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EFFICACY OF THEORY-BASED HIV BEHAVIORAL PREVENTION AMONG RURAL-TO-URBAN MIGRANTS IN CHINA: A RANDOMIZED CONTROLLED TRIAL

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Abstract

Our objective was to evaluate the efficacy of a cultural adaptation of a social cognitive theory-based HIV behavioral prevention program among young rural-to-urban migrants in China. The intervention design and assessment were guided by the Protection Motivation Theory (PMT). The intervention was evaluated through a randomized controlled trial with 6-month and 12-month follow-ups. The primary behavioral outcome was the use of condoms. Other outcome measures include HIV knowledge, condom use knowledge, HIV-related perceptions (PMT constructs), and intention to use condom. The mixed-effects regression models for condom use with regular partners indicated that overall frequency of condom use, condom use in last three sexual acts and proper condom use increased over time for the participants but the increases were significantly greater among the intervention group than the control group at 6-month and 12-month follow-ups. The mixed-effects models for HIV-related perceptions indicated that extrinsic rewards, intrinsic rewards, and response costs decreased while vulnerability, severity, response efficacy, and self-efficacy increased over time for the intervention group. The increases in HIV knowledge, condom use knowledge, and intention to use condom were also significantly greater among the intervention group than the control group. The data in the current study suggested efficacy of a social cognitive theory-based behavioral intervention in increasing condom use among young migrants in China. The intervention also increased protective perceptions and decreased risk perception posited by the theory (i.e., PMT).

Substantial research literature shows that well-designed, theory-based prevention interventions can positively impact HIV risk and protective behaviors (Lyles et al., 2007; O'Leary, 2001; Rotheram-Borus, Cantwell, & Newman, 2000). Most risk reduction interventions that have been demonstrated through randomized controlled trials to reduce sexual risk behaviors have been based on social cognitive theory, a theoretic framework developed in Western cultures (Bandura, 1986; Fisher & Fisher, 1992). In contemporary Western societies such as the United States, the rights of the individual are central to governance and to behavioral decision-making. The individual is therefore understandably the focus of theories of behavioral change. These theories, including social cognitive theory, understand that individuals are influenced by others and that the effects of their actions on others may be of importance in their decision-making, but ultimately the individual is at the center of the behavioral decision-making universe (Merson, Dayton, & O'Reilly, 2000).

Cultural orientation in some societies, such as China, is not individualistic but rather communal (Du et al., 2013). With nearly 3,000 years of Confucianism as its background and more than a half century of communism (Michael, 1986; Nisbett, 2003), Chinese society has developed around the notion of the importance of the family and the community. Individual needs are secondary to family and community needs and communal decision-making is understood as important to maintain systems that work (Du, Li, Lin, & Tam, 2014, Michael, 1986). Rural China remains rooted in this long history and experience of communalism (Zhang, 2001).

Since the late 1970s when China began to open its doors to Western trade and tourism, traditional Chinese values holding the family and community as paramount have been challenged in its cities. Western products, Western advertisements and other expressions of Western thoughts and culture have become increasingly prevalent (Beech, 2005; Li et al., 2004). Thus, China is at a cultural cross-road, with vast numbers of its population living in rural areas with minimal exposure to Western notions of individualism but a substantial urban population exposed to Western ideas of individualism. Among China's sub-populations, rural-to-urban migrants are especially prominent in their collision of cultures. Rural-to-urban migrants refer to those individuals who move from rural areas (or small cities) to urban centers for jobs and better lives without obtaining permanent urban residency at the destination. In China, these individuals are also referred to as the floating population, rural migrants, migrant workers, mobile population, peasant workers, or temporary migrants (Li et al., 2004; Qian, Vermund, & Wang, 2005; Zhang, 2001). Reared in rural China in families and communities adhering to traditional Chinese values, these young adults are traveling to Chinese cities seeking economic opportunities, where they are confronting new cultural influences and corresponding value systems (Hong et al., 2006).

The rural-to-urban migration has been repeatedly identified by the Chinese government (Li, 2005; Qi, 2002), the research community (Anderson, Qingsi, Hua, & Jianfeng, 2003; Qian et al., 2005; Yang et al., 2005; Zhang & Ma, 2002; Zhang, Ma, & Xia, 2004), the media (Pomfret, 2001), and international society (Brady et al., 2001; Joint United Nations Programme on HIV/AIDS, 2002) as a major risk factor in the spread of HIV/STD in China. In a public announcement on HIV prevention in July 2005, the China Ministry of Health

identified rural migrants and college students as the two high risk groups that should be targeted in the country's HIV prevention intervention efforts (Li, 2005). Limited data in China have demonstrated a relatively high HIV/STD prevalence among rural-to-urban migrants (Qian et al., 2005; Qiao, Guo, & Zhang, 2000; Zhu, Wu, & Yu, 2001). For example, migrants account for 95% (259/274) of the new HIV/AIDS cases reported in 2004 in Shenzhen, 77% (184/239) in Shanghai, and 75% (333/442) in Beijing (China National Center for AIDS/STD Control and Prevention, 2005). While there has been a growing interest in China to devise effective, affordable, and culturally appropriate prevention strategies for the migrant population (Coates, 2002; Lin et al., 2005; Watanabe, 1999; Zhu et al., 2001), to date there have been limited theory-based HIV/STD prevention intervention efforts targeting this population (Lin et al., 2010; Xiao, Li, & Mehrotra, 2012).

Therefore, in this study, we conducted and evaluated a community-based randomized controlled trial among young adult rural-to-urban migrants (under 30 years of age) in China to test the efficacy of a cultural adaptation of a social cognitive theory-based behavioral intervention in HIV/STD risk reduction. The key research question in this study was whether a social cognitive theory-based HIV behavioral prevention intervention program, through appropriate cultural adaptation, could be effective in the Chinese cultural setting. The intervention program was a multiple-session behavioral intervention that was delivered to small groups in a structured setting. Our selection of the theoretical model/intervention approach and cultural adaptation of the intervention curriculum were informed by both qualitative and quantitative data from the existing literature (Hong et al., 2006; Li et al., 2004; Zhang et al., 2004). The primary behavioral outcome was the use of condoms with both regular and casual partners.

INTERVENTION DESIGN

GUIDING THEORY

The guiding theoretical model for the intervention and evaluation was Protection Motivation Theory (PMT), a social cognitive theory of behavioral change that characterizes relevant social, cultural, cognitive, and psychological variables related to behavior and behavioral change. PMT envisions environmental and personal factors combined to pose a potential threat (Rogers, 1983). Consideration of a maladaptive response is mediated by a balance between rewards accompanying the behavior, both intrinsic rewards (thereby addressing the influences of individual factors) and extrinsic rewards (thereby addressing the influence of perceived societal, peer, and parental factors), and perceived severity and personal vulnerability to the threat. An adaptive response is mediated by balancing the response efficacy (perceived likelihood that the action will reduce the threat) and self-efficacy (belief that the individual can complete the adaptive response) with the response costs (barriers or inconveniences) of completing the adaptive response. As shown in Figure 1, these two appraisal pathways combine to form protection motivation-the intention to respond to a potential threat in either an adaptive (protective) or maladaptive (risk) manner (Rogers, 1983).

FOCUS ON KIDS (FOK): AN EVIDENCE-BASED PROGRAM

Beginning in 1990, with funding from NIH, the PMT-based FOK program was developed, implemented, and evaluated in Baltimore, MD, targeting urban African American adolescents (Stanton & Li, 2014). In 1998, the U.S. Center for Disease Control and Prevention (CDC) designated FOK as one of the Programs that Work nationwide in the U.S. In 2005 FOK was selected by the CDC for inclusion in the national Diffusion of Effective Behavioral Intervention (DEBI) program. The primary intervention series (Stanton et al., 1996), focusing on decision-making, consisted of eight weekly meetings (seven 1.5 hour-long sessions and a one-day-long session) and were led by trained intervention facilitators. With the support of the World AIDS Foundation, the FOK curriculum (Stanton et al., 1996) and relevant assessment tools (Stanton et al., 1995) were culturally and developmentally adapted for use among adolescents and college students in China through both qualitative and quantitative approaches (Cottrell et al., 2005; Zhang et al., 2004). The revised intervention curriculum emphasized abstinence for secondary school students (Li, Zhang, Mao, Zhao, & Stanton, 2011) and both abstinence and safer sex for college students (Li et al., 2008). To be responsive to the Chinese communal view of value system, the adaptation focused not only the individual factors (personal feelings, personal attitudes), but also the influences from family and community, such as perceived rewards from family and community (both extrinsic rewards such as approval and endorsement from family and community and intrinsic rewards such as personal satisfaction and pride from being cohesive with family and community), perceived negative consequence (severity) of own behaviors to family and community (e.g., bringing bad reputation to family and community, challenges to family structure), and perceived barriers (response costs) from family and community for performing protective behaviors (e.g., condom use).

The culturally adapted Chinese curriculum was pilot-tested separately among 302 students in six secondary schools and 382 students in eight colleges in a quasi-experimental design with a 6-month follow-up. The data showed a significant intervention effect among middle school students at 6-month post-intervention in increasing HIV knowledge, decreasing perceptions of response costs associated with abstinence, and reducing stigmatizing attitudes towards people living with HIV and AIDS (Li et al., 2011). Likewise, the intervention showed a significant effect among college students in increasing HIV-related knowledge (including knowledge of condom use) and protective perceptions (e.g., self-efficacy), and in decreasing intention of engaging in sexual intercourse in the next six months (Li et al., 2008). The college student version of the curriculum served as a template for the intervention curriculum in this study for use among young rural-to-urban migrants.

CULTURAL ADAPTATION OF THE INTERVENTION CURRICULUM FOR MIGRANTS

Because of substantial economic, educational, and perceptual differences between Chinese college students, who represent a relatively elite group within Chinese society (Zhang et al., 2004), and socially marginalized migrants (Li, Stanton, Fang, & Lin, 2006), and vast differences in the experiences and threats that may place them at risk for HIV/STD, we further modified the Chinese program in response to the socio-cultural context of sexual risk among young rural-to-urban migrants (Hong et al., 2006, 2008; Li et al., 2004; Lin et al., 2010; Yang et al., 2005). Several modifications were made to maximize the likelihood that

the programs would be responsive to the Chinese culture in general and young migrant population specifically.

First, communal considerations were augmented by increasing emphasis on family and community through the PMT constructs of severity, vulnerability, extrinsic rewards, and response costs. We recognized in doing so that this remains an individually focused behavioral change model, but further hypothesized that the increased focus on family and community norms will allow for an effective intervention in the Chinese cultural context. Second, an empowerment component was added in response to the socially marginalized status of the migrants (Hong et al., 2006; Li et al., 2004). We added activities to increase their self-confidence, self-esteem, and self-worth and to help them to establish their long-term goals (career, relationship, etc.). In the modified curriculum, participants had an opportunity to discuss the positive aspects of being migrants, their strengths and resilient factors, personal goals, role models in their life, and relative importance of self, family, and community in their decision-making. Participants also learned coping skills, general job searching and interviewing skills, interpersonal communication skills, and information regarding existing community resources.

Third, the revised version included a greater emphasis on response efficacy, addressing misperceptions regarding condoms and discussions regarding vulnerability, including facts about actual risk and protective practices and addresses widely prevalent myths regarding notions of who is or is not at risk (Hong et al., 2006). We sought to help young migrants identify multiple HIV/STD risk factors (e.g., individual, social, environment, and economic), increase their perceived vulnerability, and facilitate their ability to discuss sexual issues, including negotiation of condom use. Fourth, a greater emphasis was placed on perceptions of response costs and self-efficacy in relation to relevant HIV-related risk and protective behaviors and perceptions. As suggested by the extant literature (Hong et al., 2006), most young migrants appear to perceive substantial obstacles (e.g., response costs) to using a condom and lack confidence in their ability to use them (self-efficacy), including feeling inadequate to initiate and/or insist upon the use of condoms. Fifth, the modified version included a greater emphasis on safer sex practices in response to higher rates of sexual risk compared to those among Chinese college students. Finally, the level of reading proficiency required to understand the curriculum was reduced and time devoted to practice and rehearsal of safer sex skills (e.g., condom uses, negotiation, decision making) was increased in response to the limited education among the majority of young migrants.

OUTLINE OF THE INTERVENTION SESSIONS

Guided by the PMT, the culturally adapted intervention program (My Health & My Future) consisted of four 3-hour sessions (Table 1). The sessions were grounded in PMT constructs and also concentrated on skill-building. To address specific gender-related issues in HIV/STD prevention, there were separate male and female versions of the curriculum. All the sessions were conducted in same-gender groups except Session Three, which contained two mini-sessions: Sessions 3a (condom use efficacy and skills) and 3b (condom use negotiation). The purpose of the same-gender groups was to facilitate discussion and exploration of several gender-specific issues that are critical for empowering young migrants

in sexual risk reduction. These issues included gender inequity in sexual relations, barriers of condom use, negotiation skills (and practical skills) for partners to use condoms, options beyond male condoms; skills to avoid unprotected sex, and combining HIV/STD infection prevention and contraception. However, because of the importance of desensitization and negotiation of condom use between genders, the hand-on practice and role-play exercises of condom use negotiation skills were conducted in mixed-gender group. One of the purposes of using mixed-gender groups for mini-session 3a was to have an opportunity to introduce the male and female participants from the same-gender groups to one another, so that the young migrants (particularly the women) could be more comfortable in the condom negotiation skill role play exercise in session 3b.

RESEARCH METHOD

PROJECT LOCATION

The intervention trial was implemented in Chaoyang District in Beijing, the capital city of China. Chaoyang District is the most populous district in Beijing with a population of about 3.64 million, including about 840,000 migrants at the time of the study.

INCLUSION/EXCLUSION CRITERIA

The participants in the intervention trial included sexually active young (< 30 years of age) rural-to-urban migrants, both men and women. There were three additional inclusion criteria for the study sample: migrants without a permanent Beijing household registration, having been in Beijing for at least 3 months, and being unmarried or if married, not living with their spouse in Beijing. Exclusion criteria included unwillingness to provide informed written consent or unwillingness to be randomized to either of the conditions. Participants who were HIV-positive were eligible although none of the participants tested positive for HIV at baseline. We decided to exclude married young migrants who were currently living with their spouse (about 2.5% of the migrants between 18–24 years in Beijing) as the condom use dynamics might be considerably different among these couples (Crosby, DiClemente, Holtgrave, & Wingood, 2002).

RECRUITMENT PROCEDURE

Following the same venue-based recruitment procedure used in our previous study (Li et al., 2004), we recruited the young migrants from their workplaces (store, shop, club, dance hall, bathhouse, barbershop, office, factory, construction site), migrant settlements, streets (for those who do not have fixed workplaces, such as garbage collectors, street vendors), and job markets (for those who do not have a job). Outreach strategies used in our previous study (Li et al., 2004) were employed to reach the migrant population. First, employers (or managers) at recruitment sites (workplaces, settlements, or job market) were contacted for permission to conduct the study in their premises (but employers or managers would not engage in any phase of the actual recruitment). Upon receiving permission, local research team members approached the young migrants and provided eligible individuals with a detailed description of the study design, consenting procedure and invited them to participate. During the consenting process, the research personnel also sought input from young migrants regarding their preference on time and location for assessment and intervention. The local research

team organized the participants in same-gender groups of 8 to 12 young migrants based on their work schedule, proximity of their workplace, living place, and origin of their home village (when possible), so cross-contamination between two study arms would be minimized. A total of 660 young migrants consented to participate in the study and completed the baseline assessment. However, 19 of these migrants were excluded from the current analysis because they reported an age > 30 years on the survey, which resulted in a final sample of 641 young migrants in the current study.

ASSESSMENT PROCEDURE

The baseline and follow-up assessments were administered one-on-one or to small migrant groups in private settings in the community (such as the migrants' workplace) where they were recruited. The interviewers began with a description of the purpose of the assessment and reassurance of confidentiality and a brief instruction on how to mark the answers on the questionnaire. Participants then completed the questionnaire. Assistance was provided to young migrants with limited literacy by reading the entire or part of the questionnaire to them. When such assistance was needed, the interviewer read through the questionnaire, and the participant marked her/his response on a second copy of the instrument. By using this method, we ensured a greater level of confidentiality, as the interviewer would not know how the participant was responding. The surveys typically took 45 minutes to complete. Immediately upon completion of baseline measures, all participants (including attention control group) received an educational package containing free condoms, brochures of HIV/STD knowledge and prevention, contact information of local HIV/STD clinics, counseling centers, and hotlines, along with their intervention assignment and schedule. The participants received a small gift (equivalent to U.S. \$2) for their participation in each of the assessment or the intervention sessions. All the participants provided a blood specimen for HIV screening at baseline and 12-month follow-up and none of them tested positive at either time. The study protocol, including recruitment and assessment procedures, received clearance from the Institutional Review Boards at both Wayne State University in the United States and Beijing Normal University in China.

INTERVENTION DELIVERY

The four 3-hour behavioral intervention sessions were delivered over four weeks (not necessarily consecutive) with one session per week in the evening or weekend hours. Following a format similar to the original FOK (Stanton et al., 1996), each modified 3-hour session focused on two or more different PMT constructs and/or behavioral skills. The primary content foci of the intervention were on consistent and correct use of condoms and reduction of other sexual risks (e.g., multiple sexual partners), but avoidance of alcohol and drug use and empowerment were also addressed. Two trained intervention facilitators from a local university and local CDC delivered the materials for each of the sessions through multimedia presentations, discussions, role-play, group exercise, and games. The intervention was implemented among same-gender groups using gender-specific curriculum except Session Three (Sessions 3a and 3b) regarding condom use efficacy and skills, which were conducted in mixed-gender groups.

OUTCOME MEASUREMENT

Condom Use.—The participants were inquired about condom use and condom use intention with their regular and casual partners. The regular partners in this study were defined as those partners with whom the migrants frequently had sex or maintained a sexual relationship for at least six months; whereas the casual partners referred to individuals with whom the migrants had sex occasionally (including one-night stand or commercial sex). Given the methodological challenges of measuring condom use (Crosby et al., 2002), we employed three measures in this study to assess the condom use. The first was the overall frequency of sexual intercourses that are protected by condoms (i.e., never, occasionally, sometime, most of time, always). The second was the number of times (0 to 3) using a condom during the most recent three sex episodes (vaginal or anal). The third was the frequency (never, occasionally, sometime, most of time, always) of proper use of condom (i.e., putting on a condom prior to intercourse). The condom use intention was measured using a question “Will you use condoms with your regular (casual) partners in the future?” (no, occasionally, sometimes, often, and every time).

PMT Constructs.—PMT was selected as the guiding theoretical model for the proposed efficacy trial. The measures to be used in this study were selected on the basis of their relevance to the theoretical framework and their successful application in previous intervention studies (Li et al., 2008; Li et al., 2011). The seven scales of PMT that have already been adapted and used among the Chinese migrant population (Li et al., 2004) were modified and used in this study to collect data to test the intervention effect on risk or protective perceptions. The detailed information (construct, number of items, Cronbach alpha, sample question, and response option) on the seven PMT scales is provided in Table 2

Condom Use Knowledge.—The condom use knowledge was assessed using the Condom Use Skills Checklist (Stanton et al., 2009). The checklist consists of 16 true and false statements describing the detailed (correct and incorrect) steps of condom use from opening a condom pack for use to disposal after use. The participants were told in the instruction that eight of the items were correct steps of condom use (e.g., Dispose of the used condom in a trash can) while eight were incorrect (e.g., Clean and wrap the used condom to save for next time). The participants were asked to check the correct items. They received a score for accurate identifications of both correct and incorrect items, resulting in a total score ranging from 0 to 16. The internal consistency estimates (Cronbach alpha) for the correct items and incorrect items were .66 and .71, respectively, at baseline.

HIV/AIDS Knowledge.—HIV/AIDS knowledge was measured using 20 items which were modified from an existing scale for Chinese migrants in our previous study (Li et al., 2004). The measures included general knowledge of HIV/AIDS (e.g., everyone can get HIV), symptoms or clinical outcomes of HIV/AIDS (e.g., HIV reduces body immune system against other diseases), transmission modes (e.g., you can get HIV through using contaminated blood), preventive measures (e.g., using a condom during sex can reduce the chance of getting HIV). Similar items have been used with different populations in China with adequate psychometric properties (Li et al., 2008; Li et al., 2011). The internal consistency estimate for the 20 items was .64 at baseline.

STATISTICAL ANALYSIS

Baseline Equivalence.—Chi-square (for categorical variables) or ANOVA (for continuous variables) were used to assess baseline equivalence among two study arms in terms of their demographic characteristics, migrant history, PMT perceptions, and intention to use condoms. Any demographic characteristics that differed between the intervention and control groups were identified and statistically controlled in the subsequent analyses when appropriate.

Testing Primary Hypotheses.—The evaluation of the intervention was based on the intent-to-treat model. ANOVA was employed to assess the differences in HIV knowledge, condom use knowledge, HIV-related perceptions (PMT constructs), intention to use condoms, and condom use with casual and regular sexual partners between the intervention and control groups at baseline, 6-month, and 12-month follow-ups.

Multivariate Analysis.—The effects of the intervention on HIV knowledge, HIV-related perceptions and condom use were assessed using mixed-effects regression analysis, adjusting for the correlation among the repeated measures. In mixed-effects models, time-invariant variables including baseline age, gender, marital status, education, and years as a migrant in Beijing were included as confounding factors. The models also tested time effect and the interaction between intervention assignment and time. Further, within-group and between-group comparisons were conducted through model contrasts to assess whether the changes in knowledge, perception, and condom use from baseline were significant for the intervention and the control groups and whether the differences in change scores between the intervention and control groups were significant. All analyses were performed using the SAS 9.3 software (SAS Institute, Cary, NC).

A critical feature of the research design employed in the current study was that the unit of randomization (migrant groups) differed from the unit of analysis (individuals). As noted by Koepsell and colleagues (1991) and Murry and Hannan (1990), when randomization occurs at a different level than the level of analysis, proper inference requires the intraclass correlation (ICC) be taken into account. The mixed-effects analysis was selected because it is a flexible modeling technique that can incorporate ICC as well as the correlation of outcomes within subjects across time (when appropriate) into the analysis.

RESULTS

DEMOGRAPHIC CHARACTERISTICS

The baseline sample in the current study included 641 young migrants (376 men and 265 women). The participants were 17 to 30 years of age (mean = 24.11 years; *SD* = 3.30 years). A total of 349 (54%) migrants were randomly assigned to receive the intervention and 292 (46%) were to serve as the control group. Baseline demographic characteristics by intervention group assignment are shown in Table 3

Of the migrants participating in the baseline survey, 93.1% completed the 6-month follow-up assessment and 74.7% completed the 12-month follow-up assessment. No significant baseline differences existed between the migrants who completed both follow-up

assessments and those who did not in terms of gender, age, migrant history, PMT perceptions, intention to use condoms, and condom use at the $\alpha = .05$ level with two exceptions: “Overall frequency of condom use with regular partners” and “intention to use condoms with regular partners” were higher at baseline among the migrants who did not complete both follow-up assessments than those who completed ($p = .04$ and $p = .03$, respectively).

The intervention and control groups did not differ with respect to age, ethnicity, education, marital status, years of being a migrant worker, self-reported health status, and monthly income. However, the intervention group contained significantly more males (63.0% vs. 53.4%, $p < .01$) and participants in the intervention group visited their hometown less frequently than in the control group (23.5% vs. 27.3% for visiting home at least once every 6 months, $p < .05$).

CHANGES IN OUTCOME MEASURES OVER TIME

As shown in Table 4 the intervention group and the control group were very similar at baseline in terms of outcome measures. The two groups differed on condom use knowledge and condom use with casual partners. Condom use knowledge was higher in the intervention group than the control group (10.67 vs. 10.24, $p < .05$). Participants in the intervention group used condoms with casual partners less frequently than those in the control group at baseline. At the 6-month follow-up, the intervention group was significantly higher than the control group on condom use knowledge, HIV knowledge, intention to use condoms with casual and regular partners, as well as actual condom use and proper condom use with casual and regular partners. The increases in knowledge, intention and actual condom use in the intervention group were sustained through 12-month follow-up except condom use with casual partners.

As shown in Table 3, there were no significant differences between the intervention and control groups at baseline in the scores of the seven PMT constructs except the extrinsic rewards scale which was higher in the intervention group than the control group (3.59 vs. 3.29, $p < .001$). At 6-month follow-up, participants in both the intervention and control groups reported similar levels of extrinsic rewards, vulnerability, severity, response efficacy, and self-efficacy. However, intrinsic rewards and response costs were lower in the intervention group than in the control group. Significant differences were seen in four PMT constructs at the 12-month followup survey. Participants in the intervention group reported lower levels of intrinsic rewards and response costs and higher levels of vulnerability and response efficacy than did participants in the control group.

INTERVENTION EFFECTS ON CONDOM USE

The mixed-effects regression models for condom use with regular partners indicated that overall frequency of condom use, condom use in last three sexual acts and proper condom use increased over time (Table 5). There was a significant interaction between group assignment (intervention vs. control) and time (i.e., baseline, 6-month, and 12-month follow-ups), indicating that the rates of increase in condom use were different for the intervention and control groups. The change over time and the difference in change from baseline

between the two groups at each followup were estimated through model contrasts. At each follow-up assessment, we observed a significant improvement in three condom use measures for the intervention and control groups. Between-group comparisons indicated that the improvements in three condom use measures were significantly greater among the intervention group than the control group at 6-month and 12-month follow-ups. In addition, male gender, unmarried, and older age were associated with lower levels of condom use with regular partners.

Mixed-effects models for condom use with casual partners showed significant improvements in three condom use measures for the intervention group. However, the increases in condom use measures among the intervention group were not significantly greater than the control group except the increase in proper condom use at 6-month follow-up. Being unmarried was associated with lower levels of condom use while longer duration in Beijing was associated with higher levels of condom use with casual partners.

INTERVENTION EFFECT ON PMT CONSTRUCTS

Mixed-effects models for HIV-related perceptions indicated that extrinsic rewards, intrinsic rewards, and response costs decreased while vulnerability, severity, response efficacy, and self-efficacy increased over time for the intervention group. The increases in vulnerability, response efficacy, and self-efficacy and decreases in intrinsic rewards and response costs were significantly greater among the intervention group than the control group. In addition, female gender, unmarried, higher education attainment, and longer stay in Beijing were associated with lower levels of extrinsic rewards. Male gender was associated with lower levels of severity while older age and being unmarried were associated with lower levels of response costs (Table 6).

INTERVENTION EFFECT ON INTENTION AND KNOWLEDGE

The mixed-effects models for intention to use condoms with casual or regular partners indicated that condom use intention increased over time for both intervention and control groups (Table 7). There was a significant interaction between intervention assignment and time, indicating that the change in condom use intention were different for the intervention and control groups. Between-group comparisons indicated that the increase in condom use intention was significantly greater among the intervention group than the control group at 6-month and 12-month follow-ups. Similarly, the mixed-effects models for HIV knowledge and condom use knowledge showed that the improvements were significantly greater among the intervention group than the control group at 6-month and 12-month follow-ups. In addition, never being married was associated with lower levels of condom use intention with casual and regular partners. Older age, male gender, or a shorter stay in Beijing were associated with lower levels of condom use knowledge.

DISCUSSION

The data in the current study suggested efficacy of a social cognitive theory-based behavioral intervention in increasing condom use among young migrants in China. The intervention also increased protective perceptions and decreased risk perceptions posited by

the theory (i.e., PMT). It is possible that the intervention program changed the perceptions which in turn facilitated or encouraged the change of behavioral outcomes. Therefore, the next logical step will be investigating the pathways through which the intervention affected behavioral outcomes by testing if the changes in behavioral outcomes were indeed a result of the changes in various PMT constructs.

We have found a significant intervention effect in increasing condom use with regular partners, but not with the casual partners. This finding suggests that the factors that influence condom use with regular partners may not be the same as those influencing condom use with casual partners. As suggested in previous studies (Lescano et al., 2006), condom use with casual partners (e.g., one-night stand, commercial sexual encounter) may be more context-dependent than the condom use with regular partners. Some unique relationship factors (e.g., unbalance in power) or contextual factors (e.g., condom availability) may be more important predictors for condom use during casual sex. In addition, individuals with casual partners may also have different risk profiles (e.g., engagement in alcohol and other substance use) from those who only have regular partners and these additional risk involvements may dilute the intervention effect on condom use. Future studies need to further explore both cognitive and contextual factors in influencing condom use with different types of partners.

The results of the current study also confirmed the cultural relevance of PMT in Chinese settings. Because of the marked differences between Western and traditional Chinese cultures (Michael, 1986; Nisbett, 2003), one objective of our research was to explore the fit of this theory to the Chinese context in general and to the migrant populations specifically. Existing qualitative data (Zhang et al., 2004) and quantitative data (Cottrell et al., 2005) provided evidence about applicability of PMT among adolescents and college students in China. Previous cross-sectional data among migrant populations (Li et al., 2004) and the current intervention study provide additional support to the relevance and applicability of PMT in both assessment and intervention design in the Chinese context. These data suggest that the decisionmaking processes regarding the involvement of sexual and other HIV-related risk among rural-to-urban migrants are consistent with social cognitive theory and in many situations the importance of family and community is part of individual desires or concerns. These findings suggest that a Western theory-based intervention, with appropriate cultural adaptation, can change behaviors in a population with a different cultural background.

The current study has several potential limitations. First, the participants were recruited from a single urban district in Beijing and the sample might not be representative of other migrant population in China, especially in areas with a large proportion of intraprovince migrants as a previous study has documented a substantial difference in both risk behaviors and risk perceptions between interprovince and intraprovince migrants (Li et al., 2007). In addition, none of the participants were tested positive for HIV at both baseline and 12-month follow-up, which indicated that the participants in the current study might not be the most-at-risk segment of the migrant population in Beijing. Second, one of the PMT scales (intrinsic rewards) and some outcome measures (e.g., HIV/AIDS knowledge) had relatively low reliability estimates (e.g., Cronbach's $\alpha < .70$) which could threaten the internal validity of the study. Third, the current study had a relatively high rate of attrition during follow-ups (e.g., 25% at 12-month follow-up). Fourth, although the intervention curriculum targeted

many family and community level factors, the intervention is largely an individual level intervention.

Despite these limitations, the current study has several important implications for HIV intervention research and practice in China and other resource-limited settings. First, future research needs to continue examining the relevance and applicability of Western theories in guiding both the behavioral assessment and designing behavioral intervention and to improve our understanding of the interaction between culture and behavior to justify the use of a social cognitive model (or other Western-developed models) of behavioral change in these settings. Given the resources and time required to develop and evaluate effective HIV/AIDS prevention programs, it would be expedient to adapt the theory-based effective interventions to China and other resource limited settings. However, as pointed out by Wingwood and DiClemente (1999), a guiding theory for HIV prevention intervention effort should not be utilized without first determining its relevance to a particular population or cultural context, as the theory provides foundation on which particular cultural elements and environmental factors can be examined in a specific socio-cultural context and appropriately integrated into the theoretical framework. Second, future etiological study and intervention research need to examine the structural, societal, and environmental factors in the context of migration. While young migrants in general perceived low vulnerability to HIV/STD, a number of economic and socio-cultural factors including hardship in the city that may particularly contribute to young migrants' susceptibility to infection with HIV/STDs (Hong et al., 2006). These contextual factors may be critical in terms of both the formation of their HIV-related perceptions (risk or protective) and the engagement of HIV-related risk or protective behaviors. The future intervention targeting rural-to-urban migrants in China and other resource-poor countries also needs to focus on the empowerment and resilience-building and improve the social support and affordable health care access for this socioeconomically marginalized population.

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REFERENCES

- Anderson AF, Qingsi Z, Hua X, & Jianfeng B (2003). China's floating population and the potential for HIV transmission: A social-behavioural perspective. *AIDS Care*, 15(2), 177–185. doi: 10.1080/0954012031000068326 [PubMed: 12856339]
- Bandura A (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice Hall.
- Beech H (2005, 12 12). Sex, please— We're young and Chinese. *Time*, p. 61. [PubMed: 15926775]
- Brady WE, Chung T, Jenkins RG, Lackritz E, Murrill C, Needle R, & Nieburg P (2001). *Report of an HIV/AIDS assessment in China*. Atlanta, GA: CDC Global AIDS Program.

- China Ministry of Health, United Nations Program on HIV & AIDS, & World Health Organization. (2006) 2005 Update on the HIV/STD epidemic and response in China. Beijing, China: Author.
- China National Center for AIDS/STD Control and Prevention. (2005). 2004 HIV/STD epidemic in China. Beijing, China: Author.
- Coates T (2002, 11 1). Challenges of International Collaboration and Synthesis of Potential Research China/U.S Paper presented at the Prevention Initiatives, First Joint Workshop to Build Research Collaborations to Prevent Transmission of HIV and STDs, Beijing, China.
- Cottrell L, Li X, Stanton B, Harris C, D'Alessandri D, Sun Z et al. (2005). Perceptions regarding preventive sexual practices and communication with sexual partners among Chinese college students. *Preventive Medicine*, 40(2), 189–196. doi: 10.1016/j.ypmed.2004.05.019 [PubMed: 15533528]
- Crosby R, DiClemente RJ, Holtgrave DR, & Wingood GM (2002). Design, measurement, and analytical considerations for testing hypotheses relative to condom effectiveness against non-viral STIs. *Sexually Transmitted Infections*, 78(4), 228–231. [PubMed: 12181456]
- Du H, Jonas E, Klackl J, Agroskin D, Hui EKP, & Ma L (2013). Cultural influences on terror management: Independent and interdependent self-esteem as anxiety buffers. *Journal of Experimental Social Psychology*, 49, 1002–1011.
- Du H, Li X, Lin D, & Tam CC (2014). Hopelessness, individualism, collectivism, and substance use among young rural-to-urban migrants in China. *Health Psychology and Behavioral Medicine*, 2, 211–220. doi: 10.1080/21642850.2014.888656 [PubMed: 25750778]
- Fisher JD, & Fisher WA (1992). Changing AIDS-risk behavior. *Psychological Bulletin*, 111(3), 455–474. [PubMed: 1594721]
- Hong Y, Li X, Stanton B, Fang X, Lin D, Wang J et al. (2008). Expressions of HIV-related stigma among rural-to-urban migrants in China. *AIDS Patient Care and STDs*, 22(10), 823–831. doi: 10.1089/apc.2008.0001 [PubMed: 18847389]
- Hong Y, Stanton B, Li X, Yang H, Lin D, Fang X et al. (2006). Rural-to-urban migrants and the HIV epidemic in China. *AIDS and Behavior*, 10(4), 421–430. doi: 10.1007/s10461-005-9039-5 [PubMed: 16421651]
- Joint United Nations Programme on HIV/AIDS. (2002). Report on the global HIV/AIDS epidemic. Geneva, Switzerland: Author.
- Koepsell TD, Martin DC, Diehr PH, Psaty BM, Wagner EH, Perrin EB, & Cheadle A (1991). Data analysis and sample size issues in evaluations of community-based health promotion and disease prevention programs: a mixed-model analysis of variance approach. *Journal of Clinical Epidemiology*, 44(7), 701–713. [PubMed: 2066748]
- Lescano CM, Vazquez EA, Brown LK, Litvin EB, Pugatch D, & Project SHIELD Study Group (2006). Condom use with “casual” and “main” partners: What’s in a name? *Journal of Adolescent Health*, 39(3), 443.e1–443.e7.
- Li F (2005, 7 26). AIDS campaign to focus on migrants, students. *China Daily*, (p. 4).
- Li X, Fang X, Lin D, Mao R, Wang J, Cottrell L et al. (2004). HIV/STD risk behaviors and perceptions among rural-to-urban migrants in China. *AIDS Education and Prevention*, 16(6), 538–556. doi: 10.1521/aeap.16.6.538.53787 [PubMed: 15585430]
- Li X, Stanton B, Fang X, & Lin D (2006). Social stigma and mental health among rural-to-urban migrants in China: A conceptual framework and future research needs. *World Health Population*, 8(3), 14–31. [PubMed: 18277106]
- Li X, Stanton B, Wang B, Mao R, Zhang H, Qu M et al. (2008). Cultural adaptation of the Focus on Kids program for college students in China. *AIDS Education and Prevention*, 20(1), 1–14. doi: 10.1521/aeap.2008.20.1.1 [PubMed: 18312063]
- Li X, Zhang L, Mao R, Zhao Q, & Stanton B (2011). Effect of social cognitive theory-based HIV education prevention program among high school students in Nanjing, China. *Health Education Research*, 26(3), 419–431. doi: 10.1093/her/cyr001 [PubMed: 21330355]
- Li X, Zhang L, Stanton B, Fang X, Xiong Q, & Lin D (2007). HIV/AIDS-related sexual risk behaviors among rural residents in China: Potential role of rural-to-urban migration. *AIDS Education and Prevention*, 19(5), 396–407. doi: 10.1521/aeap.2007.19.5.396 [PubMed: 17967110]

- Lin D, Li X, Stanton B, Fang X, Lin X, Xu X et al. (2010). Theory-based HIV-related risk-reduction prevention for Chinese female rural-to-urban migrants. *AIDS Education and Prevention*, 22(4), 344–355. [PubMed: 20707694]
- Lyles CM, Kay LS, Crepaz N, Herbst JH, Passin WF, Kim AS et al. (2007). Best-evidence interventions: Findings from a systematic review of HIV behavioral interventions for U.S. populations at high risk, 2000–2004. *American Journal of Public Health*, 97(1), 133–143. doi: 10.2105/AJPH.2005.076182 [PubMed: 17138920]
- Merson MH, Dayton JM, & O'Reilly K (2000). Effectiveness of HIV prevention interventions in developing countries. *AIDS*, 14(Suppl 2), S68–84.
- Michael F (1986). *China through the ages: History of a civilization*. Boulder, CO: West-view Press.
- Murray DM, & Hannan PJ (1990). Planning for the appropriate analysis in school-based drug-use prevention studies. *Journal of Consulting and Clinical Psychology*, 55(4), 458–468.
- Nisbett R (2003). *The geography of thought: How Asians and Westerners think differently and why*. New York: Free Press.
- O'Leary A (2001). Social cognitive theory mediators of behavior change in the National Institute of Mental Health Multisite HIV Prevention Trial. *Health Psychology*, 20, 369–376. [PubMed: 11570651]
- Pomfret J (2001, 1 11). The high cost of selling blood. *Washington Post*, (p. A01).
- Qi X (2002, 11). HIV/AIDS epidemiology and China five-year action plan and research. Paper presented at the The First Sino-US Conference on Research and Training in AIDS-Related Areas, Beijing, China.
- Qian HZ, Vermund SH, & Wang N (2005). Risk of HIV/AIDS in China: Subpopulations of special importance. *Sexually Transmitted Infections*, 81(6), 442–447. doi: 10.1136/sti.2004.014258 [PubMed: 16326842]
- Qiao X, Guo X, & Zhang L (2000). HIV infection among migrants in Shanxi Province. *Chinese Journal of STD and HIV Prevention and Treatment*, 6(5), 265–267.
- Rogers RW (1983). Cognitive and physiological processes in fear appeals and attitude change: A revised theory of protection motivation In Cacioppi T & Petty RE (Eds.), *Social psychology* (pp. 153–176). New York: Guilford.
- Rotheram-Borus MJ, Cantwell S, & Newman PA (2000). HIV prevention programs with heterosexuals. *AIDS*, 14(Suppl 2), S59–S67. [PubMed: 11061643]
- Stanton B, Black M, Feigelman S, Ricardo I, Galbraith J, Li X et al. (1995). Development of a culturally, theoretically and developmentally based survey instrument for assessing risk behaviors among African-American early adolescents living in urban low-income neighborhoods. *AIDS Education and Prevention*, 7(2), 160–177. [PubMed: 7619645]
- Stanton B, Deveaux L, Lunn S, Yu S, Brathwaite N, Li X et al. (2009). Condom-use skills checklist: A proxy for assessing condom-use knowledge and skills when direct observation is not possible. *Journal of Health, Population, and Nutrition*, 27(3), 406–413.
- Stanton B, & Li X (2014). A quarter-century of HIV prevention intervention efforts among children and adolescents across the globe. *Health Psychology and Behavioral Medicine*, 2(1), 231–251. doi: 10.1080/21642850.2014.889572 [PubMed: 24839584]
- Stanton B, Li X, Ricardo I, Galbraith J, Feigelman S, & Kaljee L (1996). A randomized, controlled effectiveness trial of an AIDS prevention program for low-income African-American youths. *Archives of Pediatrics & Adolescent Medicine*, 150(4), 363–372. [PubMed: 8634730]
- Watanabe ME (1999). China confronts AIDS: International help needed to stop the spread. *Scientist*, 13(1), 1, 4. [PubMed: 12349316]
- Wingwood GM, & DiClemente RJ (1999). The use of psychosocial models for guiding the design and implementation of HIV prevention interventions: Translating theory into practice In Gibney L, DiClemente RJ, & Vermund SH (Eds.), *Preventing HIV in developing countries: Biomedical and behavioral approaches* (pp. 187–204). New York: Plenum Publishers.
- Xiao Z, Li X, Lin D, Jiang S, Liu Y, & Li S (2013). Sexual communication, safer sex self-efficacy, and condom use among young Chinese migrants in Beijing, China. *AIDS Education and Prevention*, 25(6), 480–494. [PubMed: 24245595]

- Xiao Z, Li X, & Mehrotra P (2012). HIV/Sexual Risk Reduction Interventions in China: A Meta-Analysis. *AIDS Patient Care and STDs*, 26(10), 597–613. [PubMed: 22989271]
- Yang H, Li X, Stanton B, Liu H, Liu H, Wang N et al. (2005). Heterosexual transmission of HIV in China: A systematic review of behavioral studies in the past two decades. *Sexually Transmitted Diseases*, 32(5), 270–280. [PubMed: 15849527]
- Zhang L (2001). Migration and privatization of space and power in late socialist China. *American Ethnologist*, 28, 179–205.
- Zhang KL, & Ma SJ (2002). Epidemiology of HIV in China. *British Medical Journal*, 324(7341), 803–804. [PubMed: 11934762]
- Zhang KL, Ma SJ, & Xia DY (2004). Epidemiology of HIV and sexually transmitted infections in China. *Sex Health*, 1(1), 39–46. [PubMed: 16335294]
- Zhang H, Stanton B, Li X, Mao R, Sun Z, Kaljee L et al. (2004). Perceptions and attitudes regarding sex and condom use among Chinese college students: A qualitative study. *AIDS and Behavior*, 8, 105–117. doi:10.1023/B:AIBE.0000030242.46843.71 [PubMed: 15187473]
- Zhu J, Wu Q, & Yu S (2001). HIV-related health education among migrant workers. *China Journal of Tropical Medicine*, 1 (1), 76–77.

FIGURE 1.
Protection Motivation Theory.

TABLE 1.

Outline of the Intervention Sessions

Session One: Building group cohesion and HIV/STD knowledge base (gender-segregated)	
Session 1a (60 min.):	Introduction and opening ritual; group cohesion activities, establishing group rules.
Session 1b (120 min.):	Knowledge of HIV/STD infection and transmission; awareness of HIV/STD risk, potential negative impact on family and community (vulnerability, severity) and preventive behaviors (response efficacy); desensitization issues such as condom and sex; continuum of HIV/STD risk (e.g., activities ranged from safe to risk); introduction of decision-making skills.
Session Two: Identifying risks and barriers (gender-segregated)	
Session 2a (90 min.):	Factors contributing to unprotected sex: social influences, family values, community expectations (extrinsic rewards), biological and emotional needs (intrinsic rewards) and broader economic and socio-cultural factors; rehearsal of decision-making skills.
Session 2b (90 min.):	Identify the barriers and solutions of condom use (response costs, response efficacy, situational risk); view and discuss scenes of risk situations; problem-solving skills; imaginary exercise; risk behavior management; potential threats to family or community (response costs).
Session Three: Building self-efficacy and condom use skills (gender-mixed)	
Session 3a (90 min.):	Knowledge of condoms; self-efficacy and skill for obtaining condoms, correct use of condoms (self-efficacy and skills training); hands-on practice.
Session 3b (90 min.):	Negotiation skills for condom use; view and discuss scenes of ineffective sexual communication; elements of assertive communication; five-step of negotiation process; role-play negotiation skills of condom use.
Session Four: Empowering yourself (gender-segregated)	
Session 4a (90 min.):	Rehearsal of condom use skills; life goal-setting (career, health, family, relationship); role models in life, barriers, options, and plan (decision-making skills); importance of self, family, and community in individual and group decision-making; self-confidence and self-esteem building; job-searching skills, job interview skills; coping strategies in daily life.
Session 4b (90 min.):	Goal setting (safe sex, healthy sexual relationship); barriers, options, and plan (decision making skills); imaginary exercise; group game (“undoing thousand ties”); workplace interpersonal skills; community resources, friendship and social support; closing ceremony.

TABLE 2.

Measures of PMT Constructs

PMT Construct	No. of Items	Cronbach's alpha	Sample Item	Response Options
Extrinsic Rewards	4	.92	How many of your peers use condoms with their partners?	none, few, some, most, all
Intrinsic Rewards	5	.40	I feel more intimate with my partner if I do not use a condom	strongly disagree, disagree, agree, strongly agree
Severity	5	.89	One's life is over if one catches HIV	strongly disagree, disagree, agree, strongly agree
Vulnerability	2	.91	How likely will you get HIV or STD in the future?	very unlikely, unlikely, likely, very likely
Response Efficacy	3	.89	Using a condom is an important way to prevent HIV and STD	strongly disagree, disagree, agree, strongly agree
Self-Efficacy	9	.91	I will refuse to have sex if my partner does not want to use a condom	strongly disagree, disagree, agree, strongly agree
Response Costs	8	.88	If my partners know I am carrying a condom, they will be upset	strongly disagree, disagree, agree, strongly agree

TABLE 3.

Demographic Characteristics of the Participants at Baseline and Rates of Follow-Ups

	Overall	Intervention	Control	<i>t/χ²</i>
<i>N</i> (%)	641 (100%)	349 (54%)	292 (46%)	
Age (SD)	24.11 (3.30)	24.34 (3.34)	23.84 (3.23)	1.93
Gender				
Male	58.7%	63.0%	53.4%	6.06 ^{**}
Female	41.3%	37.0%	46.6%	
Ethnicity				
Han	95.8%	95.0%	96.8%	1.29
Non-Han	4.2%	5.0%	3.2%	
Marital status				
Unmarried	59.6%	56.1%	63.8%	4.35
Unmarried but living together	7.5%	8.8%	5.9%	
Married	32.6%	34.8%	30.0%	
Divorced, widowed, or separated	0.3%	0.4%	0.3%	
Years of being a migrant worker (SD)	4.69 (2.87)	4.75 (2.87)	4.62 (2.88)	0.55
Years of being a migrant worker in Beijing (SD)	3.62 (2.51)	3.71 (2.58)	3.52 (2.44)	0.91
Years of education (SD)	10.09 (2.54)	9.96 (2.45)	10.26 (2.65)	1.49
Mean monthly income in Yuan (SD)	2455.81 (1223.69)	2369.13 (1205.00)	2563.35 (1240.35)	1.93
Frequency of home visit				
At least once every 6 mo.	25.3%	23.5%	27.3%	4.24 [*]
Once a year	60.4%	58.5%	62.6%	
Once every 2 years	11.4%	15.3%	6.9%	
Once every 3 or more years	1.8%	1.2%	2.4%	
Never	1.1%	1.5%	0.7%	
Health status				
Very good	39.6%	36.1%	43.7%	7.07
Good	37.2%	37.1%	37.3%	
Fair	20.1%	23.8%	15.8%	
Poor or very poor	3.1%	3.0%	3.2%	
6-month follow-up (%)				
Completed	93.1%	94.3%	91.8%	1.54
Lost-to-follow-up	6.9%	5.7%	8.2%	
12-month follow-up (%)				
Completed	74.7%	75.4%	74.0%	0.16
Lost-to-follow-up	25.3%	24.6%	26.0%	

* $p < .05$;** $p < .01$.

TABLE 4.

Key Outcome Measures at Baseline and Follow-Ups

Variables	Baseline		First Follow-Up		Second Follow-Up	
	Control (<i>n</i> = 292)	Intervention (<i>n</i> = 349)	Control (<i>n</i> = 268)	Intervention (<i>n</i> = 329)	Control (<i>n</i> = 216)	Intervention (<i>n</i> = 263)
Condom use with casual partners						
Frequency of condom use	3.00 (1.29)	2.54 (1.20)**	3.09 (1.38)	3.50 (1.25)*	3.07 (1.40)	3.34 (1.27)
Last three-time condom use	2.16 (0.99)	2.36 (1.15)	2.55 (1.13)	2.83 (1.15)	2.61 (1.15)	2.73 (1.10)
Proper condom use	2.87 (1.28)	3.01 (1.44)	3.35 (1.32)	3.88 (1.33)*	3.26 (1.36)	3.70 (1.32)*
Intention to use condom	3.14 (1.43)	3.29 (1.46)	3.42 (1.49)	4.15 (1.12)***	3.56 (1.45)	4.12 (1.12)***
Condom use with regular partners						
Frequency of condom use	2.78 (1.18)	2.95 (1.35)	2.80 (1.20)	3.62 (1.27)***	2.96 (1.31)	3.65 (1.26)***
Last 3-time condom use	2.29 (1.08)	2.43 (1.18)	2.40 (1.16)	3.11 (1.11)***	2.52 (1.20)	3.15 (1.07)***
Proper condom use	3.05 (1.20)	3.14 (1.38)	3.20 (1.36)	4.00 (1.31)***	3.35 (1.43)	4.06 (1.25)***
Intention to use condom	2.66 (1.29)	2.57 (1.29)	2.89 (1.39)	3.75 (1.25)***	3.06 (1.42)	3.75 (1.23)***
Knowledge						
Condom use knowledge	10.24 (2.21)	10.67 (2.21)*	10.33 (1.97)	12.16 (1.75)***	10.82 (2.19)	12.54 (1.72)***
HIV knowledge	13.14 (2.86)	12.92 (2.97)	13.63 (2.81)	15.00 (2.39)***	13.38 (3.08)	14.81 (2.59)***
PMT constructs						
Extrinsic rewards	3.29 (1.11)	3.59 (1.09)***	3.05 (1.07)	3.15 (1.08)	3.16 (1.20)	2.99 (1.20)
Intrinsic rewards	2.44 (0.36)	2.44 (0.44)	2.39 (0.38)	2.18 (0.47)***	2.32 (0.42)	2.12 (0.41)***
Vulnerability	2.80 (0.67)	2.78 (0.62)	2.89 (0.66)	2.92 (0.53)	2.85 (0.68)	2.96 (0.49)*
Severity	2.64 (0.65)	2.60 (0.59)	2.67 (0.66)	2.64 (0.55)	2.64 (0.66)	2.74 (0.52)
Response efficacy	2.91 (0.63)	2.85 (0.61)	2.98 (0.57)	3.07 (0.45)	2.91 (0.61)	3.01 (0.46)*
Self-efficacy	2.77 (0.55)	2.73 (0.46)	2.84 (0.54)	2.89 (0.39)	2.82 (0.55)	2.88 (0.39)
Response costs	2.36 (0.52)	2.31 (0.52)	2.33 (0.57)	2.22 (0.47)*	2.30 (0.64)	2.12 (0.48)***

*
 $p < .05$;**
 $p < .01$;***
 $p < .001$.

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Notes: Gender: 1 = Male vs. 2 = Female (ref); Marital Status: 1 = Single vs. 2 = Married (ref); Intervention Group Assignment: 1 = Intervention vs. 2 = Control (ref).

^a $p < 0.05$;
^b $p < 0.01$;
^c $p < 0.001$.

TABLE 6.
Results From Mixed-Effects Regression Models for Protection-Motivation-Theory (PMT) Constructs

Variables	Extrinsic Rewards		Intrinsic Rewards		Vulnerability		Severity		Response Efficacy		Self-Efficacy		Response Costs	
	β	SE	β	SE	β	SE	β	SE	β	SE	β	SE	β	SE
Fixed Effects														
Age	0.017	(0.014)	-0.001	(0.006)	-0.011	(0.009)	-0.006	(0.009)	0.002	(0.009)	-0.003	(0.007)	-0.018	(0.008) ^a
Gender	0.213	(0.069) ^b	0.034	(0.033)	-0.087	(0.047)	-0.098	(0.045) ^a	-0.062	(0.043)	-0.042	(0.035)	0.032	(0.039)
Marital status	-0.022	(0.084)	-0.030	(0.039)	-0.014	(0.057)	-0.043	(0.054)	-0.046	(0.052)	-0.076	(0.043)	-0.145	(0.047) ^b
Education	-0.279	(0.044) ^c	-0.010	(0.021)	-0.010	(0.030)	0.018	(0.029)	-0.002	(0.028)	-0.017	(0.023)	-0.014	(0.025)
Years in Beijing	-0.057	(0.015) ^c	-0.007	(0.007)	0.002	(0.011)	0.008	(0.010)	-0.011	(0.010)	-0.009	(0.008)	0.008	(0.009)
Intervention	0.307	(0.143) ^a	0.088	(0.045) ^a	-0.075	(0.065)	-0.094	(0.063)	-0.150	(0.064) ^a	-0.072	(0.054)	0.045	(0.053)
Time	-0.127	(0.049) ^b	-0.063	(0.015) ^c	0.022	(0.020)	0.022	(0.020)	-0.003	(0.019)	0.035	(0.017) ^a	-0.004	(0.019)
Time*intervention	-0.077	(0.067)	-0.102	(0.021) ^c	0.055	(0.028) ^a	0.036	(0.027)	0.092	(0.026) ^c	0.046	(0.023) ^a	-0.073	(0.025) ^b
Random Effect														
Participant	0.001	(0.011)	0.008	(0.002) ^c	0.010	(0.003) ^b	0.011	(0.003) ^c	0.003	(0.003)	0.005	(0.002) ^a	0.017	(0.003) ^c
Change = follow-up- baseline														
Intervention														
6-month	-0.226	(0.074) ^b	-0.222	(0.024) ^c	0.109	(0.035) ^b	0.008	(0.034)	0.183	(0.033) ^c	0.151	(0.029) ^c	-0.072	(0.030) ^a
12-month	-0.448	(0.083) ^c	-0.331	(0.027) ^c	0.190	(0.039) ^c	0.143	(0.038) ^c	0.162	(0.037) ^c	0.168	(0.032) ^c	-0.190	(0.034) ^c
Control														
6-month	-0.241	(0.083) ^b	-0.056	(0.027) ^a	0.071	(0.039)	0.053	(0.038)	0.031	(0.036)	0.049	(0.032)	-0.016	(0.033)
12-month	-0.191	(0.093) ^a	-0.124	(0.030) ^c	-0.002	(0.043)	0.024	(0.042)	-0.027	(0.040)	0.046	(0.035)	-0.035	(0.037)
Difference in change (intervention-control)														
6-month	0.015	(0.111)	-0.166	(0.036) ^c	0.037	(0.052)	-0.045	(0.051)	0.152	(0.049) ^b	0.101	(0.043) ^a	-0.088	(0.045)
12-month	-0.257	(0.124) ^a	-0.207	(0.040) ^c	0.193	(0.058) ^c	0.119	(0.057) ^a	0.190	(0.054) ^c	0.122	(0.048) ^a	-0.155	(0.050) ^b

Notes. Gender: 1 = Male vs. 2 = Female (ref); Marital Status: 1 = Single vs. 2 = Married (ref); Intervention Group Assignment: 1 = Intervention vs. 2 = Control (ref).

$p > 0.001$
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TABLE 7.

Results From Mixed-Effects Regression Models for HIV Knowledge, Condom Use Knowledge and Intention to Use Condoms.

Variables	Intention to Use Condoms With Casual Partners		Intention to Use Condoms With Regular Partners		HIV Knowledge		Condom Use Knowledge	
	β	SE	β	SE	β	SE	β	SE
Fixed Effects								
Age	-0.039	(0.022)	-0.041	(0.020) ^a	0.033	(0.040)	-0.065	(0.028) ^a
Gender	-0.098	(0.110)	0.006	(0.102)	-0.139	(0.200)	-0.344	(0.143) ^a
Marital status	-0.255	(0.132) ^a	-0.250	(0.122) ^a	0.009	(0.241)	-0.189	(0.172)
Education	0.018	(0.070)	-0.035	(0.064)	-0.160	(0.127)	0.168	(0.091)
Years in Beijing	-0.013	(0.024)	-0.019	(0.022)	0.013	(0.045)	0.092	(0.032) ^b
Intervention	-0.013	(0.147)	-0.382	(0.137) ^b	-0.908	(0.319) ^b	0.132	(0.247)
Time	0.189	(0.043) ^c	0.208	(0.046) ^c	0.117	(0.112)	0.279	(0.085) ^b
Time*intervention	0.223	(0.058) ^c	0.391	(0.063) ^c	0.907	(0.152) ^c	0.614	(0.116) ^c
Random Effect								
Participant	0.032	(0.016) ^a	0.095	(0.018) ^c	0.321	(0.080) ^c	0.102	(0.044) ^a
Change = follow-up-baseline								
Intervention								
6-month	0.790	(0.074) ^c	1.105	(0.076) ^c	2.000	(0.189) ^c	1.134	(0.143) ^c
12-month	0.845	(0.083) ^c	1.205	(0.085) ^c	1.954	(0.212) ^c	1.854	(0.160) ^c
Control								
6-month	0.226	(0.083) ^b	0.251	(0.084) ^b	0.302	(0.208)	-0.139	(0.158)
12-month	0.413	(0.091) ^c	0.486	(0.094) ^c	0.144	(0.232)	0.467	(0.177) ^b
Difference in change (intervention-control)								
6-month	0.564	(0.111) ^c	0.854	(0.113) ^c	1.698	(0.281) ^c	1.273	(0.213) ^c
12-month	0.431	(0.124) ^c	0.720	(0.127) ^c	1.810	(0.314) ^c	1.387	(0.238) ^c

Note. Gender: 1 = Male vs. 2 = Female (ref); Marital Status: 1 = Single vs. 2 = Married (ref); Intervention Group Assignment: 1 = Intervention vs. 2 = Control (ref).

$p > 0.001$

$p > 0.01$

$p > 0.05$

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