intervention

Cervical cancer screening self-efficacy and knowledge. Table 3 shows the pre- and postintervention self-efficacy and knowledge levels among participants. At baseline, the cervical cancer screening self-efficacy level of participants in the intervention and control group showed no statistically significant difference ($P = 0.428$). After the intervention,

Table 3

Cervical cancer screening self-efficacy and knowledge of participants ($N = 30$).

Variables	Intervention group ($n = 15$)	Control group ($n = 15$)	P -value ^a	Effect size ^c (95% CI)
Self-efficacy				
Baseline	55.00 ± 7.32	52.60 ± 8.94	0.428	2.93
Post-intervention	31.53 ± 8.90	54.87 ± 6.94	< 0.001	(1.90–3.95)
P-value^b	< 0.001	0.444		
Knowledge				
Baseline	4.73 ± 1.39	5.47 ± 1.41	0.162	2.91
Post-intervention	8.27 ± 1.03	5.07 ± 1.16	< 0.001	(1.88–3.94)
P-value^b	< 0.001	0.403		

^a Between-group comparison by using Mann–Whitney test.

^b Within-group comparison by using Wilcoxon signed rank test.

^c Hedges'g effect size estimated based on the change score between the two groups.

participants of the intervention group showed a more significant reduction in the self-efficacy score ($P < 0.001$, a lower score indicates a higher level of self-efficacy) than participants of the control group (effect size = 2.93, 95% CI: 1.90–3.95, $P < 0.001$). At baseline, participants' cervical cancer screening-related knowledge levels in the intervention and control group showed no statistically significant difference ($P = 0.162$). After the intervention, the knowledge level of participants of the intervention group increased ($P < 0.001$) and was significantly higher than that of participants of the control group (effect size = 2.91, 95% CI: 1.88–3.94, $P < 0.001$).

Regarding the results of all 16 items in the self-efficacy scale, at baseline, the first three items with the highest average scores among all 30 rural female participants were as the following. "If I do not have any uncomfortable feeling with my vagina, I still choose to receive cervical cancer screening"; "If I am undergoing some medical treatment, I still choose to receive cervical cancer screening"; and "If I choose to receive cervical cancer screening, I need to hire someone to take care of my child/grandchild at the same time." The highest scores represented the lowest level of self-efficacy.

Meanwhile, regarding the results of all ten items in the knowledge questionnaire, at the baseline, the first three items with the lowest average scores among all 30 participants were "Generally for the healthy women, how often should she receive once cervical cancer screening at least"; "What is the main symptom of cervical cancer"; and "What is the commonly adopted method for cervical cancer detection." The lowest scores represented the lowest appropriate knowledge level. About the question "what is the main symptom of cervical cancer" most participants ($n = 9$, 30.0%) chose the wrong answer "menorrhagia." Regarding the question "For a healthy woman, how often should she receive once cervical cancer screening at least," only a few participants ($n = 2$, 6.7%) responded rightly.

Cervical cancer screening intention and appointment behavior. Table 4 shows participants' pre- and postintervention intention for completing cervical cancer screening. At baseline, the proportion of participants' willingness to receive cervical cancer screening in the intervention and control group showed no statistically significant difference ($P = 0.651$). After the intervention, a significantly higher proportion of participants were willing to receive screening in the intervention group than those in the control group ($P = 0.003$).

Table 5 shows participants' pre- and postintervention appointments for cervical cancer screening. At baseline, the proportion of participants who had already made an appointment to receive cervical cancer screening in the intervention and control group showed no statistically significant difference ($P = 0.598$). After the intervention, no statistically significant between-group difference could be found in the proportion of participants' appointment behavior ($P \approx 1$).

Table 4
Cervical cancer screening intention of participants (N = 30).

Variables	Intervention group (n = 15)	Control group (n = 15)	RR (95% CI)	P-value
Intention				
Baseline				
Yes, willing to receive	2 (13.3%)	4 (26.7%)	0.50	0.651
I am not sure/No, I do not want	13 (86.7%)	11 (73.3%)	(0.11–2.33)	
Post-intervention				
Yes, willing to receive	13 (86.7%)	5 (33.3%)	2.60	0.003
I am not sure/No, I do not want	2 (13.3%)	10 (66.7%)	(1.24–5.46)	

RR: risk ratio.

Table 5
Appointment behavior of participants (N = 30).

Variables	Intervention group (n = 15)	Control group (n = 15)	RR (95% CI)	P-value
Appointment				
Baseline				
Yes, already made	1 (6.7%)	3 (20.0%)	0.33	0.598
Not yet/Not want to have screening	14 (93.3%)	12 (80.0%)	(0.04–2.85)	
Post-intervention				
Yes, already made	3 (20.0%)	4 (26.7%)	0.75	≈1
Not yet/Not want to have screening	12 (80.0%)	11 (73.3%)	(0.20–2.79)	

RR: risk ratio.

Acceptability

Table 6 shows themes and relevant quotations of participants' feedback on the newly developed educational intervention. Three participants in the intervention group (20.0%) mentioned the time arrangement as the barrier to participating in this intervention. They reported they "felt tired of having long sessions at weekends." About the facilitators, participants who signed up for the study on their initiative mentioned they used to hear about cervical cancer screening but did not receive any types of screening. Hence, they hoped to learn more about it to decide between completing the screening.

Regarding the most favorable part, more than half of the participants in the intervention group (9, 60.0%) mentioned the role-play about experiencing the process of receiving cancer screening services in local healthcare facilities. One participant (6.7%) admitted, "I disliked group discussion because I did not know what I should say." Regarding the most valuable part, six (40.0%) participants proposed the role-playing part, and four (26.7%) participants reported that they believed the "video about experience sharing was most helpful. This could help me to decide on receiving screening myself." Nine (60.0%) participants mentioned they hoped to use the hard copies of questionnaires because they thought completing the E-form of the questionnaire on mobile phones was too complex and troublesome. They felt tired of reading words on mobile phones.

All participants felt helpful and excited about participating in the intervention. They said they like the form of a group session and like to learn new knowledge with their companions. After completing the educational sessions, they mentioned they would like to share the information they learned with their families and friends.

Discussion

This two-phase study developed and evaluated the feasibility and preliminary effects of a theory-driven, culture-tailored, community-based educational intervention for promoting cervical cancer screening among rural populations. To the best of our knowledge, this study was the first evidence-based and culture-tailored educational intervention on

Table 6
Feedback of the intervention from participants.

Aspect	Theme	Quotations from participants
Barriers/facilitators to participate	Time arrangement	"I felt a little bit tired of having long sessions at weekends". "Sometimes I did not want to come here because I want to enjoy rest at weekends".
	The demand for related knowledge	"I saw the poster, and I would like to learn about cervical cancer." "In our age, health is an important issue. I should learn some knowledge to know how to keep healthy."
Perception	Different orientations on session components	"I really enjoyed role-playing. It was like a game and gave us a chance to experience it all by ourselves." "I liked watching the video. It helped me to know how my peers' decisions on screening." "For me, I did not like group discussion, to some extent. Sometimes I just keep silent because I did know what I should say."
		Satisfaction
Satisfaction	Helpful and interesting about the sessions	
	Difficult to complete E-form questionnaires	

cervical cancer screening for rural Chinese females.

In Phase I, this educational intervention was successfully developed, driven by the social cognitive theory. This theory was proven effective in promoting health behavior change.⁴³ Our intervention was organized based on the critical components of this theory. Inspired by the function and relationship among these components, we first constructed the intervention strategies' skeleton. In designing the detailed strategies, enhancing self-efficacy (one core determinant of the social cognitive theory) was the center of the relevant development. Therefore, the development of our educational intervention contributed to the application of this theory in healthcare practices in rural health. The theory-driven intervention development was a bright spot.

Meanwhile, another advantage of this newly developed educational intervention was the applying rural females-targeted and culture adaptation content. Previous studies emphasized that developing interventions for the rural populations, being targeted and culturally appropriate, was essential.^{1,19,44} About the educational contents' development in our intervention, first, to guarantee the contents could be rural females targeted, we reviewed relevant studies specifically focused on rural females to conclude the evidence for determining the contents' range. Based on the content range, we developed the specific content for each session and supporting materials and used previous relevant studies as references. Meanwhile, we applied culture adaptation to the content by combining real-world settings and cultural elements in rural Chinese contexts.

Regarding Phase II, results demonstrated that conducting group educational sessions about cervical cancer screening among rural females was feasible. Thirty participants (including six volunteers) were recruited within 5 days of this educational intervention. The recruitment result revealed that this educational intervention was attractive to rural females. Regarding the intervention retention and attrition rate, a previous

study reported that at least 80% of all participants could finish the intervention was considered acceptable.⁴⁵ In this phase, we found that the retention rate of five sessions could reach over 80%. Therefore, this intervention could be regarded as acceptable and relevant to the needs of rural females. However, some minor adjustments should be refined for the future main study. First, in this study, we did not set up in-session breaks, but some participants needed rest, which resulted in some not completing some sessions thoroughly.

Meanwhile, some participants mentioned the barriers to participating in weekly educational sessions: “feel tired to have a long session.” This reminded us to control the duration of each session appropriately and arrange in-session breaks. Another issue was about the after-session review. The results showed that the frequency and duration of reviewing educational materials each rural female completed after each session were unsatisfactory. This indicates that reviewing supporting materials after sessions should be emphasized during the main study to facilitate retention and reinforcement of participants’ knowledge and information gained in the intervention.

This study evaluated participants’ self-efficacy, knowledge, and intention of cervical cancer screening as outcomes of the intervention’s preliminary effects. Comparing the pre- and postintervention results between intervention and control groups, we found that participants’ self-efficacy and knowledge of cervical cancer screening showed statistically significant positive changes. A previous study showed that self-efficacy was a vital factor influencing cervical cancer screening behavior.⁴⁶ Meanwhile, their cervical cancer screening-related knowledge was deficient.⁴⁷ The educational intervention in this study was a theory-driven program developed based on the social cognitive theory. Self-efficacy is one core component of the theory,^{30,31} while enhancing participants’ screening-related self-efficacy was one of the aims of this intervention. Hence, the self-efficacy of cervical cancer screening among rural females in the intervention group could increase after the completed educational sessions. A possible reason participants’ knowledge level improved might be relevant to the various educational strategies involved in sessions. Considering the limited educational background and health literacy among rural populations,⁴⁸ group discussion and teach-back strategies were designed to adopt during the intervention development in each session. These teaching strategies helped strengthen participants’ understanding and assimilation of the educational content.³³

Additionally, the single item’s self-efficacy and knowledge questionnaires score demonstrated that rural females’ understanding of cervical cancer was significantly inadequate. They were not clear about the significant symptom of cervical cancer. Therefore, their judgment of whether they need a cervical cancer-related examination or how often they should receive one examination mainly depended on their feelings and judgment of their gynecological health status. For instance, they believed that not having uncomfortable feelings about the vagina meant no need for screening. They tended to give up screening when they met some time or financial barriers. The results indicated that detailed and comprehensive explanations of cervical cancer screening should be emphasized for implementing relevant health education in the future. Although some relevant information tended to be like the “common sense,” for example, the main symptom of cervical cancer, for rural females, they still did not understand.

Rural females’ intention to receive cervical cancer screening improved after they completed educational sessions. The results showed that the postintervention proportion of rural females willing to receive screening in the intervention group improved and was statistically higher than that of the control group. However, although the intention improved, no statistically significant changes were found in participants’ cervical cancer screening-related behavior. During the study period, no rural females reported making appointments of receiving the screening. The following two reasons could explain this. First, this study was a pilot study with only 30 participants involved, and the outcomes were only evaluated once after the intervention was completed. The limited sample

size and study duration might influence the evaluation of behavior-change outcomes.⁴⁹ Therefore, the effectiveness of this educational intervention in increasing the uptake rate of cervical cancer screening among rural females still needs to be estimated in future studies.

Meanwhile, individual behavior change was a complex process.²⁹ A previous study proposed an “intention-behavior gap,” explaining why individuals could have the behavior-change intention but fail to fulfill it.⁵⁰ This indicated that researchers should stress the importance of “taking action” in the educational sessions and focus on participants’ behavior change rather than the intention change only.⁵¹

Limitations

This study had several limitations. First, we only recruited rural females from one province. Considering the comparability of healthcare resources for cervical cancer screening among provinces, findings of this study may not generalize to other rural areas of the country, especially to some extraordinarily remote and low-developed rural areas. Second, we used the self-developed questionnaire to evaluate participants’ knowledge levels. There might be some potential biases, such as social desirability bias. Third, only participants’ screening intention was assessed in this pilot study for timesaving. The effect of the intervention on cervical cancer screening uptake has not been preliminarily evaluated.

Research and clinical implication

In this study, we developed a theory-driven, culture-tailored, community-based educational intervention on cervical cancer screening targeted at rural females in mainland China. To the best of our knowledge, this was the first study that applied the social cognitive theory for intervention development in rural females’ cervical cancer screening in China. In addition, this intervention was culturally tailored, which was appropriate for implementation in Chinese rural contexts.

The results of this study proved that this educational intervention was well-designed, with a high level of satisfaction and acceptance among rural Chinese females. The preliminary effects evaluation demonstrated that this intervention could be influential in improving rural cervical cancer screening prevention to some extent. Hence, this educational education could be promoted in rural mainland China to bridge the urban-rural disparities of cervical cancer screening and disease control.

However, several limitations were identified during the implementation of this study. For future practice, based on the feedback from this feasibility and pilot study, this educational study could be further optimized. Meanwhile, a large-scale interventional study on evaluating more behavior-change-related outcome variables needs to be conducted to confirm the effectiveness and generalization of the intervention.

Conclusions

Cervical cancer prevention among rural females should be emphasized. The theory-driven, culture-tailored, community-based educational intervention targeting rural populations may promote cervical cancer screening. In addition, rural females involved in the educational sessions showed positive attitudes toward participation. These indicated that implementing this educational intervention could be feasible. Regarding the limited sample size and study duration of this pilot study, a large-scale interventional study with a prolonged follow-up duration is warranted to evaluate further and corroborate the effectiveness of this educational intervention.

Credit author statement

Mengyue Zhang: Conceptualization, Methodology, Investigation, Writing – Original draft preparation. **Janet W.H. Sit:** Writing – Reviewing and editing, Supervision. **Kai Chow Choi:** Formal analysis,

Writing – Reviewing and editing. **Carmen W.H. Chan:** Writing – Reviewing and editing, Supervision. All authors had full access to all the data in the study, and the corresponding authors had final responsibility for the decision to submit for publication. The corresponding authors attest that all listed authors meet authorship criteria and that no other meeting the criteria have been omitted.

Declaration of competing interest

The authors declare that they have no conflict of interest. The corresponding author, Prof. Carmen W.H. Chan, is an editorial board member of *Asia-Pacific Journal of Oncology Nursing*. The article was subject to the journal's standard procedures, with peer review handled independently of Prof. Chan and their research groups.

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Ethics statement

The study received ethics approval from the Joint Chinese University of Hong Kong-New Territories Easter Cluster Clinical Research Ethical Committee (IRB No. 2021.618). All participants provided written informed consent.

Data availability statement

Data can be achieved by contacting the authors.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.apjon.2023.100218>.

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