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A Cluster Randomized Controlled Trial of an Adolescent HIV Prevention Program among Bahamian Youth: Effect at 12 Months Post-Intervention

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Abstract

Background—Behavioral interventions based on the Protection Motivation Theory (PMT) have been demonstrated to reduce HIV risk behavior among mid- and older adolescents in different settings across the globe but have not been evaluated among Caribbean nations and have received limited evaluation among pre-adolescents.

Objective—To determine 1) the effectiveness among pre-adolescents in The Bahamas of a PMT-based HIV prevention program “Focus on Youth in the Caribbean” (FOYC) and 2) the role of the targeted PMT constructs in intervention effect.

Methods—1,360 sixth grade youth (10-11 years of age) from 15 urban schools in New Providence, The Bahamas were randomized by school to receive either FOYC or a control condition. Data collected at baseline, six and 12 months post intervention were analyzed. A five-step scheme was used to assess sexual behavior progression, ranging from “1” = “a virgin without intention to have sex” to “5” = “having sex without a condom”. Group-based trajectory analysis was utilized in assessing the program effect.

Results—Two sexual behavior progression patterns were detected: slow progressors and quick progressors. Receiving FOYC reduced the likelihood for adolescents to become quick progressors (adjusted *OR* = 0.77, 95% *CI*: 0.64-1.00). The observed effectiveness was especially impacted by a subset of the targeted PMT constructs.

Conclusion—FOYC effectively delays sexual risk among Bahamian pre-adolescents. The group-based trajectory analysis provides an analytical approach for assessing interventions among adolescents with low rates and diverse progression patterns of sexual activity.

Keywords

Behavioral Intervention; FOK; HIV/AIDS; Adolescent risk behavior; The Bahamas

INTRODUCTION

Adolescence represents a strategic opportunity for health risk prevention, including prevention of HIV/AIDS related risk behavior in general (Chen & Wu-Weiss, 2007; Fasula & Miller, 2006; Highleyman, 2007) and unprotected sex in particular (Hartell, 2005; Manji, Pena, & Dubrow, 2007). Efforts to develop effective vaccines against HIV/AIDS continue to face many challenges (Lemckert, Goudsmit, & Barouch, 2004; Letvin, 2006). Given the intensity of the HIV epidemic in many developing and transitional countries, it is of global importance to determine the effectiveness in such settings of evidence-based behavioral intervention programs developed in Western settings (HIV/AIDS Prevention Research Synthesis Project, 1999; Lyles et al., 2007).

Adaptation of an effective US program

“Focus on Kids” (FOK) was developed in the 1990s for adolescents residing in Baltimore housing developments (Stanton et al., 1996). FOK, consisting of eight sessions delivered on a weekly basis, was designed for use in community-settings (recreation centers, housing developments). FOK has been evaluated through several randomized controlled trials (Stanton et al., 2004; Stanton et al., 2005; Stanton et al., 2006; Stanton et al., 1996; Wu et al., 2003) and has been included by the Centers for Disease Control and Prevention in its “Diffusion of Effective Behavioral Interventions” portfolio (Lyles et al., 2007). Derivative programs of FOK have been shown to be effective in reducing risky sex and substance use behaviors among adolescents outside of the US, including Namibia, China, and Vietnam (Chen, Fang, Li, Stanton, & Lin, 2006; Fitzgerald et al., 1999; Kaljee et al., 2005; Li et al., 2007; Stanton et al., 1998).

One of the strengths of FOK is its solid theoretical basis. The development of FOK was guided by Protection Motivation Theory (PMT) (Rippetoe & Rogers, 1987), a social cognitive model incorporated in numerous intervention programs (Colfax et al., 2005; Kaljee et al., 2005; Orr, Langefeld, Katz, & Caine, 1996). Consisting of two closely related cognitive pathways, PMT provides a conceptual framework facilitating personal decision-making regarding engagement in risk or protective behaviors through two closely related cognitive pathways (Figure 1). (1) The Threat-Appraisal pathway elaborates the factors associated with threat, including perceived *intrinsic rewards* and *extrinsic rewards* from the potential risk behavior (e.g. pleasure from having sex), balanced by the perceived *severity* or negative consequences of engaging in the risk behavior (e.g., STD and HIV/AIDS resulting from unprotected sex) and *vulnerability* to these negative consequences. (2) The Coping-Appraisal pathway describes the processes involved as an individual contemplates averting the threatened danger, including perceived *self-efficacy* to enact the protective behavior and *response efficacy* of the protective behavior (e.g. abstinence and/or protected sex), and the *response cost* from engaging in the protective behavior rather than the risk behavior. Consistent with PMT, FOK emphasizes skills training so that adolescents actively engage in thoughtful decision-making regarding sexual risk behavior. Increases in perceived threat and/or coping will lead to greater protection motivation, resulting in heightened intention to take protective actions (Kaljee et al., 2005; Stanton et al., 2006; Stanton et al., 1996).

Sexual Behavioral Progression and Program Evaluation

The developmental pattern of sexual behavior, including the practice of risky sexual intercourse, differs among individual adolescents (Butler, Miller, Holtgrave, Forehand, & Long, 2006; Martyn & Martin, 2003; O'Sullivan, Cheng, Harris, & Brooks-Gunn, 2007). Some youth may initiate sex in their preteens while others may remain abstinent throughout their teen years. After initiation, some youth may not engage in sex for a long period of time, some may have limited sex and always with a condom, while others may progress quickly toward more risky forms of sex (Butler et al., 2006; O'Donnell, O'Donnell, & Stueve, 2001). Adolescents who initiate sex early may progress more rapidly than adolescents who initiate sex later (Liu et al., 2006; O'Donnell et al., 2001). Consequently analyzing responses to an intervention by subgroup may better assess the effectiveness of an intervention. Several randomized trials of interventions addressing a range of health behaviors have reported differential efficacies for different subgroups (Gueorguieva et al., 2007; McMahon, Malow, Jennings, & Gomez, 2001; Taylor et al., 2006), supporting the utility of such analytical approach. A recent presentation of results from two randomized trials using a sub-group analytic approach found Naltrexone to be effective in treating alcohol dependence among drinkers who followed a trajectory of consistent drinking (characterized by a high likelihood of daily drinking) but not among drinkers who followed other two progression trajectories (e.g., sporadic drinkers with a low likelihood of daily drinking and rare drinkers with a daily likelihood of drinking approaching zero) (Gueorguieva et al., 2007). However, prior analyses from the two trials that did not include subgroup analysis had failed to show any treatment effect (Krystal, Cramer, Krol, Kirk, & Rosenheck, 2001; O'Malley et al., 2007).

In addition to different developmental trajectories, the rates of risky sex are often relatively low (around 0% to 5%) among pre- and early adolescents (Stanton et al., 1997). In this situation, very large sample sizes are required to detect a practically meaningful program effect. The association between intention to engage in sex (Siegel, Aten, & Enaharo, 2001; Villarruel, Jemmott, Jemmott, & Ronis, 2004) and/or to use a condom (Molla, Astrom, & Brehane, 2007; Sutton, McVey, & Glanz, 1999; Villarruel et al., 2004) with subsequent actions has been well established. The robust nature of these longitudinal associations could be capitalized upon in analyses that utilize a progression perspective to explore the onset of risky sex in populations with low rates thereof.

Purpose of this Study

In response to the high rates of HIV infection in The Bahamas in the 1990s (The Bahamas Ministry of Health, 2005), The Ministries of Health and Education of The Bahamas invited the investigators from the US to collaborate in the development and evaluation of a FOK-based intervention program "Focus on Youth in the Caribbean" (FOYC). Previously we reported significant program effects from FOYC, including improving HIV/AIDS knowledge, condom use skills and PMT perceptions at six months post intervention (Deveaux et al., 2007). In the present study, we assess the effect of FOYC in preventing and/or delaying the progression of sexual risk behavior through 12 months post intervention, including the role of the targeted PMT constructs in affecting the effectiveness of the intervention.

METHODS

Study Site

The intervention trial was conducted in the Commonwealth of The Bahamas, a Caribbean nation of over 700 coral islands with a population of 321,000 (85% African descent). English is widely spoken; approximately 10% of the population speaks Creole (The Bahamas Ministry of Health, 2005). With an estimated 3% of Bahamians infected with HIV, AIDS is the leading cause of death among individuals aged 15 to 44 years. The HIV epidemic is concentrated in urban areas and heterosexual activity is the predominant mode of transmission. The island of New Providence (21 miles long) was selected as the study site because it is the most populated island and hosts the highest rates of HIV; 86% of HIV infected Bahamians reside on this island. (Ministry of Health HIV/AIDS Center, 2006) All 26 elementary schools from the island were invited to participate in the study and 15 schools were selected based on their response to the invitation, size (schools with larger numbers of students were preferred), geographic distribution (representing all four of the Ministry of Education's districts from the four quadrants of the island) and urban location. The selected schools included approximately 80% of all six grade students and approximately 95% of urban six grade students on the island.

Intervention Description

FOYC is a ten-session school-based intervention program, with eight sessions being derived from FOK (University of Maryland Department of Pediatrics, 1998). Two additional sessions emphasizing substance use/abuse and healthy sexual relationships were added in response to aspects of the HIV epidemic in The Bahamas and feedback from focus groups. Through games and other interactive exercises, FOYC targets all seven PMT constructs constituting the Threat Appraisal and the Coping Appraisal pathways. The intervention emphasizes skills development and practice in decision-making, negotiation and communication. Each session requires about 75 minutes to complete; students were scheduled to receive one session per week.

The program "The Wondrous Wetlands" (WW), also a 10-session curriculum that was developed by professionals at The Bahamian National Trust for use in the school system, served as the attention control condition. WW is a conservation program that emphasizes the importance of water conservation, wildlife and other natural resources. The program was implemented through field trips, crafts projects, lectures and discussion. The Ministry of Education of The Bahamas had decided that all students in grade six in the 15 participating schools would receive either FOYC or WW as part of the formal curriculum.

During our preliminary ethnographic work, parents had indicated that they too wished to be involved in efforts to teach their children and therefore we decided to offer all parents of the enrolled children one of two interventions directed towards parents (Deveaux et al., 2007). Caribbean Informed Parents and Children Together (CImPACT) is a parental monitoring and communication program for HIV prevention adapted from Informed Parents and Children Together (ImPACT) (Stanton et al., 2004). CImPACT consists of an educational video teaching parents how to communicate with their children about sex (one session only,

lasting about 20 minutes), followed by a condom demonstration and discussion (30 minutes). As a control program alternative to CImPACT for parents, we offered “Goal for It” (GFI) (Stanton et al., 2004). This is an educational video lasting 20 minutes, which contains no information on HIV/AIDS or sexual education but describes the process for establishing and implementing career goals, including the importance of preparatory schooling. After the video, a brief discussion session is conducted among the participants in small groups in the community settings. Among the 1,360 parents who initially agreed to participate in the study, 1,137 (84%) completed the baseline assessment and participated in the parental intervention. Both CImPACT and GFI for parents were a single session only, and were completed immediately after the baseline assessment.

Intervention assignment

The 15 participating schools were randomly assigned at the level of the school to receive FOYC (10 schools) or WW (control condition, 5 schools) using the 15 unique two-digit school identification numbers a random numbers table. The 10 schools receiving FOYC were further subdivided according to parent intervention, with parents in five of the schools receiving CImPACT and those in the other five GFI. Parents of the control youth received GFI. Post randomization assessment indicated that the shortest distance from an intervention school to a control school in the densely populated island of New Providence was about 5 miles, thus reducing the likelihood of subject-to-subject contamination. Figure 2 depicts the school selection and randomization using the Consolidated Standards of Reporting Trials (CONSORT) –style diagram.

Findings from our preliminary analyses indicated the lack of additional effect associated with CImPACT or GFI on the outcome measures, including sexual behavior progression and condom use. Consequently, in these analyses we focus on the effect of FOYC versus WW; all youth receiving FOYC were included in one group for analysis regardless of the intervention status of their parents.

Parental consent and child assent were obtained for participation in the evaluation trial. The study protocol was approved by both the Human Investigation Committee at Wayne State University in the US and the Ministry of Health in The Bahamas.

Data Collection and Processing

The intervention evaluation was conducted over two “waves”; the first wave (involving nine of the 15 schools) was launched in 2004 and the second wave (the remaining six schools) in 2005. Data were collected using the Bahamian Youth Health Risk Behavioral Inventory, a paper-and-pencil questionnaire delivered in the classroom settings. The instrument is a cultural adaptation of the Youth Health Risk Behavioral Inventory developed by the researchers for use in the US (Stanton et al., 1995). Data collected at baseline (prior to the intervention), and six months and 12 months post intervention were included.

Sexual Behavior and Sexual Behavior Progression

Data were derived from the following items to define sexual behavior progression: intention to have sex in the next six months and whether the subject had engaged in penilevaginal or

penile-anal sex in his/her life (yes/no). Among those who responded positively, they were further questioned as to whether they had engaged in sex in the past six months (yes/no) and if so, the number of partners (one, two, three or more), the frequency of sexual intercourse in the past six months (once, twice, three or more times), and the frequency of condom use (never, rarely, about half the time, more than half the time, and always).

A five-step scheme was used to guide the coding of sexual behavior progression. Subjects were scored “1” (a virgin with no intention to engage in sex) if they reported never having had sex and did not anticipate having sex in the next 6 months (e.g. answered “unlikely” or “very unlikely” in response to this question: “How likely is it that you will engage in sex in the next six months?”). Subjects were scored “2” (a virgin with intentions to have sex) if they reported never having had sex but considered it very likely, likely or possible that they would have sex in the next 6 months. Subjects were scored “3” (sexual debut) if they reported having had sex for the first time (either vaginal and/or anal sex) within the six month assessment interval. Subjects were considered to have progressed beyond sexual initiation (“sexually experienced”) if they had engaged in sex prior to the six month assessment interval and had sex thereafter or had initiated sex and had engaged in sex more than once during the six month interval when sexual initiation occurred. Among sexually experienced youth, those who reported always using a condom were scored “4” and those who reported that they did not were scored “5”. Although more detailed data on frequency of sexual events and condom use might produce a more informative sexual behavior progression, we used binary measures of these variables because of the low frequencies of sexual events and therefore of event-subgroups (such as the number of episodes of sex, the number of partners, and frequency of condom use by an individual).

PMT Constructs and Other Intervention Variables

A 5-point Likert scale was used to assess all items of the PMT related constructs. Confirmative factor analysis using the structural equation modeling method indicated that the seven-construct PMT model fit the data well ($GFI = 0.999$, $RMSEA = 0.09$). The individual items were correlated with the seven corresponding constructs and the constructs were correlated with the two corresponding cognitive pathways as the PMT model implies.

With regard to the Threat Appraisal pathway, perceived severity ($\alpha = 0.65$) was assessed using three items (negative feelings about HIV infection, STD, and pregnancy). Perceived vulnerability ($\alpha = 0.75$) was assessed using three items (likelihood being infected with HIV, STD and pregnancy). Perceived intrinsic rewards were assessed using one item (pleasure from having sex) and extrinsic rewards ($\alpha = 0.62$) were assessed using five items (desire peers to know that the individual is not a virgin, is having sex, and perceived number of boys, girls and close friends who have had sex).

With regard to the Coping Appraisal pathway, perceived self-efficacy ($\alpha = 0.50$) was assessed using three items regarding resisting pressure to engage in sex under various circumstances and response efficacy ($\alpha=0.47$) was assessed using three items assessing perceptions of the effectiveness of abstinence. Perceived response cost ($\alpha=0.30$) was assessed using four items concerned with the possible negative consequences of refusing sex.

HIV/AIDS knowledge was assessed using a set of 15 statements ($\alpha = 0.45$), including both correct (e.g., “Anybody can get AIDS”) and incorrect ones (e.g., “What you eat can give you AIDS”) regarding HIV/AIDS transmission (seven items) and prevention (eight items). These true/false statements were scored 0 or 1 such that a higher score indicated greater knowledge.

Condom skills were assessed using 15 statements (eight correct, seven incorrect) describing the detailed steps of condom use from opening a pack for use to disposal after use (coefficient of reproducibility or $CR = 0.80$ from Guttman analysis) (Farries, Fenaughty, & Lindemann, 2003). Likewise, one point was assigned for each correct answer such that higher scores indicated better condom skills.

Statistical Analysis

Baseline equivalence between the intervention and control groups was assessed using comparative statistics (χ^2 test for categorical variables and Student t-test for continuous variables). Prevalence rates of sexual behavior measures and the mean levels of sexual progression index were computed and compared between the intervention and the control groups at 6 months and 12 months post intervention respectively using multivariate models to adjust for baseline differences and gender.

The group-based developmental trajectory analysis method (Nagin, 1999; Nagin & Tremblay, 2001) was used to uncover potential subgroups with distinct patterns of sexual behavior progression and to estimate the number of persons in different progression subgroups. Let Y_i denote a longitudinal sequence of measurements for i th individual participant from baseline to various follow-up periods, $P(Y_i)$ denote the probability or the likelihood of obtaining Y_i from a survey study, $P^j(Y_i)$ denote the conditional probability of Y_i given the membership in group j , and π_j denote the probability of a randomly chosen participant belonging to group j , then:

$$P(Y_i) = \sum_j \pi_j P^j(Y_i) \quad (1)$$

Fitting model (1) to longitudinal data of Y_i , we can solve for π_j and $P_j(Y_i)$. The model has been extended to include predictor variables that may affect both π_j and $P_j(Y_i)$. The extension provides a mechanism for this research to assess the effect from FOYC and the targeted variables (e.g., PMT constructs) on group membership and developmental trajectories for individual participants. In fitting a group-based model, a censored normal distribution (Nagin & Tremblay, 2001) was assumed and the Bayesian Information Criteria (BIC) (Jones, Nagin, & Roeder, 2001) was used to assist in determining the number of groups with distinct progression trajectories along with a polynomial degree.

Initially, age, gender and a proxy of lower SES (speaking Creole, the language of Haitian refugees, many of whom arrived in The Bahamas in economic distress) were all considered as covariates. Ultimately only age and gender were included because results from the analysis indicated no significant associations between the language variable and sexual behavior progression. Statistical analyses were conducted using SAS (version 9.13, SAS

Institute, Cary, NC). The group-based trajectory analysis was conducted using PROC TRAJ, an added-on procedure to SAS (Jones et al., 2001).

RESULTS

Sample Characteristics at Baseline and Follow-up Rates

Among the 1,360 student participants, 863 (452 girls) received FOYC; 427 of their parents were allocated to GFI and 436 to CImPACT. The remaining 497 students (269 girls) received WW while their parents were allocated to GFI. The average age at participation was 10.5 (SD=0.7) and 10.4 (SD=0.6) years for students in the FOYC and WW groups respectively. Among all student participants at baseline, 1,290 (94.8%) were retained at the 6-month follow-up and 1,212 (89.1%) were retained at the 12-month follow-up. The attrition rate was comparable between the intervention and the control group (see Figure 2).

Data in Table 1 indicate that at baseline, the level of sexual activities of the participants was low. Among the total sample, 8.8% of the subjects reported intending to engage in sexual intercourse in the next six months, 4.0% reported having ever had sex in their lifetime, 1.6% reported having had sex in the past 6 months and 0.8% reported having had sex with multiple partners. Among the subjects who had ever had sex, 16.4% reported having always used a condom during sex, 7.4% reported having sex with two partners in the past six months and 13.0% with three or more partners; 5.8% reported having had sex once, none reported having sex twice, and 9.3% reported having sex three or more times (data not shown in the table). At baseline, more subjects in the FOYC group than in the WW group reported an intention to have sex in the next six months (10.5% vs. 5.8%, $\chi^2 = 3.86$, $p = 0.049$). The differences in other measures between the FOYC and the WW were not statistically significant, including the percent who had sex in the past six months (1.8% vs. 1.3%, $\chi^2 = 2.63$, $p = 0.105$), had sex with multiple partners (1.1% vs. 0.2%, $\chi^2 = 2.63$, $p = 0.105$), and always used a condom during sex (19.4% vs. 10.5%, $\chi^2 = 0.72$, $p = 0.395$). The sexual behavior progression indices did not differ (1.18 vs. 1.13, $t = 1.72$, $p = 0.084$).

Prevalence of Condom Use

Data in Table 1 further indicate that the adjusted rate of condom use among sexually experienced youth in the FOYC group was 25.9% (95% CI: 17.1%-34.7%) and 27.1% (95% CI: 20.6%-33.7%) at six and 12 months post intervention respectively, approximately double the respective rates for the control group. The difference in condom use at 12 months post intervention between the intervention and control youth was statistically significant ($\chi^2 = 3.30$, $p = 0.050$).

Slow Progressors and Quick Progressors

Two distinct sexual behavior progression patterns were detected by the group-based trajectory analysis of the defined five-step progression index: slow progressors (91.8% of the total sample) and quick progressors (8.2% of the total sample). The pattern of slow progression was characterized by a low progression index at baseline (mean = 1.06, SD = 0.23) and a very slow speed of progression over time. The pattern of quick progression was characterized by a higher level of baseline progression index (mean = 2.31, SD=1.28) and

rapid progression over time. Logistic regression controlling for covariate effect indicated that compared to the controls, the odds ratio (*OR*) for subjects who received FOYC to be a quick progressor was 0.77 (95% *CI*: 0.64-1.00).

Figure 3 further depicts the progression patterns for the students in the intervention and the control group. There was a slowing of sexual progression among the quick progressors who received FOYC compared to those who received WW (negative beta coefficients were -0.4484 and -0.2302 for the FOYC and WW respectively, $t = 3.93$, $p = 0.00$).

Effect from PMT Constructs and Other Intervention Variables

Group-based trajectory analysis models that contained no PMT constructs and other intervention variables indicated that receiving FOYC was associated with reduced likelihood of becoming a quick progressor ($\beta = -0.2714$, $t=2.01$, $p = 0.040$) and negatively associated with speed of sexual behavior progression among quick progressors ($\alpha = -0.036$, $t=1.98$, $p = 0.048$), controlling for gender differences.

Data in Table 2 indicate that when the intervention variables were included in the model, the PMT constructs intrinsic rewards and extrinsic rewards were positively associated with the likelihood to be in the quick progression subgroup and the speed of sexual behavior progression for both slow and quick progressors. Perceived severity was negatively associated with speed of sexual progression for quick progressors while perceived vulnerability was associated with low speed of sexual progression for both slow and quick progressors. Perceived response efficacy, HIV/AIDS knowledge and condom skills were negatively associated with the speed of sexual behavior progression among the quick progressors.

After inclusion of the PMT constructs and other intervention variables, receiving FOYC remained associated with reduced likelihood of being a quick progressor ($\beta = -0.3709$, $t = 1.98$, $p=0.05$) and negatively associated with the speed of sexual behavior progression among the quick progressors ($\alpha = -0.1000$, $t=2.00$, $p = 0.03$). Data in Table 2 further indicated that girls were less likely than boys to be in the quick progressor group ($\beta = -1.2821$, $t=4.17$, $p = 0.00$). Among the quick progressors however, the speed of sexual progression was more rapid for girls than for boys ($\alpha = 0.2025$, $t=2.12$, $p=0.01$).

DISCUSSION

In this study, we report data supporting the effectiveness of “Focus on Youth in the Caribbean” (FOYC) in delaying sexual behavioral progression toward risky sex among pre-adolescents in The Bahamas. The evaluation was based on a cluster randomized controlled trial with follow-up data through 12 months post intervention. The outcome variable was assessed based on the concept of sexual behavior progression using group-based trajectory analysis, an approach which is responsive to both the relatively low prevalence levels of sexual behavior among the majority of young adolescents and the diversity of this behavior among subgroups.

Limitations

The study participants were 10 to 11 years old when entering into the trial. We do not know if the effect observed in this study will persist among youth in older age ranges. A five-step progression scheme was used to assess sexual behavior progression due to the relatively low levels of sexual activities. More detailed progression steps could not be assessed, such as having sex with different number of partners or use condom at different frequencies because only a few subjects (~0 to 3) would fulfill the criteria for such progression steps. Such limited numbers in one or more progression steps would have been inadequate for robust statistical analysis. The Cronbach alphas were low for the PMT constructs in the Coping Appraisal Pathway although exploratory and confirmative factor analysis indicated that the PMT model fit the data well. A potential reason for the low alpha could be the young age of the participants and the lack of sexual experience. Finally, our analysis did not formally adjust the effect from school randomization due to the relative small number of clusters (15 schools), which did not provide adequate statistical power.

FOYC Significantly Slowed Sexual Behavior Progression

In this evaluation, we have detected two patterns of sexual behavior progression: slow progressors and quick progressors. The slow progressors (approximately 90% of young teens) were characterized by having little or no intention to have sex when they were about 10 years of age. These adolescents never reached the next level, e.g., expressed an intention to have sex, representing a group with low risk of engaging in sexual risk behavior. The quick progressors (approximately 10% of young teens) were characterized by expressing intention to have sex when they were also about 10 years of age. These adolescents then quickly progressed to the next level: sexual debut in the subsequent six months, representing a group with increased risk of engaging in unprotected sex.

Receiving FOYC was associated with reduced likelihood for a subject to be a quick progressor and reduced speed of sexual behavior progression among those who were quick progressors up to the period 12 months post intervention. The results of this study extend the findings reported earlier at six months post-intervention that youth receiving FOYC compared to controls had greater knowledge and condom use skills and protective changes in PMT-related perceptions (Deveaux et al., 2007). Findings of this study suggest that the original US-based intervention, “Focus on Kids” had been successfully adapted as a second-generation intervention program (“Focus on Youth in the Caribbean”) for HIV prevention among young pre-adolescents in Bahamas.

Significance of the PMT-Related Constructs and Condom Skills

Consistent with the Protection Motivation Theory that guided the development of FOYC, several PMT constructs are associated with the outcome measures, including perceived vulnerability, response efficacy, and intrinsic and extrinsic rewards. Increasing awareness of vulnerability to HIV/AIDS to enhance the threat appraisal pathway and fostering response efficacy to strengthen the coping appraisal pathway are two key components of FOYC. Given the strong association between extrinsic rewards and sexual behavior progression, the effect of FOYC may be further improved by focusing on how to educate adolescents to reduce their perceived rewards from engaging in risky sex. The lack of independent effect of

other PMT constructs on the outcome measures may result from the significant correlation among them as indicated by our confirmative factor analysis. Further, the items in each of the PMT scales assessed primarily abstinence-related behaviors; additional items assessing condom-use and/or multiple partners may have detected additional direct effects. Finally, the alpha values of the scales in the Threat Appraisal pathway whose constructs did exhibit direct effects on behavioral progression, were generally higher than those in the Coping Appraisal pathway where only one construct was significant.

In addition to PMT constructs, HIV/AIDS knowledge and condom skills consist of another component for FOYC to be effective in delaying/slowing down sexual risk behavior progression among Bahamian youth.

In conclusion, data from this study indicate that FOYC, a cultural adaptation of FOK, is effective in delaying/slowing down the progression of sexual risk behavior among young adolescents in The Bahamas. These data suggest that FOYC may also be used in other Caribbean countries with similar cultural backgrounds. In addition, the group-based developmental trajectory analysis should be used in future studies to assess program effect in settings where sexual activities are relatively less frequent and contain distinct risk groups.

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Figure 1.

Cognitive processes involved in decision making in the Protection Motivation Theory. Two pathways lead to the intention to be involved in a HIV risk or protective behavior (see text for further description)

Figure 2.
Consolidated Standards of Reporting Trials (CONSORT) –Style Diagram Illustrating the Selection, Randomization and Evaluation of the Intervention

Figure 3.

Differences in Sexual Behavior Progression between the Intervention (FOYC, N=863) and Control (WW, N=497), Bahamian Adolescents, 2007

Note: Progression index: 1 = no intention to have sex, 2 = likely to have sex in the next 6 months, 3 = sexual debut, 4 = always used a condom during sex and 5 = did not always use a condom during sex.

$$\text{Progression score (slow, FOYC)} = 0.3836 + 0.0670(\text{age})$$

$$\text{Progression score (quick, FOYC)} = -59.1194 + 10.5797(\text{age}) - 0.4484 (\text{age})^2$$

$$\text{Progression score (slow, WW)} = 0.7339 + 0.0647(\text{age})$$

$$\text{Progression score (quick, WW)} = -32.5182 + 5.7380(\text{age}) - 0.2302(\text{age})^2$$

Table 1

PMT Constructs, Cronhach Alpha and Mean Score (SD) AND HIV/AIDS Knowledge by Assignment Group, N=1360 (721 girls), 2007, Bahamas

Constructs and Items	Intervention (FOYC, N=863)	Control (WW, N=427)
PMT CONSTRUCTS		
Threat Appraisal		
Extrinsic reward (Cronbach α = 0.62)	1.70 (0.75)	1.64 (0.74)
1. I want kids my age to think I am having sex. ^{5(agree)-1(disagree)}	1.56(0.96)	1.57(1.00)
2. I want kids my age to think I am a virgin. ^{1(agree)-5(disagree)}	2.20(1.44)	1.99(1.32)*
3. How many of your close friends have sex? ^{5(most),3(some),1(none)}	1.45(1.00)	1.43(1.07)
4. How many of the boys you know have sex? ^{5(most),3(some),1(none)}	1.71(1.25)	1.65(1.26)
5. How many of the girls you know have sex? ^{5(most),3(some),1(none)}	1.58(1.12)	1.52(1.12)
Intrinsic reward (n/a)	1.61 (1.18)	1.47 (1.05)
1. Have Sex. ^{1(bad)-5(good)}	1.61(1.18)	1.47(1.05)
Perceived severity (Cronbach α = 0.65)	4.73 (0.60)	4.70 (0.62)
1. Get HIV infection. ^{5(bad)-1(good)}	1.20(0.65)	1.21(0.66)
2. Get a STD. ^{5(bad)-1(good)}	1.22(0.66)	1.22(0.68)
3. Get pregnant or get a girl pregnant. ^{5(bad)-1(good)}	1.39(0.95)	1.42(0.96)
Perceived vulnerability (Cronbach α = 0.75)	1.59 (0.81)	1.67 (0.85)
1. In the next 6 months I will become infected with HIV. ^{5(likely)-1(unlikely)}	4.50(0.91)	4.38(0.98) *
2. In the next 6 months I will get an STD. ^{5(likely)-1(unlikely)}	4.43(0.92)	4.38(0.95)
3. In the next 6 months I will get pregnant/get a girl pregnant. ^{5(likely)-1(unlikely)}	4.30(1.07)	4.16(1.08)
Coping Appraisal		
Self efficacy (Cronbach α = 0.50)	3.76 (0.96)	3.61 (1.03) *
1. Even if all my friends were having sex, I would not feel I had to. ^{5(agree)-1(disagree)}	3.23 (1.57)	3.04(1.65)
2. I would be able to say no to someone I was going with if I didn't want to have sex. ^{5(agree)-1(disagree)}	4.06 (1.21)	3.91(1.31)
3. I could go with a person for a long time and not have sex with them. ^{5(agree)-1(disagree)}	3.98 (1.25)	3.90(1.35)
Response efficacy (Cronbach α = 0.47)	4.08 (0.90)	4.13 (0.88)
1. Not having sex is the best way of protecting yourself from getting pregnant. ^{5(agree)-1(disagree)}	4.11 (1.32)	4.10(1.34)
2. I want to wait until I'm married before I have sex. ^{5(agree)-1(disagree)}	4.07 (1.32)	4.16(1.29)
3. A guy and a girl can go together and not have sex. ^{5(agree)-1(disagree)}	4.06 (1.24)	4.11(1.24)
Response cost (Cronbach α = 0.27)	2.48 (0.78)	2.45 (0.87)
1. Kids my age respect a girl who is a virgin. ^{1(agree) to 5(disagree)}	2.61 (1.27)	2.49(1.28)
2. A guy and a girl can go together and not have sex. ^{1(agree)-5(disagree)}	1.94 (1.24)	1.89(1.24)
3. If a girl says she won't have sex, a boy would say okay. ^{1(agree)-5(disagree)}	2.92 (1.42)	2.94(1.43)
HIV/AIDS KNOWLDEGE (alpha = 0.45)	0.72 (0.16)	0.70 (0.17)
1. If you touch someone with AIDS you can get AIDS.(true/false)	0.70(0.46)	0.71(0.46)
2. What you eat can give you AIDS.(true/false)	0.89(0.31)	0.86(0.34)
3. You can get AIDS from sharing needles for tattoos or piercing.(true/false)	0.72(0.45)	0.70(0.46)
4. You can get AIDS the first time you have sex.(true/false)	0.65(0.48)	0.66(0.47)

Constructs and Items	Intervention (FOYC, N=863)	Control (WW, N=427)
5. You can get AIDS even if you are only having sex with one person.(true/false)	0.74(0.44)	0.76(0.43)
6. If a condom breaks during sex, you can become infected with the HIV virus.(true/false)	0.77(0.42)	0.80(0.40)
7. Using a condom during sex is a way to protect yourself from getting AIDS.(true/false)	0.83(0.37)	0.84(0.37)
8. Bathing after sex is one way to reduce the chances infected with the AIDS virus.(true/false)	0.59(0.49)	0.55(0.50)
9. Taking birth control pills is one way to protect from AIDS virus infection.(true/false)	0.57(0.50)	0.56(0.50)
11. Abstinence is the best protection from AIDS. (true/false)	0.83(0.37)	0.72(0.45)
12. Plastic wrap can be used instead of condoms to protect against HIV/AIDS.(true/false)	0.66(0.48)	0.65(0.48)
13. Keeping in good physical shape is the best way to keep from getting AIDS.(true/false)	0.53(0.50)	0.52(0.50)
14. A shower after sex reduces the risk of getting AIDS.(true/false)	0.73(0.45)	0.67(0.47)
15. A good diet and plenty of sleep will keep a person from getting AIDS.(true/false)	0.77(0.42)	0.68(0.47) **

* *Note:* n/a: not applicable; $p < 0.05$;

** $p < 0.01$; Value in parentheses is standard deviation.

Table 2

Percentage Rate of Sexual Behavior, Condom Use and Index of Sexual Behavior Progression at Baseline and Adjusted Rate (95% CI) at 6 Months and 12 Months Post Intervention

Sexual behavior indicator Percentage/mean (95%CI)	Total (FOYC+WW)	Intervention (FOYC)	Control (WW)
Sample size N	1360	863	497
Intention to have sex			
Baseline ^a	8.8	10.5	5.8
6 Months	10.5(9.2-11.8)	9.5(7.9-11.1)	11.5(9.4-13.6)
12 Months	12.6(11.2-14.1)	13.2(11.5-14.9)	12.0(9.7-14.3)
Ever had sex			
Baseline ^a	4.0	4.2	3.8
6 Months	8.9(8.1-9.8)	9.1(8.1-10.1)	8.7(7.4-10.1)
12 Months	14.4(13.2-15.7)	14.7(13.2-16.1)	14.2(12.2-16.2)
Had sex in past 6 months			
Baseline ^a	1.3	1.6	3
6 Months	2.2(1.6-2.8)	2.4(1.7-3.2)	2.0(1.0-3.0)
12 Months	3.1(2.4-3.9)	2.8(1.9-3.7)	3.4(2.3-4.6)
Multi-partners			
Baseline ^a	0.8	1.1	0.2
6 Months	1.6(1.1-2.2)	1.7(1.1-2.4)	1.5(0.6-2.4)
12 Months	2.6(1.9-3.3)	2.6(1.8-3.4)	2.6(1.5-3.7)
Condom use among sexually experienced			
Baseline ^a	16.4	19.4	10.5
6 Months	19.8(12.2-27.4)	25.9(17.1-34.7)	13.6(2.5-24.8)
12 Months	21.3(15.6-27.0)	27.1(20.6-33.7)	15.5(6.9-24.1) *
Index of sexual behavior progression			
Baseline ^a	1.16	1.18	1.13
6 Months	1.24 (1.22-1.26)	1.23 (1.20-1.27)	1.28 (1.23-1.33)
12 Months	1.36 (1.34-1.39)	1.36 (1.32-1.41)	1.40 (1.33-1.46)

Note: The rates and index for baseline were directly estimated from data and the adjusted rates/means and their 95% confidence interval (CI) for the same variables at 6 and 12 months follow-up were estimated using multivariate linear models to controlled for gender, age and baseline differences between the interventions and the control group.

* : P<.05.

Table 3

The Impact of Intervention Variables on the Outcome of Sexual Behavior Progression from Group-Based Developmental Trajectory Analysis

(FOYC, N=863 vs. Control, N = 497)			
Mediator Variable	Group membership (being a quick progressor, β)	Speed of progression over time	
		Slow progressors (α)	Quick progressors (α)
Threat appraisal			
Intrinsic rewards	0.1763 *	0.0943 **	0.0130 **
Extrinsic rewards	0.8016 **	0.0738 **	0.2360 **
Severity	-0.3081	-0.0117	-0.0013
Vulnerability	-0.1769	-0.0367 **	-0.0284
Coping appraisal			
Self-efficacy	-0.1433	-0.0141	-0.0246
Response efficacy	-0.1371	-0.0074	-0.1278 **
Response cost	-0.2164	-0.0051	-0.0196
Knowledge and skills			
HIV/AIDS knowledge	-0.0409	-0.0062	-0.027
Condom skills	-0.0055	-0.0038	-0.0541 **
Intervention & covariate			
Received FOYC/GFI	-0.3709 *	-0.0047	-0.1000 **
Female gender	-1.2821 **	-0.0134	0.2025 *
Model fitting	BIC= -2003.3	AIC = -1871.6	

Note: Similar to other multiple regression method, the group-based trajectory analysis uses the model coefficients to assess the relationship between predictor variables and outcome variables. Since the group-based analysis can simultaneously assess the association of a predictor variable on (1) the group membership and (2) the speed of progression of individual subgroups, two different terms (β and α) were used to denote the model coefficients (similar to a regression coefficient) with the β coefficient assessing factors associated with group membership and the α coefficient assessing factors associated with the speed of progression. BIC: Bayesian Information Criterion and AIC: Akaike Information Criterion.

* : $p < .05$ and

** : $p < .01$