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Randomized Trial of Group Interventions to Reduce HIV/STD Risk and Change Theoretical Mediators Among Detained Adolescents

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Criminally involved adolescents engage in high levels of risky sexual behavior and alcohol use, and alcohol use may contribute to lack of condom use. Detained adolescents ($n = 484$) were randomized to (1) a theory-based sexual risk reduction intervention (GPI), (2) the GPI condition with a group-based alcohol risk reduction motivational enhancement therapy component (GPI + GMET), or (3) an information-only control (INFO). All interventions were presented in same-sex groups in single sessions lasting from 2 to 4 hr. Changes to putative theoretical mediators (attitudes, perceived norms, self-efficacy, and intentions) were measured immediately following intervention administration. The primary outcomes were risky sexual behavior and sexual behavior while drinking measured 3 months later (65.1% retention). The GPI + GMET intervention demonstrated superiority over both other conditions in influencing theoretical mediators and over the INFO control in reducing risky sexual behavior. Self-efficacy and intentions were significant mediators between condition and later risky sexual behavior. This study contributes to an understanding of harm reduction among high-risk adolescents and has implications for understanding circumstances in which the inclusion of GMET components may be effective.

Keywords: motivational enhancement therapy, HIV/STD, criminally involved adolescent, condom use, alcohol

Motivational interviewing (MI; Miller & Rollnick, 2002) and its extensions (e.g., motivational enhancement therapy [MET]; Miller, 2000) have been shown to be effective, gaining the most support in the field of substance use and abuse (Hettema, Steele, & Miller, 2005), and increasing support in the venue of health behavior change (Resnicow, Baskin, Rahotep, Periasamy, & Rollnick, 2004). However, there are still a number of gaps in the literature regarding how and in what contexts MI-based interventions are effective. A recent review by Burke, Arkowitz, and Menchola (2003) has demonstrated that they might not be effective across all contexts, including human immunodeficiency virus (HIV) prevention. Furthermore, although MI/MET strategies are substantially better than no treatment or control treatments, research has not shown them to be consistently better than other active interventions (Burke et al., 2003). Finally, starting almost 10 years ago, the use of these techniques has been suggested in the context of group interventions (Foote et al., 1999; Van Horn & Bux, 2001; Walters, Ogle, & Martin, 2002), yet there are only a few studies that have tested some version of group-based approaches (e.g., LaBrie, Pedersen, Lamb, & Quinlan, 2007; Santa Ana, Wulfert, & Nietert, 2007). As with individual MI, there is some evidence of efficacy (LaBrie et al., 2007; Michael, Curtin, Kirkley, Jones, & Harris, 2006), although not necessarily as compared with other active group interventions (John, Veltrup, Driessen, Wetterling, & Dilling, 2003; Santa Ana et al., 2007).

To best determine under what circumstances MI/MET works, a better question might be to determine *how* effects are achieved

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(Morgenstern et al., 2007). Some previous work has examined the mechanisms of change underlying MI approaches, primarily focusing on intermediate outcomes (e.g., self-regulation, readiness to change, development of discrepancy beliefs) achieved by participants (Carey, Henson, Carey, & Maisto, 2007; Neal & Carey, 2004) and on characteristics of the therapist (Moyers & Martin, 2006; Moyers, Miller, & Hendrickson, 2005). However, there remains little research examining theoretically derived psychosocial constructs (e.g., attitudes, self-efficacy, perceived norms, intentions) that might be expected to change as a result of the content of MI-based interventions. There is also no research, of which we are aware, bearing on the mechanisms of action when MI/MET is implemented in a group.

We present an evaluation of a randomized controlled trial comparing three intervention conditions: (1) a group-based, theory-driven psychosocial intervention designed to reduce sexual risk (GPI); (2) the GPI condition with a group-based alcohol risk reduction MET component (GPI + GMET); and (3) a group-based, information-only control (INFO). The interventions were compared in a sample of ethnically diverse detained adolescents. In addition to the implications of the present study in terms of harm reduction among an extremely high-risk population of adolescents, this study contributes to an understanding of the effectiveness of MI/MET approaches, specifically by (1) testing the efficacy of the addition of *group* MET to a traditional theory-based sexual risk reduction intervention, specifically among adolescents, in a rigorous randomized controlled trial with behavioral outcomes; (2) uncovering mechanisms of action underlying the effectiveness of the GPI + GMET intervention relative to the GPI and control conditions; (3) linking these mechanisms to well-established theorizing on safer sexual behavior among an at-risk population (Bryan, Aiken, & West, 2004; Bryan, Rocheleau, Robbins, & Hutchison, 2005); and (4) comparing the GPI + GMET intervention with both another active treatment and with a control, all of which were presented in a group format.

Harm Reduction Among Criminally Involved Adolescents

Adolescents in general are at high risk for sexually transmitted diseases (STDs), including HIV (Centers for Disease Control and Prevention [CDC], 2005). Higher rates of STDs have been observed among adolescents involved with the criminal justice system in comparison with the general adolescent population, likely because such adolescents are younger at first intercourse, have a greater number of sexual partners, and report lower rates of condom use (cf. Teplin, Mericle, McClelland, & Abram, 2003). Despite the fact that these adolescents are at great risk for HIV/STDs, few studies have evaluated the efficacy of sexual risk reduction interventions among adolescents involved in the criminal justice system (for exceptions, see Clark et al., 2000; Gillmore et al., 1997; Rosengard et al., 2007; Schlapman & Cass, 2000; Shelton, 2001; St. Lawrence, Crosby, Belcher, Yazdani, & Brasfield, 1999). Furthermore, a number of the existing programs have been methodologically limited by a lack of a control condition and by failing to examine behavior following the intervention program (Clark et al., 2000; Schlapman & Cass, 2000; Shelton, 2001), and no programs have, to our knowledge, sought to understand why a program may have worked by uncovering the mediational processes underlying program effects (cf. West & Aiken, 1997).

Alcohol use is commonly cited as a reason for lack of condom use among high-risk adolescents (Bryan, Ray, & Cooper, 2007; Rosengard et al., 2006), and substance use in the context of sexual encounters appears to be increasing among adolescents (CDC, 2006). Behavior change interventions to promote safer sexual behavior that also address the role of alcohol use on risky sexual behavior may thus be particularly effective. There exist many examples of HIV/STD prevention interventions that are conducted with individuals who have substance abuse disorders (for reviews, see Prendergast, Urada, & Podus, 2001; van Empelen et al., 2003), but there are few, if any, interventions that specifically target both substance use and sexual risk reduction in groups who are not in treatment for or selected because of substance use (although see Rosengard et al., 2007).

The present study was an attempt to address these gaps in the literature through the development of a theory-based intervention, targeted to detained adolescents, which addressed the role of alcohol use in sexual risk behavior. MI approaches have shown exceptional promise for adolescents in general, and recent work has also provided preliminary support for the use of MI/MET based interventions with criminally involved adolescents (Rosengard et al., 2007; Stein, Colby, Barnett, Monti, Golembeske, & Lebeau-Craven, 2006; Stein, Colby, Barnett, Monti, Golembeske, Lebeau-Craven, & Miranda, 2006). Group MI/MET approaches may be particularly suited to interventions with detained and incarcerated adolescents for a number of reasons (Feldstein & Ginsburg, 2006). The nonconfrontational and supportive approach of MI/MET may be seen as an excellent developmental fit for adolescents involved in the justice system. Furthermore, entry into the justice system can be considered a "teachable moment" when adolescents may be more receptive to contemplating the negative aspects of a behavior, and to contemplating avenues of behavior change. It is a time when this high-risk population may be accessible and open to receiving intervention, and their participation in detention programs might mean they are already accustomed to the group intervention context. On that note, peer influences are particularly important for adolescents (Rivis & Sheeran, 2003), underscoring the potential value of group-based interventions (Burleson, Kaminer, & Dennis, 2006).

Putative Theoretical Mediators Targeted Through Intervention Components

Theoretical models in the area of HIV prevention among high-risk adolescents (Bryan et al., 2004, 2005) served as the basis for the development and implementation of the GPI component of the present interventions. Such models have been tested and validated cross-sectionally in incarcerated adolescents (Bryan et al., 2004) and longitudinally with probated adolescents (Bryan et al., 2005). Several predictors of condom use have emerged from these studies, including condom use attitudes, perceived norms for condom use, and intentions to practice safer sex from the theory of planned behavior (TPB; Ajzen & Madden, 1986), and self-efficacy for condom use from social cognitive theory (SCT; Bandura, 1992). Mediational model structure in this study was based on the TPB, such that intentions were considered the most proximal determinant of behavior; and attitudes, perceived norms, and self-efficacy for condom use served as coequal predictors of intentions to practice safer sex.

These same constructs may translate to the mechanisms underlying the effectiveness of the GMET component. Two potential driving forces of MI-based interventions may be increasing motivation to change and increasing self-efficacy (Miller & Rollnick, 2002). MI has been characterized as being consistent with the major models of health behavior, including the TPB and the SCT (Apodaca, Abrantes, Strong, Ramsey, & Brown, 2007; Britt, Hudson, & Blampied, 2003). The development of self-efficacy and changes to normative perceptions using personalized feedback, both key components of MET, translate easily to the self-efficacy and norm constructs from several theories of health behavior. Furthermore, readiness to change is essentially a categorical version of behavioral intentions from the TPB (Apodaca et al., 2007), and consideration of the pros and cons associated with the relevant behavior has been mapped onto the TPB attitude construct (Apodaca et al., 2007). Given that both the GPI and the GMET components target TPB constructs, and that the combined intervention includes *both* the GPI and GMET components, it would be expected that the effectiveness of the GPI + GMET would be mediated by its stronger effects on self-efficacy, perceived norms, attitudes, and intentions by targeting these constructs through multiple approaches.

Attitudes, perceived norms, self-efficacy, and intentions were thus considered important putative mediators in the present study on the basis of prior theoretical findings (Bryan et al., 2004, 2005), the overlap between these constructs and the rationale underlying MI/MET approaches, and the multiple targeting of these constructs in the combined GPI + GMET intervention. The specific characterizations of the constructs were tailored to the population at hand. Attitudes were measured as affective responses to condom use (e.g., whether sex is enjoyable vs. unpleasant when condoms are used). Perceived norms were characterized as both descriptive norms specifying what others actually do (Cialdini, Kallgren, & Reno, 1991), as well as injunctive or subjective norms dictating what an individual should do on the basis of the views of significant others, as both are important in predicting adolescent sexual risk (Bryan et al., 2004, 2005; Fisher, Misovich, & Fisher, 1992). Self-efficacy was a multidimensional construct that included the assessment of one's confidence in his/her condom use skills (e.g., buying, carrying, and using condoms), as well as negotiating condom use with one's sexual partner.

Program Overview and Hypotheses

Adolescents in detention were randomly assigned to one of three group-based interventions: INFO, GPI, or GPI + GMET. We present the full evaluation of program effects on longitudinal risky behavior outcomes elsewhere (Bryan, Schmiege, & Broaddus, 2008). Here we seek to uncover the immediate postintervention changes in psychosocial constructs that act as mechanisms of action of the GPI + GMET as compared with the GPI and INFO interventions in influencing 3-month behavioral outcomes. It was expected that the GPI + GMET intervention would be most effective in reducing risky sexual behavior and potentially reducing the degree to which alcohol use and sexual behavior occurred together, and these effects were expected to be driven by changes to attitudes, perceived norms, self-efficacy, and intentions.

Method

Participants

Participants were 484 adolescents[1] recruited from three detention facilities in the Denver, Colorado, judicial district from January 2004 to July 2006. Eligible adolescents had to be between 14 and 17 years of age, English-speaking, and current residents at one of the detention facilities. Eligible adolescents also had to have fully informed consent from a parent/guardian and to give their own fully informed assent. Mean age of the participants was 15.8 years ($SD = 1.1$), and the majority (82.7%) were male. The sample was ethnically diverse, such that approximately 36.6% of participants were Caucasian, 28.5% were Hispanic, 12.9% were African American, 4.8% were Native American, 3.5% were Asian, 2.1% were other ethnicity, and 12.6% were biracial/mixed ethnicity.

Risky behavior was high, with 92.65% of participants reporting ever having had sex. Mean age of first intercourse was 13.02 years ($SD = 1.7$), and median number of sexual partners was 6 (mode was 4). Only 29.4% reported condom use in *all* sexual encounters; 15.8% reported never using condoms. Most participants (90.9%) reported using alcohol in the prior year, and average number of drinks at one time was 4.67 ($SD = 2.50$) on a 10-point scale (in which 4 = *4–6 drinks*, and 5 = *5–7 drinks*). Of those who were sexually active, the vast majority (82.02%) had used alcohol at least once during a sexual encounter, underscoring the importance of including alcohol risk reduction content in an HIV/STD preventive intervention in this population. Of female participants, 32.5% reported ever being pregnant, with 23.8% ever having an STD; 24.3% of male participants reported getting a partner pregnant, and 3.3% reported having had an STD. The observed gender differences in STD rates are consistent with the epidemiology and treatment of STDs (e.g., CDC, 2006, 2007).

Procedure

All procedures were approved by an institutional review board at the University of Colorado at Boulder, and a federal certificate of confidentiality was obtained from the National Institute on Alcoholism and Alcohol Abuse. Because the study was conducted with prisoners, approval was also obtained from the federal Office for Human Research Protections. The facilities in which the study took place are considered secure detention facilities that primarily serve preadjudicated youths and those with short sentences. The average stay for adolescents at these facilities is approximately 14 days.

One staff member from each facility was employed to assist in participant recruitment, and all new detainees who met the eligibility criteria were offered the opportunity to participate upon intake to the facility. Potential participants were told that the

[1] The 484 participants were based on a planned sample size of 480 to permit analysis of the primary research questions at a power level of .80, taking into account expected nonzero intraclass correlation values due to the cluster randomized design, and accounting for attrition at the later follow-up occasions. Power analyses were based on expected moderate effect sizes when comparing the GPI and GPI + GMET conditions with the control condition and small to moderate effect sizes when comparing the GPI and GPI + GMET conditions with one another.

research project concerned health behavior among adolescents and that their participation would include involvement in programs that discuss sensitive topics, such as sexual behavior and alcohol use. Adolescents were instructed that they would be randomly assigned to one of three possible educational sessions, although they were kept blind to the precise nature of each condition and to the study hypotheses. The intake staff member was explicit in clarifying that participation was completely voluntary and that participation decisions would in no way affect the young person's treatment by the juvenile justice system. After adolescent assent was obtained, parents/guardians were contacted by telephone by research staff to provide their own informed consent. All consent conversations were audio-recorded and logged for proof of consent. Parent/guardian consent was obtained independently from adolescent assent, and parents/guardians were instructed that although their child had expressed an interest in participating, they maintained responsibility for final participation decisions. The research staff was trained to carefully review the detailed consent form and to answer any questions prior to obtaining parental consent.

After adolescent assent and parent/guardian consent were obtained, the adolescent was scheduled by a member of our research staff for the next available intervention session. Each intervention consisted of a single session, and random assignment occurred at the level of the session (i.e., each time a session was run, it was assigned to one of three conditions) after participants were enrolled and scheduled to a particular session. Using a random numbers table, a staff member, other than the intervention leader, determined random assignment the morning the session was to be run. There were 42 groups (35.9%) assigned to the control condition, 36 groups (30.8%) assigned to the GPI condition, and 39 groups (33.3%) assigned to the GPI + GMET condition.

Interventions were conducted in classrooms within each facility and were administered in same-sex groups ranging from 1 to 10 participants. The vast majority of group sizes ranged from 3 to 5 ($M = 4.18$, with $M = 3.68$ and $M = 4.70$ for female and male groups, respectively).[2] Upon arrival to the study, participants completed baseline measures assessing demographics, sexual and substance use behavior, and potential mediating constructs. Participants then engaged in the intervention session. All sessions were led by intervention leaders trained in the provision of each intervention, including specific training in the provision of the MI/MET component. MI/MET training was supervised by an experienced clinician–investigator (e.g., Hutchison et al., 2006). Drift was controlled by regular meetings with intervention leaders and by the fact that all interventions followed a scripted intervention manual to ensure consistency of presentation across groups. Eight intervention leaders were used (three were female), and no significant differences in favorability ratings or in study outcomes across intervention leaders were observed. Gender of the intervention leader coincided with gender of the participants. An additional research staff member was present to assist in the set-up of equipment and materials and to conduct a process evaluation ensuring intervention fidelity, including evaluation of the intervention leader (see Aiken, West, Woodward, Reno, & Reynolds, 1994; Bryan, Aiken, & West, 1996; Fisher, Fisher, Bryan, & Misovich, 2002). The intervention leaders' rapport with the participants and the degree to which the leader held the participants' attention were high across trainers (91.1% and 89.1% of sessions were rated as a "6" or "7" on a 7-point scale in terms of rapport and attention, respectively). On average, 92% of the intervention components were covered. Pairwise comparisons indicated that the proportion of intervention components covered did not differ by condition (all Fs < 3, *ns*). Although occasionally intervention components were skipped for reasons such as computer or VCR malfunctions, no unique components from the active interventions were covered in the control intervention, and no unique components from the GPI + GMET intervention were covered in the GPI intervention.

The control session took approximately 2 hr to complete, the GPI intervention took approximately 3 hr to complete, and the GPI + GMET intervention took between 3 and 4 hr to complete. Immediately following the intervention, participants completed a contact information sheet for follow-up survey purposes and a short posttest survey designed to assess changes to hypothesized mediators occurring from pretest to posttest. All measures were completed on a laptop computer via audio-computer assisted self-interview (ACASI) technology, and participants were compensated $25 for this initial session. Follow-up questionnaires were administered 3 months postintervention and consisted of behavioral measures related to risky sexual behavior and sexual activity involving alcohol in the previous 3 months. This questionnaire was completed at a location convenient to the adolescent, such as his or her home, and participants were compensated an additional $25 for completion of this survey.

Figure 1 provides detailed information regarding the flow of participants through each phase of the study after the point of assent, as well as the attrition at each wave. Adolescent assent was obtained from $n = 780$ individuals.[3] Of these, $n = 484$ were randomized to condition; we obtained parental consent for an additional 159 adolescents, but these adolescents were released from detention prior to the next available intervention session and were no longer available to participate; the parent/guardian refused consent for $n = 17$ adolescents; and, there were $n = 120$ adolescents for whom our research staff was unable to reach their parents/guardians by phone prior to the adolescents being released from detention. The vast majority of participants randomized to condition completed the entire experimental session; posttest data were completed by $n = 467$ participants—a 96.5% level of retention. No participant withdrew from the study because of discomfort or adverse events, although occasionally participants would need to be pulled from the intervention for reasons unrelated to the study (e.g., to meet a court date). Follow-up data were obtained from $n = 315$ participants—a 65.1% level of retention from the original 484 participants.

GPI Condition

The group-level psychosocial intervention was based on previously successful published HIV/STD risk reduction interventions conducted with young people (Bryan et al., 1996; Fisher et al,

[2] Only one group with 1 participant and one group with 10 participants were run; these outlier groups thus comprised an extremely small percentage of the total groups run, and conclusions of the study did not differ with these outliers removed.

[3] We cannot calculate the percentage of potential participants who declined participation at the time of assent, as the calculation of these rates was too burdensome a task to ask of the already overworked intake staff.

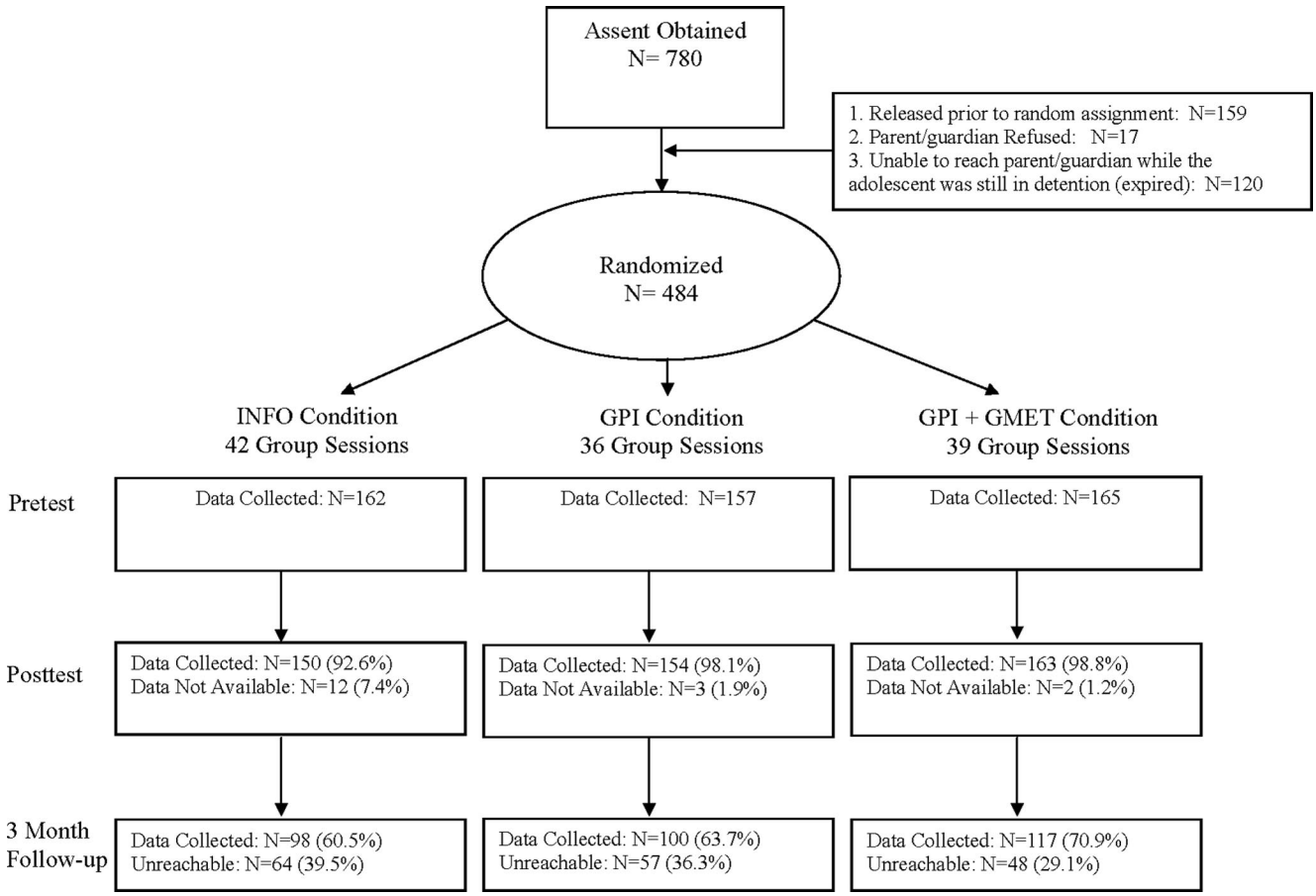

Figure 1. Diagram of participant flow through the study by condition. INFO = information-only control; GPI = theory-based sexual risk reduction intervention; GPI + GMET = the GPI condition with a group-based alcohol risk reduction motivational enhancement therapy component.

2002; St. Lawrence et al., 1999). Each component targeted constructs from the theoretical models previously shown to relate to condom use in this population (Bryan et al., 2004, 2005) through group activities, videos, and condom use demonstrations. The intervention began with general information about HIV transmission, as well as local resources for information and health services. Then, specific sections of material were devoted to developing self-efficacy, normative perceptions, and positive attitudes toward condoms. Participants discussed the best places and methods to obtain condoms, and a hands-on demonstration was conducted to teach participants the correct way to put condoms on. Participants watched a movie depicting ethnically representative young people that emphasized, and explicitly modeled, being prepared for sexual activity and the importance of good communication skills with current and potential sexual partners. Participants were asked to consider how negative consequences of unprotected sex would impact the life goals they had for themselves via a videogame in which they made a series of choices regarding sexual activity. Finally, they picked a "Safer Sex" goal that they wanted to accomplish in the subsequent 3 months to increase positive intentions. In general, the intervention is engaging and involves a great deal of active participation.

GPI + GMET Condition

The GPI + GMET intervention included all of the same sexual risk reduction sections as the GPI prior to administration of the GMET component. Participants were then given printed feedback regarding their alcohol use behavior on the basis of their pretest responses to questions. Feedback sheets included information on the participants' blood alcohol levels on a "typical" night of drinking and on a "heavy" night of drinking. Other feedback included participants' levels of drinking compared with average adolescents, risk of alcohol dependence (derived from Alcohol Use Disorders Identification Test scores; Saunders, Aasland, Babor, de la Fuente, & Grant, 1993), and their level of problems as a result of drinking (derived from Rutgers Alcohol Problems Inventory scores; White & Labouvie, 1989).

The feedback was used in an MET style to facilitate a group discussion that was designed to be empathic, open, and nonconfrontational to encourage motivation to change alcohol use behavior in the context of sexual activity. The mode of intervention delivery followed accepted MI/MET procedures at the time and utilized the FRAMES organizing structure that includes the following elements: Feedback, Responsibility, Ad-

vice, Menu, Empathy, and Self-Efficacy (Miller & Sanchez, 1994). The MET used a group discussion format to address awareness about one's level of alcohol consumption, awareness about the consequences of alcohol use (including its effects on decision making), and strategies to develop self-efficacy for reducing alcohol use risk. Here, participants were encouraged to envision manageable strategies they could enact to reduce their sexual risk in contexts in which alcohol was present (e.g., drinking water in between alcoholic drinks) and were then asked to think about how they would execute each strategy. Participants also watched a video depicting ethnically representative young people at a party with alcohol, which showed the negative consequences that can result from alcohol use in sexual situations and provided a menu of options for positive decisions (e.g., by emphasizing the positive impact that preplanning can have on one's choices). To bolster self-efficacy for reducing sexual risk in the context of alcohol, we placed emphasis throughout this section on the importance of specific alcohol-related sexual risk reduction skills (e.g., understanding one's limits, not putting oneself into a situation in which a risky sexual encounter may take place, employing a "buddy system" to reduce likelihood of risky sex, etc.).

Following the tenants of MI, the intervention leaders were trained to *guide* (i.e., gently direct; Rollnick, Miller, & Butler, 2008) participants to explore their ambivalence around alcohol use and related sexual risk behavior, with a focus on participants' thoughts around potential and experienced consequences of alcohol use. Collaboratively, participants and leaders determined and explored alternative behaviors. Consonant with MI, intervention leaders were explicitly nonjudgmental and supportive of adolescents' self-efficacy and autonomy. Fidelity checks showed that 100% of interventions addressed the group with normative feedback, developed pros and cons of drinking, discussed harm reduction strategies generally, presented and processed the video that modeled safer sexual behavior in the context of alcohol, and discussed how harm reduction strategies could have mitigated the negative consequences of drinking depicted in the movie; 97% addressed how alcohol may impact decision making regarding protection and facilitated the development of self-efficacy by eliciting the participants' opinions of the best strategies for dealing with drinking and sexual behavior and imagining themselves engaging in those strategies.

INFO Condition

Participants received several components that were also targeted in the two active interventions, including basic STD information and definitions, modes and body fluids of HIV transmission, the high effectiveness of condom use in preventing HIV transmission, discussions on the need for condom use even if one trusts his or her partner and how it is impossible to know who may be infected with HIV, and the presentation of a list of area resources for testing and other sexual health services. Additional information was presented in a video that discussed common STDs and a question and answer session that occurred after the video.

Measures

Mediational constructs. Putative mediators were measured just prior to and immediately following the intervention. These measures were originally developed for condom use research in samples of college-age women (see Bryan et al., 1996; Bryan, Aiken, & West, 1997) and were validated for use in the present study in a sample of adolescents on probation (Bryan et al., 2005) and a sample of incarcerated adolescents (Bryan et al., 2004). The range of these scales was 1–4, and response options varied from *disagree a lot* to *agree a lot* (or *will not happen* to *will definitely happen* for the intention measures), with higher numbers indicating more positive endorsement of the construct. Scale scores were calculated as a mean of the items composing each scale. Measured scales included *attitudes toward condom use* (23 items; $\alpha = .87$; e.g., "Condoms can ruin the sexual mood" [reversed] and "Condoms take the fun out of drinking alcohol and having sex" [reversed]); *perceived norms for condom use* (8 items; $\alpha = .91$; e.g., "Most of my friends use condoms when they have sex," "Most of my friends think people should always use a condom when having sex," and "Most of my friends think it's especially important to use condoms when they've been drinking"); *self-efficacy for condom use* (33 items; $\alpha = .93$; e.g., "I am confident in my ability to use a condom correctly" and "I feel confident that I could convince a sexual partner to use condoms even if I were drinking"); and *intentions to practice safer sexual behavior* (12 items; $\alpha = .88$; e.g., "How likely is it that you will use a condom every time you have sexual intercourse?" and "How likely is it that you will drink less/monitor your drinking the next time you are in a situation where you might have sex?"). We had intended to distinguish alcohol-specific measures of each mediational construct (e.g., self-efficacy for condom use while drinking) from the more general constructs. However, the alcohol-specific and general scales were psychometrically indistinguishable (r values ranged from .57 to .73 across the four constructs) and were thus collapsed.

Behavioral measures. A risky sexual behavior index and a measure addressing the co-occurrence of alcohol use with sexual behavior were assessed at baseline and follow-up. All behavioral items at both time points were placed within a 3-month time frame for ease of comparison from pretest to follow-up. Risky sexual behavior was a multiplicative combination of condom use (reverse scored) and frequency of intercourse. This index was utilized because condom use may be more or less meaningful as an indicator of risky sexual behavior depending on frequency of intercourse. This is especially the case given that the adolescent participants in the sample may have been in and out of treatment facilities following participation in the intervention and may not have had the opportunity to engage in regular intercourse, and because adolescent sexual activity is characteristically sporadic. Condom use behavior was measured on a 5-point scale ranging from 0 to 4 with the question "In the past 3 months, how much of the time did you use condoms when you had sexual intercourse?" (with response options of *never*, *almost never*, *sometimes*, *almost always*, and *always*). Frequency of intercourse was assessed on a 6-point scale ranging from 0 (*none*) to 5 (*more than 10 times*) with the item "On average, how often have you had sexual intercourse in the past 3 months?" Condom use behavior was reverse coded, and the resulting risky sex index was calculated such that higher scores indicated more risky sexual behavior (i.e., greater frequency of intercourse and lower condom use, with a potential

range from 0 to 20). Finally, we assessed sexual behavior while under the influence of alcohol using the question "In the past 3 months, how much of the time have you used alcohol when you've had sexual intercourse?" (which was also measured on a 5-point scale ranging from *never* to *always*).

Results

Overview of Analyses

Preliminary analyses were conducted to examine the pretest equivalence of the three conditions on all measures and to examine any potential impact of attrition. Next, effects of condition on proximal theoretical constructs and on later behavior were examined. Here, analysis of covariance (ANCOVA) models were estimated with pretest scores included as covariates for each respective construct. In the event of a significant main effect, we addressed alpha inflation of post hoc comparisons using Tukey's honestly significant difference corrections. Finally, mediational analyses provided a simultaneous examination of the theoretical constructs as mediators between intervention condition and follow-up behavior. The model estimated the effect of two contrast codes that compared the active interventions with the control condition (Contrast 1) and the two active interventions to each other (Contrast 2) on attitudes, perceived norms, and self-efficacy. These contrasts were orthogonal, such that for the first contrast, the control condition was coded as "−1" and the two active interventions were each coded as "+.5." For the second contrast, the control condition was coded as "0," the GPI condition was coded as "−.5," and the GPI + GMET condition was coded as "+.5." SAS Version 9.1 was used for all analyses, with the exception of the mediational model, in which Mplus Version 4.1 was used. Mplus includes the capability to test models using a full information (direct) maximum likelihood estimator, which addresses data that display levels of missingness in line with those observed in this study (i.e., 35%), and is considered the state of the art for dealing with data that are missing at random (Enders & Bandalos, 2001; Schafer & Graham, 2002).

Evaluating an intervention conducted in groups also requires specialized analytical techniques to ensure accurate estimates of intervention effects that account for the clustered nature of the data (Raudenbush & Bryk, 2002). As a first step, and prior to conducting other analyses, the independence of observations was assessed. The intraclass correlation (ICC or ratio of between group variance to total variance) associated with each mediator and outcome variable was computed. To distinguish intervention from session effects, we computed values separately by condition for all posttest and follow-up measures. Although the majority of the ICC values were zero or close to zero and would produce little (if any) inflation of Type I error, larger values ranging up to .26 were observed for some measures. Analyses were thus conducted in a multilevel framework to account for any potential nonindependence of observations at the session level. SAS Proc Mixed was used for all analyses conducted in SAS, and a complex sample function that is available in MPlus and that accounts for nonindependence by using a sandwich estimator to adjust standard errors and chi-square values was used for the mediation model.

Pretest Equivalence of Conditions

Random coefficients regression models confirmed that there were no pretest differences between conditions on any demographic or behavioral variables, including age, race, gender, whether the participant had ever had sex, number of sexual partners, frequency of intercourse, or age of first intercourse. There were also no differences between conditions on most theoretical and behavioral measures, with self-efficacy the only exception (see Table 1).

Attrition

The most common reason for missing data at the 3-month follow-up was that this is a highly transient population, and many participants were simply unreachable despite repeated efforts of our staff. To examine whether there were differential rates of attrition across the three conditions, we conducted a series of analyses of variance to examine the interaction between attrition at follow-up (retained vs. not retained) and condition (INFO vs. GPI vs. GPI + GMET) on pretest measures of all psychosocial constructs and sexual and substance use behavioral measures (Jurs & Glass, 1971). Of six tests conducted, there were neither any significant interactions of retention status with condition (which would indicate differential attrition by condition) nor were there main effects of retention status (which would indicate that retained adolescents differed from nonretained adolescents). These analyses confirm that missing data patterns did not vary systematically by condition and that participants can still be considered part of the same population regardless of whether they were retained at the 3-month follow-up.

Effect of Condition on Theoretical Model Components and Later Behavior

A series of univariate ANCOVAs were conducted to assess treatment effects on each psychosocial construct and outcome variable (see Table 1). Pairwise comparisons of condition differences for each variable can be deduced from subscripts of the posttest and follow-up means given in Table 1 (i.e., common subscripts indicate there was not a significant difference between means). Effect size estimates were computed as Cohen's *d* values (Cohen, 1988) adjusted for the covariate; the first compared a combination of the two active interventions with the control condition, and the second compared the two active interventions with one another.

There was a significant overall effect of condition on each of the theoretical mediators, in which the GPI + GMET intervention was superior to both other interventions in influencing attitudes, perceived norms, and intentions to practice safer sexual behavior; it was also superior to the control condition in predicting self-efficacy. There was a significant main effect of condition on the index of risky sexual behavior, and pairwise contrasts demonstrated significantly lower risky sexual behavior in the GPI + GMET condition relative to the INFO control condition. Effects of condition on the frequency of alcohol use during intercourse variable were in the intended direction (such that scores were

Table 1
Mean Scores (and Standard Deviations) by Time and Condition, and Tests of Differences by Condition at Pretest, Posttest, and Follow-Up

Variable	INFO		GPI		GPI + GMET		Pretest differences	Posttest effect of condition	Effect size	Effect size
	M	*SD*	*M*	*SD*	*M*	*SD*	$F(2, 114)$[i]	$F(2, 112)$[i]	INFO vs. GPI and GPI + GMET[ii]	GPI vs. GPI + GMET[ii]
Proximal mediators										
Attitudes toward condom use										
Pretest	3.06	0.42	3.01	0.45	3.11	0.47	1.76			
Posttest	3.11	0.44_a	3.12	0.40_a	3.27	0.40_b		9.79***	0.65	0.51
Perceived norms for condom use										
Pretest	2.74	0.79	2.86	0.76	2.76	0.68	0.96			
Posttest	2.82	0.83_a	2.89	0.84_a	2.95	0.72_b		3.66*	0.13	0.49
Self-efficacy for condom use										
Pretest	3.40	0.47	3.48	0.42	3.53	0.42	3.76*			
Posttest	3.43	0.44_a	3.54	0.34_{ab}	3.63	0.30_b		7.99***	0.75	0.22
Intentions to practice safer sex										
Pretest	2.85	0.66	2.83	0.65	2.88	0.63	0.29			
Posttest	2.95	0.74_a	3.03	0.59_a	3.17	0.61_b		8.19***	0.65	0.37
Behavioral outcomes										
Risky sexual behavior, last 3 months										
Pretest	4.69	5.86	4.73	5.13	5.08	5.83	0.20			
3 months	6.04	7.46_a	4.68	5.97_{ab}	3.37	5.11_b		3.12*	0.43	0.33
Intercourse while drinking, last 3 months										
Pretest	2.20	1.06	2.17	1.08	2.21	1.01	0.04			
3 months	2.13	1.06_a	1.85	0.99_a	1.89	1.17_a		1.70	0.40	0.13

Note. Tukey's honestly significant difference correction was used for post hoc comparisons, and common subscripts for each outcome indicate no significant difference between conditions. Attitudes toward condom use, perceived norms for condom use, self-efficacy for condom use, and intentions to practice safer sex were all measured on a 1–4 scale; the risky sexual behavior index ranged from 0 to 20; intercourse while drinking was measured on a 1–5 scale. INFO = information-only control; GPI = theory-based sexual risk reduction intervention; GPI + GMET = the GPI condition with a group-based alcohol risk reduction motivational enhancement therapy component.
[i] Denominator degrees of freedom were based on the number of sessions, rather than the number of individuals, as is appropriate for analyses conducted in a multilevel framework. Because of missing data, the denominator degrees of freedom were 77 and 81 for risky sexual behavior and intercourse while drinking, respectively, at the 3-month follow-up. [ii] Effect size estimate represents an estimate of Cohen's *ii* adjusted for the pretest covariate.
* $p < .05$. *** $p < .001$.

highest in the INFO condition), but differences by condition were not significant ($p = .15$).[4]

Mediational Model

The final step was to examine changes that occurred to the theoretical components as a result of condition simultaneously as mediators of effects on risky sexual behavior (see Bryan, Schmiege, & Broaddus, 2007). Table 2 demonstrates the correlations among condition contrasts, theoretical mediators, and behavior. Raw correlations are presented below the diagonal, and residualized correlations controlling for pretest values are depicted above the diagonal. The model was estimated following a TPB framework (Albarracin, Johnson, Fishbein, & Muellerleile, 2001; Bryan et al., 2004, 2005) in which attitudes, perceived norms, and self-efficacy were specified as distal predictors of behavior, with effects expected to occur through intentions. Examination of the residualized correlations confirmed that attitudes, perceived norms, and self-efficacy were significantly related to intentions, which then related to behavior.

The estimated model is depicted in Figure 2. Although not shown for ease of presentation, pretest scores on each construct were included as covariates for consistency with the ANCOVA models. As shown in Figure 2, both contrast coefficients predicted attitudes and self-efficacy, and the second contrast predicted perceived norms. Self-efficacy (but not attitudes or perceived norms),

[4] We examined gender as a moderator of the main effects of condition on the theoretical and behavioral outcomes, and we examined the path relationships in the mediational model by gender. In terms of the ANCOVA analyses, the only significant interaction that emerged between condition and gender was on self-efficacy. Further exploration of this interaction effect revealed that the intervention impacted self-efficacy for both male participants and female participants but that the effect size was stronger for female participants. We also examined the mediational model in a multiple group framework, by gender. There was not a significant difference in fit between a model in which all paths were constrained to be equal across gender and one in which all paths were unconstrained across gender.

Table 2
Correlations Among Condition Contrasts, Psychosocial Mediators at Posttest, and Behavior at 3-Month Follow-Up

Variable	1	2	3	4	5	6	7	8
1. Contrast 1: INFO vs. GPI and GPI + GMET	—	.01	.16***	.04	.18***	.15***	−.19*	−.14
2. Contrast 2: GPI vs. GPI + GMET	.01	—	.13**	.12**	.10*	.11*	−.15	.03
3. Attitudes	.10*	.15**	—	.14**	.41***	.22***	−.12	−.02
4. Norms	.06	.03	.36***	—	.17***	.09*	−.03	−.07
5. Self-efficacy	.19***	.10*	.62***	.38***	—	.34***	−.12	−.18*
6. Intentions	.11*	.09*	.45***	.36***	.54***	—	−.20*	−.07
7. Risky sexual behavior, last 3 months	−.16*	−.11	−.26**	−.24**	−.17*	−.37***	—	−.05
8. Intercourse while drinking, last 3 months	−.11	.002	−.07	−.06	−.14	−.14	−.09	—

Note. The correlations between the raw scores are provided below the diagonal, and the correlations between residualized scores that take into account pretest values are provided above the diagonal. INFO = information-only control; GPI = theory-based sexual risk reduction intervention; GPI + GMET = the GPI condition with a group-based alcohol risk reduction motivational enhancement therapy component.
* $p < .05$. ** $p < .01$. *** $p < .001$.

in turn, was related to behavioral intentions. Intentions significantly predicted later risky sexual behavior, with the negative direction indicating that greater intentions to practice safer sex predicted lower levels of risky sexual behavior 3 months later. This model fit the data adequately—$\chi^2(27, N = 484) = 72.89$, $p < .001$, comparative fit index = .97, root-mean-square error of approximation = .06, standardized root-mean-square residual = .05—and accounted for 21% of the variance in risky sexual behavior at follow-up and 58% of the variance in intentions to practice safer sexual behavior. We used the joint significance test approach for evaluating the mediated effect, in which mediation is supported if each of the paths representing the mediated effect is significantly nonzero. The decision to use this approach was made on the basis of recent evidence that the joint significance test performs well in terms of Type I error and power in the case of a two mediator and three-path mediated effect, as we have here (Taylor, MacKinnon, & Tein, 2008). We thus have evidence for self-efficacy and intentions as mediators between condition and behavior on the basis of the fact that each of the three paths representing the mediated effect were significant (i.e., the condition contrast codes to self-efficacy, self-efficacy to intentions, and intentions to behavior).

Discussion

This randomized controlled trial presents an evaluation of a theoretically driven intervention that incorporated a GMET component to target alcohol-related sexual risk reduction into a traditional sexual risk reduction intervention among an ethnically diverse, high-risk sample of criminally involved adolescents. This is one of only a few interventions conducted among incarcerated or detained adolescents (for exceptions, see Clark et al., 2000; Gillmore et al., 1997; Rosengard et al., 2007; Schlapman & Cass, 2000; Shelton, 2001; St. Lawrence et al., 1999) and is joined only by Rosengard et al. (2007) in evaluating sexual risk reduction components *and* alcohol risk reduction components, both of which

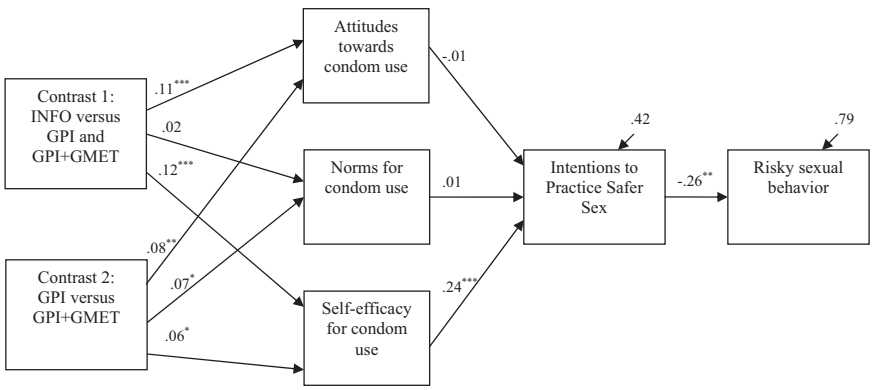

Figure 2. Mediational model examining psychosocial constructs as mediators between condition and risky sexual behavior at 3-month follow-up. All parameter estimates are standardized. INFO = information-only control; GPI = theory-based sexual risk reduction intervention; GPI + GMET = the GPI condition with a group-based alcohol risk reduction motivational enhancement therapy component. * $p < .05$. ** $p < .01$. *** $p < .001$.

were theoretically based, in a criminally involved population. Consistent with previous findings (Bryan et al., 2004, 2005), participants in this study reported high levels of risky sexual behavior at baseline, confirming that this population of adolescents is sorely in need of sexual risk reduction programs. Yet, both the INFO control condition and the GPI intervention demonstrated limited effectiveness in influencing model constructs and later behavior. In fact, the INFO group showed increased risky sexual behavior at the 3-month follow-up despite a lack of negative impact on theoretically relevant predictors. This pattern may be indicative of a natural postdetention trajectory toward increases in risky behavior in the absence of effective intervention.

This study provides empirical support for the inclusion of a group-based MET component in an intervention to reduce risky sexual behavior in this population. There has been little prior empirical support for using group approaches with MET, particularly among adolescents, or for using MET in the context of sexual risk reduction (although see Rosengard et al., 2007). The results demonstrate that the GPI + GMET intervention was more successful in influencing several theoretical mediators and at reducing sexual risk behavior than the control group and the traditional sexual risk reduction intervention alone. Even though no effects were observed for contextually related alcohol use and sexual intercourse, the findings of this study provide some evidence that the nonconfrontational and supportive nature of the MET approach is appropriate for adolescents involved in the justice system. Allowing the participants to take charge of the MET portion of the intervention made them active participants, as opposed to passive recipients, in the discussion of behavior change. As passive acceptance of rules and rulings is the status quo in the juvenile justice system, this reversal may have been especially impactful. Additionally, understanding and expecting ambivalence about behavior change may be an innovative approach to discussing sexual risk behavior. Like alcohol use, condom use and strategies to reduce sexual risk have both advantages and disadvantages (e.g., condoms prevent HIV transmission but may reduce perceived sexual pleasure or come with social or relational consequences), and acknowledging both using a nonjudgmental and empathetic style seems to be quite effective. Finally, the GMET component took a decidedly harm reduction approach and was not focused on eliminating alcohol use but on reducing sexual risk. Thus, it is possible that participants utilized strategies (e.g., bringing condoms to parties) that may have increased their safer sexual behavior without impacting their drinking behavior or drinking during sexual activity per se.

We also presented a detailed and rigorous mediational analysis of the theoretical mechanisms of program effects on behavior as a means to uncover the mechanisms of action underlying the effectiveness of the addition of the GMET component relative to the two other conditions. The finding of self-efficacy as an important mechanism underlying behavior change is consistent with hypotheses of self-efficacy as one of the main mechanisms of action of MI (Miller & Rollnick, 2002), as well as with the content of the interventions, such that there was an overwhelming emphasis on building the actual skills and participants' confidence in their abilities to execute those skills necessary for safer sex, including obtaining, using, and communicating with partners about condoms.

Even though perceived norms did not influence intentions over and above effects of self-efficacy, there was evidence of more positive perceived norms in the GPI + GMET condition relative to the GPI condition. This is consistent with the notion that provision of normative feedback is an important part of MET and with evidence that interventions can be effective by challenging the powerful descriptive norms that individuals may hold (Chernoff & Davison, 2005). The observed effects on norms may have been somewhat attenuated, as risky sexual behavior and substance use were indeed high among the majority of participants, compromising the believability of assertions that "their peers" used alcohol less. This is, in fact, a potential drawback of conducting MI/MET in a group-based format discussed by Walters et al. (2002), as negative descriptive norms can be reinforced in the context of a group discussion. This may occur through peers' positive reactions to deviant talk (Dishion, McCord, & Poulin, 1999), which is more likely in selective interventions that aggregate high-risk adolescents (Gifford-Smith, Dodge, Dishion, & McCord, 2005). Nonetheless, there remain several benefits of conducting the interventions in a group format (see Burleson et al., 2006), including establishing comfort around discussing sensitive material and providing a social supportive environment, to name a few. For an even more effective manipulation of social norms in a group-based context, multiple session interventions that provide participants with the opportunity to observe that change is indeed possible among their immediate peer group may be ideal.

It is notable that significant effects were observed for the GPI + GMET intervention, relative to both other conditions, on general constructs that did not relate to alcohol use per se, as well as on risky sexual behavior. This sample of high-risk adolescents, who may have accumulated several reasons for changing their alcohol use and sexual risk behavior, may have been primed to respond to the supportive, autonomy-focused, and nonconfrontational nature of the GMET. Another possible explanation relates to evidence of the pervasive role of substance use in risky sexual behavior in this population (e.g., Bryan, Ray, & Cooper, 2007; Rosengard et al., 2006). Less than 18% of participants in the current sample reported *never* using alcohol during sexual encounters, and addressing substance use at a general level, as well as specifically in the context of sexual encounters, may thus be effective in reducing risky sexual behavior.

One potential limitation of this work relates to the representativeness of the sample, both in general and in terms of the level of attrition. We were unfortunately unable to obtain information about any adolescents who refused to offer assent because of logistical constraints within the juvenile justice system, and the fact that the majority of participants were male could be considered a limitation of this study were we to attempt to generalize to the broader population of adolescents. However, the sample is consistent with the demographics of the population of *criminally involved adolescents* from which it was drawn, both in terms of gender and ethnicity. Although the retention rate of 65% at the 3-month follow-up was disappointing and might have limited our power to observe significant behavioral effects, of utmost importance when evaluating the retention rates is that supplementary analyses confirmed no significant pretest differences between those who attrited and those who were retained.

Another limitation is the self-report nature of the psychosocial and behavioral data, although the ACASI technology was em-

ployed to assist with truthfulness and accuracy of the self-report data, particularly in terms of the privacy provided with the laptop computers and the accuracy related to having questions read aloud by the computer and by using computer-generated skip patterns. We chose an index of risky sexual behavior that assessed condom use while controlling for frequency of sexual intercourse as a primary outcome because such an index was most consistent with the harm reduction approach of our intervention message. Nonetheless, more precise ways of quantifying self-reported sexual risk are needed and would be an important advance in this area. Finally, while empirically validated approaches to evaluating the integrity of MI/MET are still emerging, it would be helpful in future work to incorporate other approaches to evaluating the fidelity of the intervention, such as the motivational interviewing treatment integrity or the motivational interviewing skills code (Moyers, Martin, Manuel, Hendrickson, & Miller, 2005).

Intervention length, rather than content, may have played a role in the superiority of the GPI + GMET intervention over the control and GPI conditions. However, the GPI intervention was much closer in length to the GPI + GMET intervention than to the control condition; if length were the only factor accounting for the observed pattern of results, the GPI condition would have been expected to be more distinct from the control condition than from the combined intervention. Alternatively, the longer intervention sessions may have actually reduced the intervention impact because of participant fatigue and boredom, although we took steps to reduce this potential by providing breaks and by using video content throughout the session. Given that we did not see changes in frequency of intercourse in the context of using alcohol, it could be that the inclusion of the MET modality, not necessarily the substance use content, led to the stronger effects of the GPI + GMET. Future research should incorporate the GMET modality into sexual risk reduction interventions, both with and without substance use content, to explore the potential of this explanation. Finally, comparisons of the GPI and GPI + GMET interventions yielded fairly small effect sizes, although it is important to note this is a relatively new HIV prevention strategy based on a large body of literature attempting to determine the nature of the relationship between alcohol use and risky sex. Future work can continue to refine intervention content to maximize the impact of the GMET component. For example, the GPI + GMET intervention may be further enhanced by also targeting marijuana use in conjunction with sexual activity (e.g., Kingree & Betz, 2003; Kingree, Braithwaite, & Woodring, 2000; Rosengard et al., 2006). The issue of marijuana use was indeed introduced by some participants, although our manualized and structured interventions did not allow for any focused discussion on this issue. It is possible that intervention effects on sexual risk could be even stronger had we included such content, and our current work includes longitudinal evaluation of the relationship of marijuana use to risky sexual behavior and the potential for incorporating marijuana use content into the GPI + GMET format.

In summary, interventions among criminally involved adolescents are critical because of high levels of sexual and alcohol risk behavior. Because of the temporary and short-term nature of adolescents' stays in detention centers, intensive multiple-session interventions are impractical. We have shown that a brief, one-session GMET-based intervention promotes behavior change, and these effects appear to be most strongly driven by increases to participants' self-efficacy related to several dimensions of condom use and by increases to condom use intentions. This study contributes to an understanding of harm reduction among a high-risk, ethnically diverse population of adolescents, and because intervention leaders followed a structured program, this intervention could be easily implemented more widely within the criminal justice setting, for example, by detention center staff. Furthermore, the examination of the process by which the GPI + GMET intervention achieved its effects provides a critical step in understanding when and under what circumstances the inclusion of MET approaches will be effective.

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