

The Effect of Comprehensive Sexual Education Program on Sexual Health Knowledge and Sexual Attitude Among College Students in Southwest China

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Abstract

The purpose of this study was to evaluate whether a comprehensive sexual education program for college students in Southwest China (a) improved sexual health knowledge in reproduction, contraception, condom use, sexually transmitted diseases, and HIV; (b) increased accepting attitudes toward lesbian, gay, bisexual, and transsexual individuals; and (c) altered participants' attitudes toward premarital sex and monogamy. The program used diverse teaching methods, providing 6 sessions over a period of 9 weeks about sexual health knowledge and sexual attitudes to college students (age 18-26 years) in Southwest China. Sexual health knowledge and sexual attitudes of 80 comprehensive sexual education class students (education group) and 92 general mental health education class students (control group) were measured at baseline, the end of course (posttest), and 3 weeks after the end of course (follow-up). There were significant effects of the program on (a) sexual health knowledge, including reproductive health, contraception, condom use, and HIV/AIDS and (b) positive attitudes toward sexual minorities, although these changes may require further reinforcement. In contrast, the program did not alter students' attitudes about premarital sex or monogamy. The results are discussed in terms of recommendations of sex education in China and future directions for research.

Keywords

health services evaluation, adolescent health, demography, social determinants of health, psychological/behavioral medicine, evaluation

A sexual revolution has been underway in China, particularly among youths, following the implementation of the “open door policy” and “one-child policy” in the late 1970s. Because of a lack of sexual education resources, however, rapid shifts in sexual attitudes and behavior have not been accompanied by similar changes in sexual health knowledge.^{1,2} As a result, unwanted

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pregnancy and sexually transmitted disease (STD) transmission are increasingly significant public health issues, and enhancing sexual health knowledge for young people has become an important goal.³ Attitudes toward sexual and gender minorities have also remained highly conservative, with homosexuality and transsexuality still largely regarded as shameful and abnormal.^{4,5} This broad social discrimination has serious psychosocial consequences for lesbian, gay, bisexual, and transsexual (LGBT) individuals.⁶ In contrast to the increased efforts to improve sexual health knowledge among the Chinese public, however, there have been limited attempts to decrease negative public attitudes toward sexual and gender minorities. In the present research, we examine the effects of a comprehensive sexual education program in mainland China on young people's sexual health knowledge and attitudes toward sexual and gender minorities.

Sexual Knowledge and Health in Contemporary China

Several surveys have shown that young people in China have very limited knowledge about reproduction, contraception, condom use, and HIV/AIDS.^{1,7,8} For example, only 36.5% of surveyed medical students and teachers in Shanghai knew when a condom should be put on.⁸ Among college students, 60% (especially young women) possessed serious misunderstandings regarding reproduction and contraceptives.⁷ Additionally, young people had an unreasonable fear of AIDS and possessed limited general and practical knowledge about STDs and HIV.⁹

In the absence of frank and fact-based information about reproductive health and sexual risk behavior, rates of STD transmission in China have increased dramatically. According to a recent UNAIDS report, there are currently an estimated 740 000 people living with HIV in China, and around 26 000 people died from AIDS in 2009.³ In addition, unwanted pregnancies and induced abortions have also increased. The number of abortions in China increased from 7.6 million in 2007 to 9.2 million in 2008. Such estimates are likely quite conservative, because they only incorporate abortions performed by hospitals and not those performed by private clinics. Furthermore, a growing number of unmarried women, especially students, have sought abortion services in recent years.¹⁰ For these reasons, sexual health has become recognized as an important public health issue, and methods to enhance sexual health knowledge among young people are urgently needed. Despite this imperative, teachers, policy makers, and education administrators continue to raise concerns about the potential of sexuality education to inadvertently increase permissive attitudes, sexual immorality, and adolescent sexual behavior, and they therefore avoid topics related to sexual health and contraception.^{2,9} The first goal of the present study was to reveal the potentially beneficial effects of a comprehensive sexual education program on sexual health knowledge among young people in China and to examine whether this program additionally affected permissive attitudes toward premarital and extramarital sex.

Sexual Attitudes in Contemporary China

Major changes in sexual attitudes and behavior among Chinese people have occurred in a relatively short period of time,¹¹ but coexist uneasily with strict, traditional views on sexual morality.⁵ Premarital sex is regarded as common among many young people. For example, whereas 10.7% of Beijing college students in 1991 reported engaging in premarital sex, this percentage increased in 2001 to 16.9%, and in 2006 rose to 32%.¹² Public attitudes toward extramarital sex have also changed, from strong and unconditional disapproval toward compassion and understanding under conditions of spousal death or forced marriages.^{5,13}

Despite the liberalization of some attitudes, other sexual mores have remained highly traditional. For example, homosexuality is still largely regarded as unacceptable.⁵ In one study

among Chinese college students in 2002, 78.6% of men and 66.4% of women reported a general disapproval of homosexuality.¹⁴ A study of the general population showed that 40% of respondents regarded homosexuality as “completely wrong.”¹⁵ Chinese people have also retained strong, negative attitudes toward transsexuals. In a recent cross-cultural comparison with Canada, for example, Chinese people in Hong Kong reported a substantially higher level of transphobia.⁴

The values of marriage, family, and familial duty are still emphasized by many aspects of Chinese society, as evinced by LGBT respondents’ experiences of stigmatization by peers, employers, and police. Moreover, as a result of the one-child policy, sexual and gender minorities often experience intense social and familial pressure to marry and procreate to protect the family reputation and lineage.¹⁶ The stigma, social isolation experienced, and secrecy adopted by LGBT individuals increase vulnerability to substance use and mental disorders.^{16,17} Additionally, the negative self-image and low self-esteem fostered by stigma may be positively related to sexual risk behaviors and a higher rate of STD transmission.¹⁸ Thus, the negative consequences of discrimination toward sexual and gender minorities represent a significant public health issue worldwide and can be reasonably expected to do so in China also.

Prior research suggests that educational experiences exploring the topic of sexual diversity can help to decrease negative attitudes toward LGBT individuals.¹⁹ Currently, a lack of open discussion about sexual diversity in Chinese society could contribute to discrimination and prejudice against sexual and gender minorities. In 2003, Fudan University in Shanghai launched the first Chinese graduate course on homosexuality, which invited renowned scholars and LGBT activists to give lectures. This course attracted a great deal of attention from university students, the gay community, and the domestic and international mass media.²⁰ The university administration stopped the course in 2004, however, because it was regarded as a negative influence on social mainstream culture, traditional values, and “government policy.” To date, however, no research has empirically studied the effects of educational efforts to increase positive attitudes toward sexual diversity among young people in China. The second aim of the present study was to explore the effects of a comprehensive sexual education program on understanding, awareness, and acceptance of LGBT individuals.

Prior Research on Education Program Study

To our knowledge, only a handful of studies have addressed the effects of interventions aimed at improving sexual health knowledge among young Chinese adults. For example, Wang and his colleagues conducted 3 studies examining the effects of community-based sex education on sexual health knowledge, safe sex practices, and sexual attitudes among unmarried youths aged 15 to 24 years in Shanghai. The results showed that sex education programs increased sex-related knowledge and actual use of contraception and condoms, decreased rates of unintended pregnancy, and increased males’ positive attitudes toward monogamy.^{2,21,22} Another intervention conducted in San Ming, a medium-sized city on the southeast coast of China, found that peer sex education increased students’ HIV-related knowledge and increased acceptance toward people living with HIV/AIDS.²³

The studies conducted to date share certain limitations. First, interventions have mainly focused on biological aspects of STDs/HIV and pregnancy prevention, but none have devoted additional attention to social acceptance of sexual and gender minorities. The present research is the first to examine whether a comprehensive sexual education program that addresses sexual diversity issues might increase acceptance of LGBT individuals among Chinese young adults.

Second, these studies were conducted in the same geographical region, focusing on wealthy cities on the East coast of mainland China, such as Shanghai and Fujian province. In contrast, no

attention has been devoted to inland cities that tend to be less economically advanced and more socially conservative. For this reason, the present study focused on Chongqing in Southwest China. Southwest China is notable because it contains the majority of reported HIV infections in China and a higher population of men who have sex with men.²⁴ This region also contains the largest municipality by population and area in China, which is an important industrial center and transportation hub. Chongqing, as the largest city in the Southwest region, has seen a steady increase in HIV prevalence, growing from 10.4% in 2006 to 12.5% in 2007 among men who have sex with men.¹⁶ Furthermore, individuals in the Southwest Chinese interior tend to hold more traditional cultural values than the relatively Westernized, coastal cities. The stronger negative attitudes toward sexual and gender minorities in this region may further complicate the seeking of health services, and efforts to encourage safer sex behavior, such as HIV/AIDS prevention behaviors.²⁵ This serious situation makes sexual knowledge and diversity education programs in this area highly important, but evidence for their efficacy remains scarce. The present research can thus provide an important first step in assessing receptiveness to sexual health and diversity education among young people in this region.

Finally, although most Chinese interventions to date have mainly used standard teaching methods such as lectures and assigned readings, they have tended to neglect methods aimed at promoting communication and interaction among students, and between teachers and students. In addition to basic teaching techniques, the present education program utilized diverse methods, including question and answer (Q&A), role-play, reflective essays, movies, and group presentations, which have not been used extensively in prior research. Therefore, these techniques can benefit not only the education practices but also the research literature.

Overview of the Present Study

This study examined the effects of a novel, comprehensive sexual education program in Chongqing, Southwest China. The comprehensive sexual education program was conducted as the first component of an undergraduate elective course on love, sex, and marriage at Southwest University. This program was comprehensive in the sense that we not only promoted abstinence as the most effective way to prevent pregnancy and STDs but also conveyed accurate and appropriate sexual information about contraception, condom use, and STDs (including HIV/AIDS). Additionally, certain modules of the course focused on human sexual relationships and diversity in the world. Providing this information allows individuals to make responsible decisions about sexual activity, and encourages respect for all forms of human sexuality. We designed the education components from a social learning theory (SLT) perspective.²⁶ According to SLT, individuals imitate or model specific behaviors exhibited by others. SLT has been successfully applied to many areas of health education, including tobacco use prevention, substance abuse prevention, and violence prevention.²⁷ SLT is also particularly well suited for pregnancy, STI/HIV, and risky sex behavior prevention programs.²⁸ SLT predicts that adolescents and young adults will be better able to avoid negative sexual outcomes if education programs give them a chance to both observe health-promoting behaviors and to further practice these behaviors through imitation and role-playing exercises with knowledgeable teachers and peers.^{29,30}

Based on prior empirical studies and our theoretical framework, we investigated whether this education (*a*) improved sexual health knowledge in reproduction, contraception, condom use, STDS, and HIV and (*b*) increased accepting attitudes toward LGBT individuals. Furthermore, to address concerns of Chinese government officials and school administrators that sexuality education may indirectly increase people's permissive attitudes regarding premarital and extramarital sexual behavior, we also examined whether the education program altered participants' attitudes in these respects.

Method

Participants

Participants ($N = 172$) were recruited from 2 undergraduate courses at Southwest University in Chongqing. Students who enrolled in the course “Love, Sex and Marriage Psychology” served as the experimental group ($n = 80$), and students who enrolled in a “General Mental Health Education” course served as the control group ($n = 92$). Both courses took place in the spring semester of 2011. Participants ranged in age from 18 to 26 years ($M = 20.30$ years, $SD = 1.27$). Because students self-enrolled in one course or the other, instead of being assigned randomly, we examined the 2 groups for potentially important differences. The groups differed significantly in age, $\chi^2(1) = 32.86$, $P < .001$, with the experimental group ($M = 20.86$ years, $SD = 1.30$) being slightly older, on average, than the control group ($M = 19.80$ years, $SD = 1.02$). There were also significant gender differences, $\chi^2(1) = 16.24$, $P < .001$, with a larger proportion of males (57.5%) in the experimental group than in the control group (27.2%). There were also significant grade differences, $\chi^2(1) = 91.80$, $P < .001$, with larger proportion of year 3 (33.8%) in the experimental group than in the control group (0%) and smaller proportion of year 1 (0%) in the experimental group than in the control group (34.8%). Similarly, there were significant relationship experience differences, $\chi^2(1) = 12.67$, $P < .001$, with larger proportion of year 3 (33.8%) in the experimental group than in the control group (0%) and smaller proportion of year 1 (0%) in the experimental group than in the control group (34.8%). Similarly, there were significant relationship experience differences, $\chi^2(1) = 12.67$, $P < .001$, with a larger proportion of the experimental group having been in a romantic relationship (72.5%) than in the control group (45.7%). However, there were no significant differences between the groups regarding education major or whether they were from a rural or an urban area (Table 1).

Measures

Our primary variables of interest were various dimensions of sexual health knowledge (see Appendix A). We additionally examined 3 dimensions of sexual attitudes, namely premarital sexual permissiveness, attitudes toward extramarital sex, and attitudes toward sexual and gender minorities (see Appendix B). To fit with a Chinese context, these scales were revised through focus group interviews and by expert reviewers and then pilot tested in order to gain support for reliability and validity. Each of the measures described below were presented to students at 3 time points, including a baseline session before the beginning of the education, a posttest session immediately on completion of the education (6 weeks later), and a follow-up test at 3 weeks after the end of the respective courses, in order to examine whether students retained changes in knowledge and attitudes. These measures are described in more detail below.

Sexual health knowledge. We modified an existing sexual health knowledge scale developed for American college students,³¹ shown to have acceptable validity in prior research with undergraduate students.^{31,32} Based on our focus group interviews and expert reviews, the original 37-item measure was shortened to 27 items. These items assessed reproductive health knowledge (5 items, 0-5 score range; eg, “A small amount of sperm can be released prior to ejaculation”), contraception knowledge (5 items, 0-5 score range; eg, “After unprotected sex, more than 98% of women will not get pregnant if the emergency contraceptive pill is taken in the first 72 hours”), condom use (5 items, 0-5 score range; eg, “A condom should not be unrolled before putting it on a man’s penis”), STDs (6 items, 0-6 score range; eg, “Some kinds of sexually transmitted diseases don’t give you symptoms until 6 weeks or more after you catch the infection”), and HIV

Table 1. Demographic Profile of Study Participants at Baseline: Education and Control Groups.

	Total; n (%)	Treatment (Course A); n (%)	Control (Course B); n (%)
Total N	172	80	92
Age ^a in years (mean \pm SD)	20.30 \pm 1.27	20.86 \pm 1.30	19.80 \pm 1.02
Gender ^a			
Male	71 (41.3)	46 (57.5)	25 (27.2)
Female	101 (58.7)	34 (42.5)	67 (72.8)
Discipline			
Science	127 (73.8)	63 (78.8)	64 (69.6)
Art	45 (26.2)	17 (21.2)	28 (30.4)
Grade ^a			
Year 1	60 (34.9)	0 (0.0)	60 (65.2)
Year 2	85 (49.4)	53 (66.2)	32 (34.8)
Year 3	27 (15.7)	27 (33.8)	0
Relationship experience ^a			
No	72 (41.9)	22 (27.5)	50 (54.3)
Yes	100 (58.1)	58 (72.5)	42 (45.7)
Rural/urban area			
Village	99 (57.6)	41 (51.2)	58 (63.0)
City	73 (42.4)	39 (48.8)	34 (37.0)

^aSignificant difference in χ^2 test.

(6 items, 0-6 score range; eg, “You can get HIV/AIDS from heterosexual [penis/vagina] sex”). For each item, participants could answer *True*, *False*, or *Unsure*. Each item was scored with a “1” for correct responses and “0” for incorrect and unsure responses. Higher scores indicated greater knowledge. Cronbach’s α of this measure in the present research was comparable to the original validation study³² ($\alpha = .83$) and additional follow-up studies³¹ ($\alpha = .81$), ranging in this study from .76 to .85 across the 3 measurement waves.

Premarital sexual permissiveness. We modified a worldwide used brief sexual attitude scale³³ to measure premarital sexual permissiveness. One item, “The best sex is with no strings attached” was deleted because of low intercorrelations ($r < .30$). The final permissive attitude questionnaire included 9 items (α range from .74 to .83; eg, “Casual sex is acceptable”). Respondents answered on a Likert-type scale (1 = *strongly disagree*, 5 = *strongly agree*). Higher scores indicated more permissive attitudes.

Attitudes toward extramarital sex. Attitudes toward extramarital sex were assessed with 4 items selected from existing measures in the United States and China.^{34,35} An example item is, “It is okay for one to have sex with someone other than her/his spouse after marriage.” The reliability ranged from .64 to .74 in the present study. Respondents answered on a Likert-type scale (1 = *strongly disagree*, 5 = *strongly agree*), with higher scores indicating more permissive attitudes.

Attitudes toward sexual and gender minorities. To assess attitudes toward sexual and gender minorities (ie, LGBT individuals), we revised items from an existing measure developed for Chinese college students³⁵ and created additional items, such as “Transsexuals should be accepted.” The final scale comprised 7 items in total, with reliability in the present study ranging from .84 to .86. Respondents again answered on a Likert-type scale (1 = *strongly disagree*, 5 = *strongly agree*), with higher scores indicating more tolerant attitudes.

Procedure

College students at Southwest University in Chongqing voluntarily self-enrolled for either the comprehensive sexual education course or the general mental health education course. The students completed the baseline questionnaire in their regular classroom setting. Students' questionnaires were coded with a confidential identification number to match their responses across time points. To maximize the validity of these self-report data, the researchers emphasized that (a) all individual responses were confidential and would not be revealed to others or to school personnel, (b) students were to keep their eyes on their own work and not to discuss any of the questions with other students, and (c) students were told they had the right to "pass" on any question that they did not wish to answer. They were encouraged to answer all questions, with emphasis placed on the importance of honest answers. The data collection got approval from Southwest University administration committee and human research ethics committee at the University of Hong Kong.

Comprehensive sexual education components. Based on the conceptual framework of SLT, we expected that session learning, observation, imitation, role-playing, and interaction with teachers and peers would help to promote knowledge and attitude changes in individuals. The topics of the modules were based on the research on sexuality and gender in biology, the humanities, psychology, and sociology. The program used several different activities to address sexual health knowledge and attitudes, including recommended textbook readings, lectures, educational videos and popular movies, group discussions, role-play, reflective essay assignments, group presentations by students, Q&A, and provision of counseling services related to sexuality. The teaching team included the first author, as well as a senior clinical counselor in specializing in sex and marriage and 3 postgraduate students. The comprehensive sexual education program lasted for 6 weeks, consisting of 6 consecutive sessions (2 hours each). A description of these education modules can be seen in Table 2. For the control group, students just received mental health education course (eg, emotion management and career plan) without any sex topic in the experimental period.

Strategy of Analysis

First, baseline demographic equivalences between the experimental group and the control group were examined using frequency distributions (see Participants section). Second, repeated-measures analyses of covariance (ANCOVAs) were used to compare changes over time in knowledge and attitudes between the experimental group and the comparison group. These tests used a 3 (time point) \times 2 (experimental group) mixed-factorial design. We controlled for the background variables that showed significant differences ($P < .05$) in our initial tests (ie, age, gender, grade, and relationship experience), by entering these as covariates. All statistical analyses were performed using SPSS 17.0. A significance level of $P < .05$ was adopted in bivariate comparisons and multivariate analysis.

Results

The means and standard deviations of each outcome measure, presented separately for each group at each time point, are presented in Table 3. Although there were interactions between the covariates and time for particular analyses, these results fall outside the scope of the study and thus are not reported. (These results are available from the first author on request.) Instead, we mainly focus on the effects of the education program. In the sections that follow, we first report main effects of the education program, time, and the various covariates added into the analyses.

Table 2. Comprehensive Sexual Education Topic, Teaching Strategy, and Education Goal.

Targeted Topic	Teaching Strategy	Education Goal
Session 1: Introduction: What is sex?	Lecture, discussion, and question and answer (Q&A)	Help students generally understand what is sexuality and gender; human sexual physical and psychological development
Session 2: Sexual diversity in the world	Lecture, video, Q&A	Help students understand diversity of human sexuality and encourage to respect all forms of human sexuality
Session 3: Movie: <i>Ma vie en rose</i>	Movie show and discussion	
Session 4: Movie show: <i>Prayers for Bobby</i>	Movie show and discussion	
Session 5: Sexual health knowledge and attitude	Lecture, video, reflective assignment, Q&A	Provide accurate sexual health-related information and stimulate awareness in students of the role of human sexual attitude in human relationships
Session 6: Final assessment	Web presentation and role play	Provide a setting where students can communicate, interact, and gain self-awareness by freely discussing human sexuality in an atmosphere that is accepting and nonjudgmental

Table 3. Means and Standard Deviations for Sexual Health Knowledge and Sexual Attitudes, Per Group, at Each Time Point.

	Baseline				Posttest				Follow-up			
	Education		Control		Education		Control		Education		Control	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Sexual health knowledge												
Reproductive health	1.99	1.04	1.52	1.24	2.71	1.28	1.47	1.14	2.65	1.26	1.64	1.31
Contraception	1.71	1.17	1.40	1.21	2.21	1.36	0.98	1.01	2.09	1.32	1.02	1.15
Condom use	1.46	1.21	0.74	1.10	2.15	1.21	0.80	1.04	2.25	1.30	0.84	0.98
Sexually transmitted diseases	2.90	1.56	1.26	1.17	3.16	1.73	2.17	1.70	3.41	1.52	2.09	1.59
HIV/AIDS	2.92	1.33	3.08	1.34	3.44	1.31	3.65	2.00	3.46	1.26	2.77	1.28
Sexual attitude												
Premarital sex	2.34	0.56	2.09	0.59	2.63	0.58	2.18	0.69	2.52	0.53	2.21	0.66
Extramarital sex	1.98	0.66	1.91	0.74	2.22	0.70	1.96	0.70	2.12	0.70	1.95	0.69
Sexual and gender minorities	2.70	0.78	2.51	0.90	3.07	0.73	2.65	0.77	2.93	0.77	2.61	0.82

We then report the results pertaining to our primary interest, namely the interactions between the education program and time, in order to demonstrate differences in knowledge and attitude change between the 2 groups. We then elaborate on significant interaction effects through related post hoc follow-up tests, examining differences between the groups at each time point, as well as changes over time in mean scores for each separate group.

Effects of the Program on Sexual Health Knowledge

Reproductive health. As the 3×2 mixed-factorial ANCOVA showed a significant violation of the sphericity assumption, $\chi^2(2) = 12.86, P = .002$, and we therefore interpreted the results using a Greenhouse–Geisser correction to the degrees of freedom ($\epsilon = .93$). There were main effects of education, $F(1, 166) = 12.65, P < .001, \eta_p^2 = .07$; time, $F(2, 332) = 5.69, P = .02, \eta_p^2 = .03$; and relationship experience, $F(1, 166) = 4.55, P = .03, \eta_p^2 = .03$. There were no significant main effects of age, gender, and grade (all P s $> .08$). Most important, the main effects of education and time were qualified by a Time \times Education interaction, $F(2, 332) = 7.44, P = .001, \eta_p^2 = .04$. Post hoc follow-up tests showed that, whereas the groups showed no significant differences at baseline, $F(1, 166) = 0.085, P = .36, \eta_p^2 = .01$, there were significant differences at posttest, $F(1, 166) = 15.02, P = .000, \eta_p^2 = .08$, and follow-up, $F(1, 166) = 16.16, P = .000, \eta_p^2 = .09$. The total scores of reproductive health knowledge were significantly higher in the experimental group than in the control group in posttest and follow-up waves. Examining each group separately over time, there was an effect of time for the experimental group, $F(2, 332) = 6.29, P = .003, \eta_p^2 = .13$, in which scores significantly increased from baseline to posttest ($P < .001$) but did not change further between posttest and follow-up ($P = .36$). In contrast, there was no change over time in the control group, $F(2, 165) = 0.09, P = .92, \eta_p^2 = .00$. The education program thus appeared to improve students' knowledge of reproductive health, relative to the control group (see Figure 1A).

Contraception. As the 3×2 mixed-factorial ANCOVA again showed a significant violation of the sphericity assumption, $\chi^2(2) = 8.23, P = .02$, we interpreted the results using a Greenhouse–Geisser correction to the degrees of freedom ($\epsilon = .95$). We found main effects of education, $F(1, 166) = 18.83, P < .001, \eta_p^2 = .10$, but no significant main effects of time, age, gender, grade, or relationship experience (all P s $> .10$). Again, the main effect of education was qualified by a Time \times Education interaction, $F(2, 322) = 10.22, P < .001, \eta_p^2 = .06$. Post hoc follow-up tests showed that there was no significance between the groups at baseline, $F(1, 166) = 1.06, P = .30, \eta_p^2 = .01$, but that there were significant differences at posttest, $F(1, 166) = 32.81, P < .001, \eta_p^2 = .17$, and follow-up, $F(1, 166) = 14.29, P < .001, \eta_p^2 = .08$. The contraception scores were significantly higher in posttest and follow-up for the experimental group, compared with the control group. Examining changes over time for each group separately, the experimental group showed an effect of time, $F(2, 165) = 6.60, P = .002, \eta_p^2 = .07$, indicating that scores significantly increased from baseline to posttest ($P < .001$) but did not change further between the posttest and follow-up ($P = .07$). Interestingly, there was also an effect of time for the control group, $F(2, 165) = 5.79, P < .01, \eta_p^2 = .07$, in which score actually *decreased* from baseline to posttest ($P = .001$) but did not change further between posttest and follow-up ($P = .20$). In sum, students in the experimental group showed improvements in contraception knowledge over time compared with the control group (see Figure 1B).

Condom use. The 3×2 mixed-factorial ANCOVA showed a significant violation of the sphericity assumption, $\chi^2(2) = 7.04, P = .03$, and so we again applied a Greenhouse–Geisser correction to the degrees of freedom ($\epsilon = .96$). We found main effects of education, $F(1, 166) = 21.99, P < .001, \eta_p^2 = .12$, as well as effects of the covariates gender, $F(1, 166) = 8.49, P = .004, \eta_p^2 = .05$, and relationship experience, $F(1, 166) = 10.18, P = .002, \eta_p^2 = .06$. There were no significant main effects of time, age, or grade (all P s $> .90$). Again, the main effect of education was qualified by a Time \times Education interaction, $F(2, 322) = 5.77, P < .001, \eta_p^2 = .06$. Post hoc follow-up tests showed that there was no significant differences between the groups at baseline, $F(1, 166) = 2.31, P = .13, \eta_p^2 = .01$, but there were significant differences at both posttest, $F(1, 166) = 21.77, P < .001, \eta_p^2 = .12$, and follow-up, $F(1, 166) = 29.99, P < .001, \eta_p^2 = .15$. The total scores of condom use knowledge were significantly higher in the experimental group than in the control group at both posttest and follow-up. Examining the groups separately for changes over time, there was an

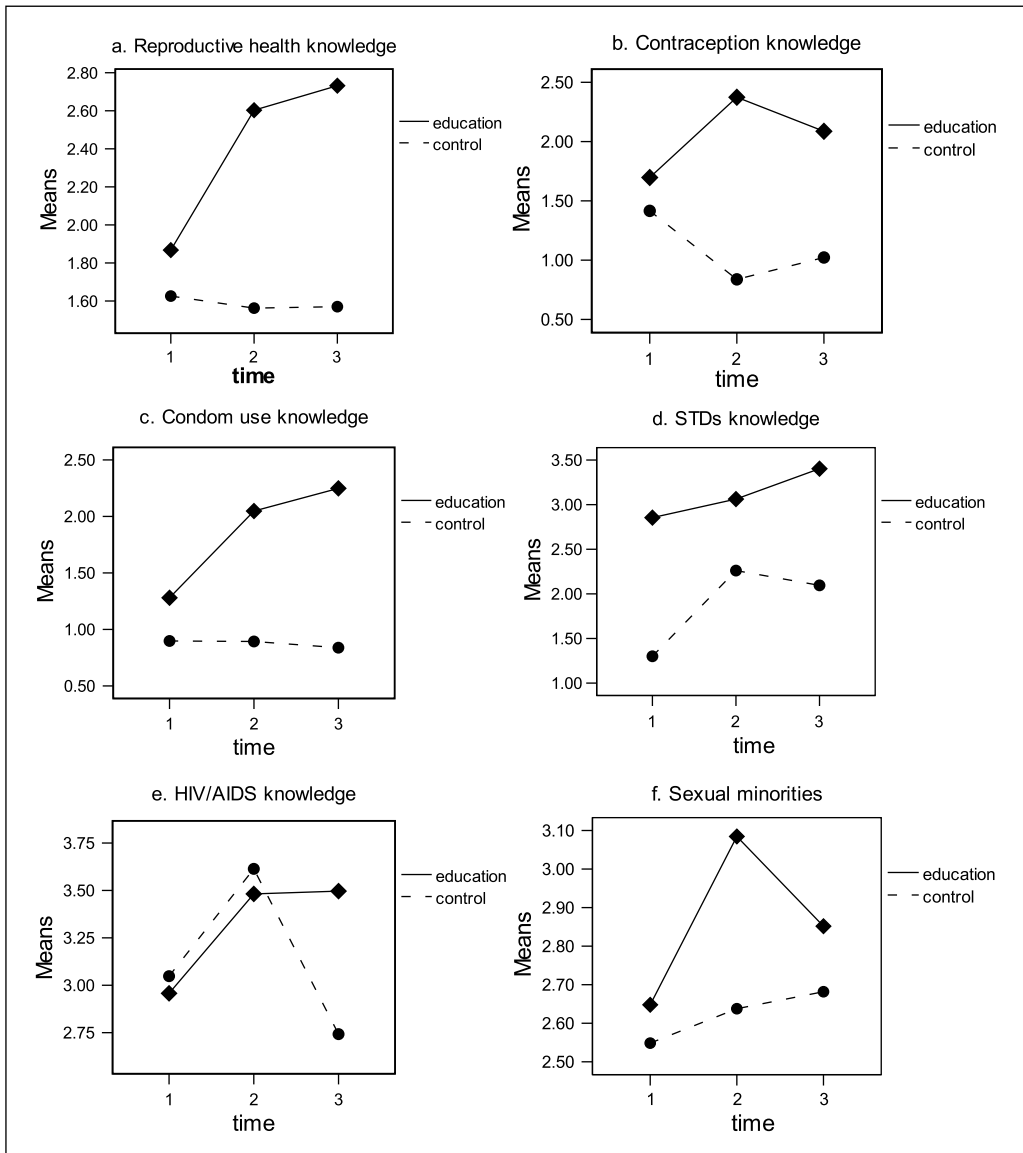


Figure 1. Profile plots of sexual health knowledge and sexual attitude in education and control group at each time point.

effect of time for the experimental group, $F(2, 165) = 18.41, P = .000, \eta_p^2 = .18$, in which scores significantly increased from baseline to posttest ($P < .001$), and this increase was maintained from posttest to follow-up ($P = .16$). In contrast, there was no effect of time in the control group, $F(2, 165) = 0.11, P = .90, \eta_p^2 = .00$. This suggests that the education program improved students' condom use knowledge over time, relative to the control group (see Figure 1C).

Sexually transmitted diseases. We found main effects of education, $F(2, 165) = 19.32, P < .001, \eta_p^2 = .10$; gender, $F(2, 165) = 7.07, P = .009, \eta_p^2 = .04$; and relationship experience, $F(2, 165) = 4.45, P = .04, \eta_p^2 = .03$. There were no significant main effects of time, age, or grade (all $P > .05$). There was no significant Time \times Education interaction, $F(2, 322) = 2.25, P = .11, \eta_p^2 = .01$. As

can be seen from examining the mean scores in Table 3, the experimental group scored higher in STD knowledge than the control group at each time point. Thus, although this group appeared to be more knowledgeable about STDs, in general, these group differences could not be attributed to the effects of the education program (see Figure 1D).

HIV/AIDS. As the 3×2 mixed-factorial ANCOVA showed a significant violation of the sphericity assumption, $\chi^2(2) = 20.2, P < .001$, we applied a Greenhouse–Geisser correction to the degrees of freedom ($\epsilon = .90$). We found no significant main effects of education, time, age, grade, gender, or relationship experience (all P s $> .41$). However, there was a significant time and treatment interaction, $F(1.79, 297.73) = 3.36, P = .04, \eta_p^2 = .03$. Post hoc follow-up tests showed that there were no significant differences between education and control groups at baseline, $F(1, 166) = 0.09, P = .77, \eta_p^2 = .00$, or the posttest, $F(1, 166) = 0.12, P = .74, \eta_p^2 = .00$. However, there was a significant difference between the groups at follow-up, $F(1, 166) = 6.73, P = .01, \eta_p^2 = .04$, in which the scores were significantly higher in the experimental group than in the control group. Examining changes over time for each group, separately, the experimental group showed a significant effect of time, $F(2, 165) = 4.06, P = .02, \eta_p^2 = .05$. Scores in this group increased from baseline to posttest ($P = .05$) and were maintained between posttest and follow-up ($P = .96$). There was also a significant effect of time in the control group, $F(2, 165) = 6.99, P = .001, \eta_p^2 = .08$, in which there was not only a significant increase in HIV/AIDS knowledge from baseline to posttest ($P = .02$) but also a decrease from posttest to follow-up ($P < .001$) in which they regressed to a similar level of knowledge as shown at baseline wave. In sum, we found an unexpected effect in which HIV knowledge increased in both groups from baseline to posttest. Only the experimental group retained their increased HIV knowledge at the follow-up, however, whereas the control group showed a momentary increase that later disappeared (see Figure 1E).

Effects of the Program on Sexual Attitudes

Premarital sexual permissiveness. We found a main effect of the gender covariate, $F(1, 166) = 14.28, P < .001, \eta_p^2 = .08$, showing males to hold more permissive attitude toward premarital sex than females but no significant main effects of education, time, age, grade, or relationship experience (all P s $> .08$). Furthermore, there was no significant Time \times Education interaction, $F(2, 332) = 2.24, P = .11, \eta_p^2 = .01$. Thus, the education program did not appear to have significant effects on students' premarital sexual permissiveness.

Attitudes toward extramarital sex. The 3×2 mixed-factorial ANCOVA showed a significant violation of the sphericity assumption, $\chi^2(2) = 6.42, P = .04$, and thus we applied a Greenhouse–Geisser correction to the degrees of freedom ($\epsilon = .96$). We again found a main effect of the gender covariate, $F(1, 166) = 7.34, P = .01, \eta_p^2 = .04$, showing males to hold more open attitude toward extramarital sex than females but no significant effects of education, time, age, grade, or relationship experience (all P s $> .11$). There was also no significant Time \times Education interaction, $F(2, 322) = 0.321, P = .72, \eta_p^2 = .00$. The education program therefore did not appear to alter students' existing attitudes toward extramarital sex.

Attitudes toward sexual and gender minorities. The education program appeared to have significant effects on students' positive attitudes toward sexual diversity. We found main effects of time, $F(2, 322) = 7.34, P = .01, \eta_p^2 = .04$, and the gender covariate, $F(1, 166) = 6.09, P = .02, \eta_p^2 = .04$, but no significant main effects of education, age, grade, or relationship experience (all P s $> .07$). Importantly, there was a significant Time \times Education interaction, $F(2, 322) = 3.47, P = .03, \eta_p^2 = .02$. Post hoc follow-up tests showed that there was no significant difference between the groups at baseline, $F(1, 166) = 0.28, P = .60, \eta_p^2 = .00$, but that there were significant differences at post test, $F(1, 166) = 7.00, P = .01, \eta_p^2 = .04$. These difference disappeared at follow-up, however, $F(1, 166) = 0.91, P = .34, \eta_p^2 = .01$. Examining changes over time separately for each group, there was

a significant effect of time in the experimental group, $F(2, 165) = 11.04$, $P < .001$, $\eta_p^2 = .12$, in which positive attitudes significantly increased from baseline to posttest ($P < .001$) but then significantly *decreased* from posttest to follow-up ($P = .004$). Nevertheless, the follow-up score was still significantly higher than the baseline score ($P = .02$), indicating that attitudes did not completely revert to original levels. In the control group, there were no changes over time, $F(2, 165) = 1.35$, $P = .26$, $\eta_p^2 = .02$. Thus, scores of positive attitudes toward sexual diversity were similar between the groups at baseline and increased among the experimental group only in posttest. Scores regressed then somewhat among the experimental group at follow-up but were still significantly higher than at the beginning of the education. In contrast, the control group showed greater stability over time in their attitudes toward sexual and gender minorities (see Figure 1F).

Discussion

Although there have been dramatic changes in sexual behavior and sexual attitudes among young Chinese people in recent decades, these shifts have not been accompanied by increased efforts to educate individuals about important topics such as reproductive health, contraception, and condom use, or by increased provision of fact-based information about STDs and HIV. Furthermore, sexual and gender minorities in China—particularly LGBT individuals—still encounter strong social stigma and discrimination that may affect their psychological and physical health, as well as their sexual risk-taking behaviors.^{16,18} Although efforts to provide comprehensive sexual education in mainland China have recently increased, such programs have been primarily located in economically rich coastal cities that are sufficiently more Westernized than the rest of China, as a whole. In contrast, the relatively poor and more traditionally minded populations located in inland areas of China have been largely ignored, even though such areas comprise some of the largest population centers and the greatest concentrations of individuals infected with HIV.^{16,24} Furthermore, no education programs, to date, have aimed to both provide sexual health knowledge and to increase acceptance toward sexual and gender minority groups. The present study is the first to report the effects of such an education program on the sexual health knowledge and attitudes among college students, located in the southwest of mainland China.

Effects of the Program on Sexual Health Knowledge

The baseline results revealed that college students in Chongqing initially had very limited knowledge of reproductive health, contraception, condom use, STDs, and HIV/AIDS. The results showed that our novel comprehensive sexual education program had several significant and positive effects on young adults' sexual health knowledge. After a 6-week, multifaceted education program, and at the 3-week follow-up, college students in the experimental group displayed and maintained a higher level of knowledge about reproductive health, contraception, and condom use, compared with the control group. For HIV/AIDS knowledge, both groups appeared to increase from baseline to posttest, but only the experimental group again showed these higher scores at the follow-up measure. Although we cannot rule out that respondents were exposed to other university- or community-based programs aimed at increasing understanding about HIV/AIDS, we are also not aware of such efforts. Interestingly, however, this knowledge was retained more effectively by the experimental group, as shown in the follow-up test. Thus, it is possible that the program promoted awareness of the importance of HIV/AIDS knowledge and helped students to more strongly retain knowledge acquired from other sources.

We did not find effects of the education program on knowledge about STDs. A lack of increase in knowledge among the experimental group could be attributed to the fact that the education program focused more strongly on preventative efforts (eg, contraception and condom use) than

it did on the biological facts related to STDs, per se. Interestingly, the experimental group appeared to hold more accurate knowledge from the baseline measurement onward, even after controlling for potential alternative explanations such as being older and having more experience with romantic relationships. It is possible, however, that other variables not accounted for, such as more experience with sexual behavior (which may have accompanied their romantic relationship experience), could account for this finding.

In sum, this novel comprehensive sexual education program appeared to have positive effects on several dimensions of sexual health knowledge. Although some of these mean-level increases were relatively modest, test items related to reproductive health, contraception, and condom use represented potentially critical information for helping individuals to make responsible and educated decisions related to sexual behavior. Although there is still clearly room for education to aim for further increases in these effects, this research provides initial data capturing baseline levels of sexual understanding among young people in a relatively unstudied area of mainland China. The results offer initial evidence regarding these individuals' receptivity toward, and retention of, comprehensive sexual education, which can potentially be of use to recommend scaled up studies incorporating longer follow-up.

Effects of the Program on Sexual Attitudes

A major barrier to comprehensive sexual education efforts in China concerns the fears of university administrators and government officials, that teaching young people about sexuality and contraceptive use promotes an erosion of traditional values toward premarital chastity and marital monogamy. Such concerns were not supported by the results of our study, as the education program did not change students' permissive attitudes toward premarital or extramarital sex. In line with a major aim of the study, however, the program did increase students' positive attitudes toward LGBT individuals. At the baseline survey, the majority of both experimental and control group students tended to hold more negative attitudes toward sexual and gender minorities. After the 6-week sexual education period, students in the control group still held negative attitudes similar to their baseline levels. In the experimental group however, students' attitudes became more tolerant and accepting. Unexpectedly, however, the scores of this group dropped again in the 3-week follow-up, becoming more similar to the control group. Although these follow-up scores were still significantly higher than initial levels, the sexual education program may have been too short to create and solidify lasting changes in this domain. Or maybe attitude change gets eroded once you get out there in the real world and see how other people think. In this sense attitude change may be quite unlike knowledge change. Future efforts to increase understanding and acceptance toward LGBT individuals in China should aim to maintain such increased tolerance, by further enriching the program content (e.g., bringing in guest speakers from LGBT advocacy groups, engaging in exposure and perspective-taking exercises, providing additional, postcourse exercises), or extending the program time to further reinforce attitude changes.

Implications for Sexual Education Program in Colleges/Universities in China

The findings in the present study have several implications in terms of sexual education program among college students in China. First, sexual health knowledge could be delivered to students by sexual education course in colleges/universities. It decreased the need by students to use other sources, for example, Internet, to obtain incorrect and misunderstood sexual information. Besides, increased acceptance and decreased prejudice about sexual and gender minorities' people could be accomplished through sexual education program without promoting premarital sex and monogamy attitude among college students. It might lessen worries and resistance to sexual

education among administrators, parents, and political officials. Third, we designed and implemented our comprehensive sexual education program using diverse methods that had not been explored in previous Chinese intervention studies with similar populations. The information was provided in a variety of ways, including reading materials and viewing videos, reflective assignments, group activities, role-play exercises, and counseling services. The increased sexual health knowledge and attitudes toward sexual diversity might thus be indirectly attributable to these education methods, through enhanced awareness, interaction, and reflection, which might further enhance individual's own knowledge and confidence to make healthy sexual decision. We suggest that reading materials and viewing videos are important components to help students to grasp general information about sex; we also suggest that reflective assignments, role-play, and group activities are important teaching techniques to promote students' empathy and tolerant attitudes toward sexual and gender minorities. We are inclined to recommend these diverse vehicles for delivering comprehensive sexual education in future research and intervention efforts. All in all, this program is feasible to implement and development in colleges/universities in other places in China.

Limitations and Directions for Future Research

Naturally, there are important limitations associated with this study that warrant mention. First, a possible selection bias existed, because participants were not randomly assigned to the education and control conditions. Instead, the experimental group consisted of students who voluntarily registered for a course on "Love, Marriage and Sex Psychology," whereas the control group consisted of students who self-selected to register for a course on general mental health education. We attempted to mitigate the potential selection bias by adding as covariates those demographic variables that showed significant group differences at the baseline, and indeed there were few baseline differences between the groups in sexual knowledge or sexual attitudes. Besides, we have also noted that examining these effects among individuals who are curious and/or interested in obtaining new information about sexual health is logical and important first step. Other unassessed variables, such as receptivity toward sexual education, attitude change, and sexual experience, may nevertheless still have accounted for the effects seen in the experimental group. Further work is necessarily in order to generalize the findings to the larger population to individuals who may be more resistant (e.g., those with highly conservative attitudes). Future studies on this program should aim for random assignment in order to more stringently control for this possibility.

Second, the research did not include a measure of participants' actual safe-sex behavior, because it was considered too sensitive by students, themselves, and university administrators. We thus could not explore whether increased safe sex behavior actually accompanied the sexual health knowledge promotion and the change of sexual attitudes. However, this is naturally an important goal for any program aimed at sexual education and/or STD and unwanted pregnancy prevention. Future work should explore the very important behavioral domain, such as safe sex practices after intervention, and whether changes in attitude and health knowledge prompted by the education contribute to increased safe sex practices. Finally, although we asked students a yes/no question regarding a prior history with romantic relationships, we did not assess their current relationship status. Asking students whether they currently had a romantic or sexual partner could open up opportunities for assessing additional constructs of interest, such as whether the program could promote sexual communication and sexual-related negotiation skills (eg, encouraging condom use) among partners. Future studies should therefore aim to assess respondents' current relationship status.

Conclusion

This study provides useful guidance for Chinese sexual education programs at schools and universities. These results showed that comprehensive sexual education, using diverse teaching

techniques, can be effectively implemented among young adult populations in Southwest China, where there are exceptionally high levels of HIV infection and conservative sexual attitudes. Furthermore, comprehensive sexual education programs can influence positive attitudes toward sexual and gender minorities in this population, promoting more tolerant views toward LGBT individuals and decreasing discrimination and prejudice. Although much work is still left to do before achieving reductions in such discrimination and stigma at a broader, societal level, this study is an important first step for shaping future efforts in these domains and provided practical implications for sexual education program in China.

Appendix A

Sexual Health Knowledge Scale

Reproductive Health

1. Fertilization of the egg by the sperm (conception) occurs in the woman's uterus. (FALSE)
2. Sexual dysfunction is often a symptom of underlying problems like diabetes or hypertension in men. (TRUE)
3. Consumption of significant amounts of alcohol can have serious negative effects on men's sexual functioning. (TRUE)
4. A female ovum (egg) is viable for fertilization for approximately 1 week after it is released. (FALSE)
5. A small amount of sperm can be released prior to ejaculation. (TRUE)

Contraception

1. If a woman has taken the pill for 2 years and then stops, she will have a much more difficult time getting pregnant, compared with a woman who has never used the pill. (FALSE)
2. In terms of preventing pregnancy, antibiotics do not reduce the effectiveness of birth control pills. (FALSE)
3. After unprotected sex, more than 98% of women will not get pregnant if the emergency contraceptive pill is taken in the first 72 hours. (TRUE)
4. Oral contraceptives work immediately, therefore backup methods (additional methods of contraception) are not necessary when a woman is on her first cycle of the pill. (FALSE)
5. During the mid-cycle part of the menstrual cycle, girls are more fertile and therefore more at risk of pregnancy. (TRUE)

Condom Use

1. Using Vaseline or petroleum jelly is a good way to increase the effectiveness of a condom. (FALSE)
2. A condom should be worn so it is snug at the tip of the penis. (FALSE)
3. It is a good idea to use hand lotion for lubrication when using a condom. (FALSE)
4. A condom should not be unrolled before putting it on a man's penis. (TRUE)
5. The man should hold onto the open end of the condom when withdrawing after ejaculation. (TRUE)

Sexually Transmitted Diseases

1. Withdrawing (“pulling out”) the penis before ejaculating works just as well as a condom for preventing sexually transmitted diseases. (FALSE)
2. If your symptoms go away you probably don’t have a sexually transmitted disease. (FALSE)
3. Some kinds of sexually transmitted diseases don’t give you symptoms until 6 weeks or more after you catch the infection. (TRUE)
4. Chlamydia is a significant cause of infertility in women. (TRUE)
5. Only people who have lots of sexual partners get sexually transmitted diseases. (FALSE)
6. If you have a sexually transmitted disease, you probably got it from the last person you had sex with. (FALSE)

HIV/AIDS

1. Women are more likely to get AIDS during their period. (FALSE)
2. You can get HIV/AIDS from heterosexual (penis/vagina) sex. (TRUE)
3. A person can be infected with HIV and not have the disease AIDS. (TRUE)
4. You can get HIV/AIDS from a person with HIV/AIDS who sneezed on you. (FALSE)
5. You can get HIV/AIDS from oral sex (with the same or opposite sex). (TRUE)
6. A woman can only get HIV from a man if she has anal sex with him. (FALSE)

Appendix B

Dimensions of Sexual Attitudes

Premarital Sexual Permissiveness

1. I do not need to be committed to a person to have sex with him/her.
2. Casual sex is acceptable.
3. I would like to have sex with many partners.
4. One-night stands are sometimes very enjoyable.
5. It is okay to have ongoing sexual relationships with more than one person at a time.
6. Sex as a simple exchange of favors is okay if both people agree to it.
7. Life would have fewer problems if people could have sex more freely.
8. It is possible to enjoy sex with a person and not like that person very much.
9. It is okay for sex to be just good physical release.

Attitude Toward Extramarital Sex

1. Extramarital sex would undermine family relationship.
2. I think extramarital sex could be acceptable.
3. It is okay for one to have sex with someone other than her/his spouse after marriage.
4. I think “extramarital lover” would bring about marriage crisis.

Attitude Toward Sexual and Gender Minorities

1. I think it is acceptable to have same-sex sexual impulses.
2. Homosexuality violates social norms.
3. Bisexuality violates social norms.
4. Transsexuals should be accepted.
5. Falling in love with a transgendered person could be accepted.
6. I could accept homosexual people marrying.
7. I think it is acceptable to have sex with someone of the same sex.

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