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The impact of an integrated treatment on HIV risk behavior among homeless youth: a randomized controlled trial

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Abstract

While many studies provide useful information on the risk behaviors in which homeless youth engage, few prior studies evaluate Human Immunodeficiency Virus (HIV) risk related reduction strategies. In this study, homeless youth (n = 180) were recruited from a drop-in center and randomly assigned to one of two conditions, either an integrated individual cognitive-behavioral treatment and HIV prevention intervention that focused on skills building and education or to treatment as usual. All youth were assessed at entry into the program and at 3 and 6 month follow-up points. Findings showed an interaction between treatment condition, age and time. In the interaction, youth assigned to the integrated treatment reported greater condom usage than youth assigned to treatment as usual, with younger youth assigned to treatment as usual showing no change in condom use. The number of sexual partners reported by youth in both treatment conditions was also reduced over time. However, youth in both conditions continued to engage in other high-risk behaviors. The integrated treatment findings are promising and suggest that interventions which target both HIV risk behavior in addition to other life areas (substance use, mental health and housing) among homeless youth may be necessary in order to significantly impact high-risk behaviors among this unique group.

Keywords

HIV prevention; Homelessness; Youth; Treatment outcome

Introduction

Two studies report that between 10.2% and 11.5% of their sample of homeless youth (between the ages of 12 and 24) was positive for HIV (Pfeiffer and Oliver 1997; Woods et al. 2002). The disparity between the rates of HIV among homeless youth and youth in the general population is significant given that .2–.4% of adolescents in the general population test positive for HIV (Rotheram-Borus et al. 2003), highlighting the need for risk reduction methods developed for homeless youth. Homeless youth are difficult to connect to care and the need for intervention is high (Ensign and Bell 2004; Rotheram-Borus et al. 2003; Woods et al. 2002). The current study examined HIV risk behaviors and an integrated intervention targeted at reducing these behaviors in a sample of homeless youth between the ages of 14 and 22.

A variety of factors associated with increased risk of contracting HIV among homeless youth have been identified. While half of all new HIV infections in the United States occur in people under age 25 (Office of National AIDS Policy 2000), homeless youth are especially at risk for HIV given their high level of intravenous (IV) drug use and sexual risk behaviors. Studies indicate that between 13% and 34% of homeless youth report sharing needles (Van Leeuwen

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et al. 2004). Also, inconsistent use of condoms, early age of first intercourse and multiple sexual partners have been amply documented (Clements et al. 1997; Halcon and Lifson 2004; Rotheram-Borus et al. 1991; Wagner et al. 2001).

Intervention studies

While research has yielded much information regarding the high-risk behaviors among these youth, less information is available to guide efficacious prevention interventions. No published report of the impact of treatment as usual on reducing high-risk behaviors among homeless youth was found. Among cities who have drop-in centers available for youth to access, treatment as usual may range from information pamphlets to condom baskets to HIV testing and counseling. Because of limited funding available to serve homeless youth, community-based intervention efforts focus primarily on basic needs (food, showers, washer/dryer) and less on counseling or intervention (Joniak 2005).

Rotheram-Borus et al. (2003) notes that HIV prevention programs must simultaneously address risk associated with both sexual and substance use behaviors among homeless youth. Street Smart is such an intervention, and is a 10 session HIV prevention intervention offered in group format for youth who reside in shelters (Rotheram-Borus et al. 1991). Two studies have examined the impact of Street Smart with youth between the ages of 11 and 18 years. In the first study, youth who received the intervention reported an increase in condom use and a decrease in high-risk behavior at the post-intervention 6-month assessment (Rotheram-Borus et al. 1991). In a two year follow-up, reductions in sexual and substance use risk behaviors among females, but not males, in both the intervention and control conditions were found (Rotheram-Borus et al. 2003).

Two studies have evaluated HIV prevention with homeless, street living youth. In one street outreach study (Gleghorn et al. 1997), 1,210 homeless youth were approached on the streets and offered service listings/referrals, condoms and bleach. Frequency of contact with an outreach worker increased the likelihood of follow through on referrals and using a new needle at last injection. However, the study failed to find a relationship between the intervention and condom use. Gleghorn et al. (1997) suggest that more intensive intervention may be necessary to see evidence of changes in sexual behaviors among street youth. Booth et al. (1999) recruited 244 homeless adolescents through a community drop-in center in Colorado. Using a four-session peer helper model in group format, outcome findings showed that youth with greater HIV related knowledge engaged in higher risk behaviors. Also, perceived likelihood of infection was not associated with lower risk behaviors. The final finding was that, even though peer educators had been useful among non-runaways in significantly reducing the frequency of unprotected anal intercourse among men who have sex with men (Kelly et al. 1992), this intervention was not effective in changing risk behaviors, especially sex behaviors among runaways. Analyses indicated that only runaways in the control condition reduced their sex risks over time.

In summary, few HIV prevention programs specifically targeting homeless youth have been evaluated and success in producing reductions in sexual risk behaviors appears somewhat elusive at this time. In a recent review, McKay et al. (2004) note that many primary prevention programs for adolescents in general (including non-runaway) have led to greater knowledge and more realistic beliefs about risk behaviors, but interventions to date generally have not dramatically reduced adolescent sexual risk taking. Integrated HIV prevention and cognitive-behavioral treatments that address HIV risk while also intervening in other problem areas (substance use, mental health, housing) of homeless youth may be especially successful (Pendergast et al. 2001). Since HIV risk, substance use, and homelessness are interlocking and multidetermined behaviors (e.g., Jessor and Jessor 1977), interventions, which address these multiple problem areas may be more potent than interventions which address one area in

isolation of other areas (Bronfenbrenner and Evans 1999). However, no published studies reporting the impact of an integrated treatment on HIV risk behaviors for homeless youth were found.

Age and gender

Sexual risk acts increase during adolescence, and the types of risky situations youth face change as they age (Paikoff 1995). Unger et al. (1998) noted that early adolescent homeless youth may be at lower risk of acquiring HIV and may be more receptive to interventions that help them get off the streets compared to older youth. Some research suggests that risk behaviors increase with age because of increases in autonomy and freedom and from social control agents (Bachman et al. 1997; Staton et al. 1999). Older age in combination with homelessness may be associated with more opportunities to engage in high-risk activities. Because of age related changes in HIV risk among homeless youth, Rotheram-Borus et al. (2003) assert that age should be controlled in all analyses and it was controlled in the current study as well. Similar to Clatts and Davis (1999), the current study examined HIV risk behaviors among younger (14–18) and older (19–22) youth.

Studies also report that sexual risk behaviors differ depending upon gender of the homeless youth. Clements et al. (1997) reported that males and females were equally likely to use injection and noninjection drugs but females were more likely than males to be sexually active, have had a sexually transmitted disease, and to report less consistent condom use. Several researchers suggest that the lower reported condom use among homeless females is due to the fact that females are dependent on the compliance of male partners for condom use (Exner et al. 1997), and it may be difficult for women to be assertive with their partners due to the age (typically female homeless youth are younger than their male sexual partners) and power differential (Clements et al. 1997; Rotheram et al. 2003).

Depression

Compared to non-homeless youth, homeless youth report high rates of depressive symptoms (Cauce et al. 2000; Van Leeuan et al. 2004). Depression produces hopelessness and despair, which likely obstruct self-protective behaviors from being learned (Kaliski et al. 1990; Orr et al. 1994). According to Kaliski et al. (1990) depressed homeless youth reported that, “if they get AIDS they would die and that would put an end to their worry and struggle” (p. 71). Depression can increase HIV risk by affecting an individual’s sense of fatalism with hopelessness, clouding the perceived benefits of change, and reducing the individual’s belief in their ability to change (Stein et al. 2005). Further, depression may lead to an increase is substance use to numb negative affect which secondarily increases HIV risk (Hawkins et al. 2005). These studies suggest that interventions attempting to impact high-risk behaviors should examine the role of depression on behavior.

Current study

The current study evaluated change in HIV risk behaviors among a sample of homeless youth and examined how age and gender impact change in risk behaviors. Substance use, mental health and housing outcomes from this data are reported elsewhere (Slesnick et al. 2007). This study examined an integrated cognitive-behavioral and HIV prevention intervention with the expectation that youth assigned to the project intervention would report a reduced number of HIV risk behaviors post treatment compared to youth assigned to treatment as usual.

Methods

Participants

All youth (n = 180) were engaged, assessed and treated through a drop-in center for homeless youth located in a Southwestern urban city. Recruitment began in November 2001 and ended in February 2005, while follow-up assessments began in February, 2002 and ended in August, 2005. In order to be eligible for participation, youth ranged in age from 14 years to 22 years, had been living in the metropolitan area for at least 3 months with plans to remain for at least 6 months, met DSM-IV criteria for Alcohol or other Psychoactive Substance Use Disorders, as assessed by the computerized diagnostic interview schedule for children (CDISC; Shaffer 1992), and met criteria for homelessness as defined by the Department of Health and Human Services as "a situation in which a youth has no place of shelter and is in need of services and shelter where he or she can receive supervision and care" (Runaway and Homeless Youth Program/Title 45, 1999, p. 300). Youth not eligible for the project, but who wished to participate in treatment continued with services provided by the drop-in center and were provided outside referrals.

Participants included 118 (66%) males and 62 (34%) females. The average age of the youth was 19.2 (SD = 2.1). Self-identified ethnicity of the youth included 24 (13%) Native American, 1 (1%) Asian, 6 (3%) African American, 54 (30%) Hispanic, 73 (41%) Anglo, and 22 (12%) "other" or mixed ethnicity/race. At baseline, only 39% reported accessing any type of shelter or mission for services within the prior 3 months, with the first episode of homelessness occurring on average at age 13. Average number of runaway episode at baseline was eight, and 68% of youth reported at least one runaway episode. About 54% of the youth reported a history of sexual abuse, 65% reported a history of physical abuse, and 58% reporting a prior suicide attempt. Regarding sexual orientation, 82% (n = 147) of the sample identified themselves as heterosexual, 2% (n = 4) as homosexual, and 16% (n = 29) as bisexual. None of the study participants reported being HIV positive at baseline. All participants used drugs or alcohol since substance abuse or dependence was a criteria for participation in the study, and on average reported using alcohol or drugs on 64% of the assessment days (in the past 90 days) at baseline. About 49% of the participants met DSM-IV criteria for one or more Axis I (mental health) diagnoses other than substance abuse or dependence. A summary of other demographic characteristics is provided in Table 1.

Sample size—A sample size of 64 youth in each treatment group was determined necessary to detect a medium effect size (d = .50). However, 180 youth were recruited to counteract the possibility of significant attrition.

Materials

A demographic questionnaire designed to characterize and compare participants, was administered. Measures included age, gender, self-identified ethnicity, information about parents and siblings and education level.

The Health Risk Questionnaire (Slesnick et al. 2006; Slesnick and Prestopnik 2005) incorporated items from the Health Risk Survey (Kann et al. 1989) and the Homeless Youth Questionnaire (Johnson et al. 1996), which, together, address a wide range of HIV-attitudes, knowledge and risk behaviors. Several scales of the Health Risk Survey have been found to have acceptable internal reliabilities (Ashworth et al. 1992; DiClemente 1991). Moreover, Ashworth et al. (1992) found pre–post test reliabilities of .76 and .81, respectively. The Homeless Youth Questionnaire (Johnson et al. 1996) covers a wide variety of HIV risk behaviors of homeless youth.

The Health Risk Questionnaire includes 58 items with the structure for most of the items being yes/no. Some questions require fill-in responses (e.g., for the number of times or number of people). Frequency of condom use was queried using a five point Likert scale (i.e., 1 = never; 2 = rarely; 3 = sometimes; 4 = usually; 5 = always). In the current study, we utilized the overall HIV knowledge score developed by Kann et al. (1989), which includes 17 yes/no items such as, “Can a person get AIDS/HIV infection from holding hands with someone? Sharing needles used to inject drugs? Donating blood? Having sexual intercourse without a condom?” In addition to individual risk behavior items, we used the overall HIV risk behavior score developed by Johnson et al. (1996) for lifetime risk as well as risk within the past 3 months. The overall HIV risk behavior score included the aggregate of seven items: (a) intravenous (IV) drug use; (b) multiple sexual partners; (c) high-risk sexual partners (including prostitutes, IV drug users, and persons who are HIV positive); (d) usually use condom; (e) anal sex; (*f*) survival sex (trading sex for money, food or shelter); and (g) ever having had an STD. Internal reliabilities for this sample were alpha = .57 for the HIV knowledge scale (range: 0–17) and alpha = .73 for the HIV risk scale (range 0–7).

The Condom Attitude Scale-Adolescent Version (CASA; St. Lawrence et al. 1994) measures attitudes regarding condom use. It is a 23-item, true-false questionnaire. Examples of true/false statements from the CASA include, “Using a condom takes the ‘wonder’ out of sex” and “A condom is not necessary when you and your partner agree not to have sex with anyone else.” Factor analysis yielded a six factor structure as follows: (a) relationship safety; (b) perceived risk; (c) interpersonal impact; (d) safety; (e) effect on sexual experience; and (f) promiscuity. The CASA showed internal consistency (Cronbach’s alpha = .80), with an overall test–retest reliability of .84 (St. Lawrence et al. 1994). The total scale score (range: 0–20) was used as the dependent measure of youth’s overall attitude toward condoms. For this sample, the CASA showed internal consistency of alpha = .67.

Depressive symptoms were measured using the Beck Depression Inventory (BDI-II; Beck et al. 1996). The BDI-II is a 21-item, self-report instrument for measuring depressive symptoms in adults and adolescents age 13 and above. The items are scored using a four-point Likert scale describing different degrees of intensity of feelings (e.g., 0 = I do not feel sad; 3 = I feel so sad that I can’t stand it). In the current study, the BDI total score was used (range: 0–52) as a predictor of group membership in the discriminant function analysis. Internal consistency of the BDI total score for this sample was alpha = .89. Beck et al. (1996) reported a test–retest correlation of .93.

Procedure

Potentially eligible youth were screened for participation in the study, and the baseline assessment battery was administered to those eligible who consented to participate. Upon completion of the baseline assessment, youth were randomly assigned using urn randomization program which balanced groups on age and gender to either (1) the Community Reinforcement Approach + HIV therapy (*n* = 96) or (2) treatment as usual (*n* = 84). Randomization was completed by the project director and the youth’s group assignment was then communicated to the project coordinator. Youth assigned to the project intervention were offered 12 Community Reinforcement Approach therapy sessions and four HIV education/skills practice sessions, which were offered concurrently. Though administration of the HIV sessions was flexibly determined, in order to build engagement and rapport, the HIV sessions were typically delivered only after the second CRA session. Moreover, if convenient for the client, the HIV session was scheduled during the same week as the CRA session. Session duration was typically 50 min. The mean number of treatment sessions (16 total) completed was 6.8 (*SD* = 5.5). Intervention began following completion of the baseline assessment battery and randomization. An intent to treat design was used, and all adolescents were evaluated at 3 and

6 months after the baseline assessment. The follow-up rate at 3 months was 73% (132/180) and at 6 months was 86% (155/180). A total of 19 subjects out of 180 (10.6%) did not complete either the 3 or 6 month follow-up as they were unable to be contacted following the initial baseline assessment. Research Assistants (RA's) were not blind to the participant's treatment condition because in order to maintain high follow-up rates, RA's needed to acquire information on the location of participants from the therapists. All procedures were reviewed and approved by the University of New Mexico IRB committee.

The baseline and follow-up assessments, including the diagnostic battery, required approximately 2 h to complete. Youth received a care package including blankets, toiletries and food items at the completion of the baseline assessment and $50 at each follow-up appointment. Therapy sessions and follow-up appointments were conducted in offices within the drop-in center. Youth missing follow-up assessment sessions were located and rescheduled. The summary of the research design is depicted in Fig. 1.

Intervention

Community reinforcement approach (CRA)—CRA procedures and session guidelines are detailed in Meyers and Smith (1995) and Godley et al.'s (2000) Adolescent-CRA manual for the treatment of adolescent marijuana abusers. However, the following provides a brief description of the sequence/timing of the intervention and the session topics. Session one is used to establish rapport and to provide a clear rationale for the CRA approach. The goal for the end of session one is for youth to feel that treatment has begun and that there is hope to improve their life situation. Session two focuses on a tentative treatment plan developed in active collaboration between the therapist and youth. Thus, the plan targets areas of greatest need for the client: housing, medical care, job finding, social relations, psychiatric issues (depression, anxiety), and legal problems. For sessions 3 through 12, therapists follow CRA treatment strategies using both a standard set of core procedures and a menu of optional treatment modules matched to clients' needs (see Meyers and Smith 1995). Role plays and homework assignments are incorporated into the sessions in order to generalize and practice newly learned skills.

HIV prevention—The four session intervention is drawn from that used successfully by St. Lawrence, Kelly and their colleagues, *Becoming a Responsible Teen* (B.A.R.T.; Kelly et al. 1989; St. Lawrence et al. 1995). The four sessions cover AIDS education and assessment of risk, risk reduction and skills practice, sexual assertiveness and practicing negotiation as well as behavioral self-management and problem-solving strategies. The first session is devoted to AIDS education and assessment of risk. The youth is advised that abstinence is the only absolute way to remain uninfected. Given the reality that many of the youth already are sexually active, ways to lower HIV infection risk are addressed. Education aims at promoting abstinence but recognizes that less effective defenses are better than none. Session two focuses on risk reduction and skills practice. In this session, the therapist discusses with the youth ways to avoid HIV risk, both sexual and drug risks, reviews individual levels of risk and discusses barriers to condom use. Youth in this session practice applying condoms using a model and receive instruction in cleaning hypodermic needles. Session three focuses on sexual assertiveness and practicing negotiation. Communication skills and assertiveness are taught in three contexts: initiating discussion about condoms in advance with a sexual partner, refusing pressure to engage in unprotected sex and refusing pressure to share needles. Session four focuses on behavioral self-management and problem-solving strategies. Past situations in which the youth conceded to unwanted pressures and situations are discussed since those situations could be difficult for them to handle in the future. Role plays are incorporated within all sessions to allow the youth to practice newly acquired skills.

Training and supervision

Therapist training—Training included readings, a two-day didactic and role-play seminar, and on-going weekly supervision. Audiotape recordings of all therapy sessions were used for treatment adherence checks and supervision. Selected portions of audiotapes were reviewed, feedback was provided and problems were discussed. The four therapists were master's level female licensed professional counselors ranging in age from 26–47 years to 2–12 years experience in the field.

Treatment fidelity—Two female graduate students in Psychology rated a portion of the audiotapes. Codes were of two parts for nine different treatment procedures: the occurrence (yes/no) of the procedure during the session, then how well it was done by the therapist (1 "very poorly" to 7 "exceptional" scale). Coder reliability for procedure occurrence was Kappa = .71, while the coder reliability of the procedure rating was Intraclass Correlation Coefficient = .78. We had good therapist adherence with an average score of 4.5, which was in the "average" to "well" range.

Treatment as usual—Youth who were not randomly assigned to CRA + HIV were assigned to the treatment as usual control condition through the drop-in center. The drop-in center offered a place to rest during the day, food, showers, clothing and case management that linked youth with community resources at the youth's request. Moreover, AIDS Taskforce provided free HIV testing and referrals for counseling to those positive for HIV.

Overview of analyses—The primary objective of this study was to examine change in HIV risk behaviors among homeless youths who received the project intervention, CRA + HIV, as compared to treatment as usual. Thus, the primary outcome measure was the number of HIV risk behaviors as listed in Table 2. Analyses were intent to treat and were conducted to examine which risk behaviors changed, and if treatment had any relationship to those changes. Additional analyses were conducted to examine whether there were other factors, which related to the change in HIV risk behavior besides the treatment. Six different steps of analyses were conducted. First, because studies have suggested that some of the pre-existing characteristics of the subjects may affect HIV risk behaviors, we examined baseline mean differences based on different demographic groups using independent sample *t*-tests and Chi-square analyses. Second, a doubly multivariate repeated measure MANOVA[1] was performed to examine the interaction and main effects of time, gender, age, and treatment on the HIV risk behaviors. As a follow-up, repeated measures MANOVA analyses were conducted to identify the interaction effect of time, treatment, and age. Then, univariate ANOVA analyses were conducted to identify the main effects of time and gender for each of the dependent measures, which were shown to have a significant effect in doubly multivariate RMANOVA. All repeated measures design analyses were conducted with three levels of time (baseline, 3 and 6 months post-baseline). Finally, a discriminant function analysis (DFA) was conducted to examine how the variables (e.g., demographic characteristics, treatment types, HIV risk behaviors and HIV knowledge at pretreatment, the BDI total score, and the Condom Attitude Scale score) predicted group membership. For the DFA, subjects were grouped into three, based on the overall HIV risk change scores: i.e., group 1: significant decrease at post-treatment; group 2: no significant change; group 3: significant increase at post-treatment. The DFA allows the identification of variables significantly discriminating these three groups and indicates the relative contribution and direction. Cases with missing data were excluded list-wise, thus, any incomplete data were

[1]A typical repeated measure MANOVA (RMANOVA) has only one dependent measure, which is measured multiple times. In the doubly multivariate repeated measure design, two or more dependent variables are measured at two or more points in time (Weinfurt 1995). Thus, the present research design which has nine dependent measures assessed for three times fits for doubly multivariate repeated MANOVA.

omitted from the final analyses. In the Repeated MANOVA with three time points, a sample size of 116 (CRA = 61, TAU = 55) was utilized, and in the discriminant function analysis with two time points (pre- and post treatment), a sample size of 155 was utilized. Those who did not complete a follow-up assessment were compared to those who completed both follow-up assessments. Findings indicated that participants did not differ significantly by gender, $\chi^2(1) = 2.6$, $p = .46$, ethnicity (Anglo versus non-Anglo), $\chi^2(1) = 1.0$, $p = .31$, treatment modality, $\chi^2(1) = 1.5$, $p = .27$, or baseline depression (BDI > 10 versus BDI ≤ 10), $\chi^2(1) = .61$, $p = .49$.

Results

Baseline differences: gender, age, and ethnicity

Prior to examining the change in HIV risk behavior scores over time, the baseline differences of the overall HIV risk behavior score in last 3 months, individual HIV risk behaviors, and the overall HIV knowledge score by gender, age, and ethnicity were compared. A skewness statistic greater than two was considered significantly skewed (Miles and Shevlin 2001) and the log transformed scores were used for the skewed continuous variables (e.g., number of people who shared needles to inject any drugs in last 3 months, number of people having sexual intercourse with in the last 3 months, and number of times having sexual intercourse in the period).

Gender differences

Males and females differed significantly in the baseline means for some of the HIV risk behaviors. Compared to males, females reported higher overall HIV risk behaviors [$t(178) = -3.36$, $p < .001$], lower frequency of condom use [$t(178) = -2.38$, $p < .05$], and were more likely to report having sexual intercourse with a high-risk sex partner [$\chi^2(1) = 4.55$, $p < .05$].

Age differences

Significant mean differences between the younger group (14–18 years old) and older group (19–22 years old) were found for some of the HIV risk behaviors at baseline. The older youths (19–22 years) were likely to report higher means on the overall HIV risk behavior score [$t(178) = -1.98$, $p < .05$] and higher HIV knowledge [$t(178) = -2.15$, $p < .05$] than younger youths (14–18 years). A group difference by age also revealed that the older youths were more likely to report intravenous (IV) drug use [$\chi^2(1) = 4.26$, $p < .05$].

Ethnicity differences

Due to the unequal distribution across all ethnic categories only Anglo versus non-Anglo youths were used in tests for ethnic group differences on HIV risk behavior. Overall, Anglo youths 32/79 (40.5%) reported having had sex with more than one partner within the last 24 h compared to non-Anglo youths 26/101 (25.7%), $\chi^2(1) = 4.42$, $p = .04$. No other significant baseline differences were found (all p's > .10).

Repeated measures MANOVA

Simple descriptive statistic results (means and the percentages) for all of the individual risk behaviors indicated that, on average, youths reported a reduction in HIV risk behaviors from baseline to 6-months post-baseline, except that the number of youths who reported sharing needles remained the same. Overall means for the frequency of condom use (i.e., how often do you/your partner use a condom) and the HIV knowledge score increased over time, which were the desirable outcomes. Table 2 shows the means and standard deviations of the main variables at each of the assessment points.

A 3 × 2 × 2 × 2 doubly multivariate RMANOVA was conducted to examine the significant changes in the nine dimensions of the HIV risk-related behaviors over time. Time (i.e., baseline, 3- and 6-month post-baseline, Time 1, 2, and 3, respectively) was used as a within-subjects variable and the treatment type (CRA + HIV versus treatment as usual), gender (female versus male), and age (14–18 vs. 19–22) were used as the three between-subjects variables. Seven individual HIV risk behavior items (i.e., IV drug use; more than one sex partner in a 24-h time span; number of people having sexual intercourse in last 3 months; having sex with high-risk sexual partners; frequency of the condom use; anal sex; survival sex), the HIV knowledge score, and the Condom Attitude Scale total score were entered as the nine dependent variables. The log transformed scores were used for the skewed continuous variable (e.g., number of people having sexual intercourse in last 3 months (skewness > 2)). The summary of the doubly multivariate RMANOVA result is presented in Table 3. The major findings for the interactions and main effects are discussed in the following three sections.

Time × treatment × age interaction effect

Doubly multivariate RMANOVA revealed a significant interaction between time, treatment type, and age [Wilks' $\lambda = .72$, $F(18, 88) = 1.88$, $p < .05$, $\eta^2 = .28$]. A follow-up univariate analysis showed a three-way interaction for the frequency of condom use [Wilks' $\lambda = .90$, $F(2, 111) = 6.48$, $p < .005$, $\eta^2 = .11$]. Figure 2 shows the change in frequency level of condom usage as a function of time, age, and treatment type. As shown in Fig. 2, if just baseline and 6-months post-baseline are compared, all three groups (younger youths in CRA + HIV, older youths in both CRA + HIV and treatment as usual) showed an increase in their condom usage at 6-months post-baseline compared to baseline. The younger youths in treatment as usual were the group, which showed the least favorable outcome (used condom less frequently at 6-month post-baseline).

Overall, these analyses indicate that either young or old, the youths who received CRA + HIV treatment reported better improvement on the frequency of condom usage than the treatment as usual group. However, the change pattern over time differed by different age groups even in the same treatment condition (see Fig. 2). The post-hoc test indicated that the younger youths in CRA + HIV reported more frequent usage of condoms (Mean = 4.07, Standard Error = .22) than the older youths in treatment as usual (Mean = 3.04, Standard Error = .18) (Mean difference = 1.03, $p < .01$).

Time main effect

Doubly multivariate RMANOVA revealed a time main effect [Wilks' $\lambda = .71$, $F(18, 88) = 1.96$, $p < .05$, $\eta^2 = .29$]. The follow-up univariate analysis revealed a significant change over time on some HIV risk behavior items (see Table 2 for the mean change over time). Youths in this sample reduced the number of different sexual partners in a 24-h time span [$F(2, 124) = 3.84$, $p < .05$, $\eta^2 = .04$] with a significant reduction occurring from baseline to the 3-month post-baseline assessment [$F(1, 105) = 5.66$, $p < .05$, $\eta^2 = .05$]. Number of sexual partners in the last 3 months [$F(2, 124) = 5.95$, $p < .005$, $\eta^2 = .09$] also showed a time main effect. The mean number of sexual partners in the last 3 months (log value) significantly decreased from baseline to the 6-month follow-up [$F(1, 120) = 9.72$, $p < .005$, $\eta^2 = .08$].

Gender main effect

A main effect for gender was found [Wilks' $\lambda = .81$, $F(9, 97) = 2.47$, $p < .05$, $\eta^2 = .19$]. Follow-up univariate analysis showed that when time and other independent variables were controlled, gender by itself showed a significant main effect for HIV risk behavior. Findings indicated that females were more likely to engage in sexual intercourse with high-risk partners [$F(1, 105) = 5.60$, $p < .05$, $\eta^2 = .05$], anal sex [$F(1, 105) = 5.27$, $p < .05$, $\eta^2 = .05$], and survival sex [$F(1,$

105) = 4.67, $p < .05$, $\eta^2 = .04$] than males. No main effects were found for age or treatment (See Table 3).

Discriminant function analysis

The central aim of this study was to know whether there was a reduction in HIV risk behavior over time, and if so, to identify which variables contributed to the change. Doubly multivariate RMANOVA examined the interaction and simple main effects of time, gender, age, and treatment type on the HIV risk behaviors. Discriminant function analysis is usually used after MANOVA to identify variables (also known as attributes) that best discriminate members of two or more groups from one another (Duarte and Stam 1995; Field 2005).

In the present study, individuals were grouped into three, based on the level of HIV reduction between baseline and 6-months post-baseline. Some participants showed reduced HIV risk behavior from baseline to 6-months post-baseline (post-treatment), others remained the same, and the rest reported engaging in even more HIV risk behaviors at 6-months than at baseline. In order to ensure that changes were large enough to avoid the possibility of measurement error, the Reliability Change Index (RC: Jacobson and Truax 1991) was used. The value is calculated by subtracting baseline from 6 month post-baseline scores and dividing the result by the standard error of the difference between the test scores ($RC = X2 - X1/S_{diff}$). As recommended by Jacobson and Truax (1991), the proposed value of clinical significance, an RC less than −1.96 ($p < .05$), was considered statistically significant reduction from baseline to 6 months post-baseline (T1 > T3); an RC exceeding 1.96 ($p < .05$) was considered a statistically significant increase from baseline to 6 months post-baseline (T1 < T3). An RC falling in-between was not considered significant change. Based on the RC scores reflecting significant change on the overall HIV risk behavior score between baseline ($n = 180$) and 6-months post-baseline ($n = 155$), each subject was classified into either group 1, 2, or 3. i.e., group 1: significant reduction T1 > T3 ($n = 41$ (26.45%); group 2: no significant change ($n = 83$ (53.55%); group 3: significant increase T1 < T3 ($n = 31$ (20%). (In the present study, RC Mean = −1.34 ($n = 155$), $SD = 12.40$, Range: from −51.95 to 38.96, Median = 0, skewness = −0.38).

The DFA was conducted to determine how well the combination of nine variables allows one to discriminate the three groups. The nine variables (attributes) used in the DFA were: i.e., overall HIV risk behavior score at baseline, HIV knowledge score at baseline, Condom Attitude Scale score, BDI total score, and baseline age and education level, gender, ethnicity, and the treatment condition. The combination of these nine attributes discriminated the three groups with 57.4% accuracy. The overall discriminant function was significant [Wilk's Lambda = .68, $\chi^2(18) = 57.57$, $p < .0001$], indicating a significant mean difference among groups and that the combination of all nine attributes significantly discriminated the three groups. The classification results of the discriminant analysis are presented in Table 4.

As mentioned above, the major objective of DFA is to identify those factors that are able to separate predefined groups and to interpret these findings. Canonical DFA, which is the principal technique of discriminant analysis, combines and transforms the original set of attributes (i.e., nine variables) into fewer variables, known as canonical discriminant functions, which contribute to group separation. Each canonical discriminant function represents a unique linear combination of the attributes (Duarte and Stam 1995). In our findings, the nine attributes entered were transformed into two canonical discriminant functions. Table 5 shows the standardized discriminant function coefficients indicating the relative contribution of each attribute to each of these functions. Accordingly, we can interpret which baseline HIV risk behavior contributes the most to function 1 and which general measure of individual characteristics (e.g., age, gender, ethnicity and BDI score) contributes the most to function 2. The importance of the two canonical discriminant functions in terms of group separation is

reflected by their corresponding eigenvalues. The eigenvalue for function 1 (.37) was larger than for function 2 (.08). Furthermore, function 1 by itself accounted for 83% of the between-group variation, whereas function 2 accounted for only 17% of the variation. In other words, most of the group differences are explained by the first discriminant function, the function that was strongly related to baseline HIV risk behaviors. From Fig. 3, we see that function 1 appears to clearly separate group 1 (risk behavior reduced group) from the other two groups (nonsignificant change group and significantly increased group), whereas function 2 does not separate the groups.

In sum, baseline HIV risk behavior was the strongest predictor of group membership amongst other attributes including demographics, depression, treatment modality, attitudes about condom use, and HIV knowledge. The members of group 1 whose HIV risk behavior had significantly reduced over time were those who had the highest HIV risk behavior score at baseline.

Discussion

Identifying intervention strategies for use with marginalized homeless youth who are at high-risk for contracting HIV is an important public health priority given the significant individual and societal costs associated with the high levels of risk and infection among this group. Intervention efforts to date indicate that this is a difficult population to achieve positive behavioral change. The current study reports the outcome findings of an integrated intervention that included cognitive-behavioral treatment and HIV prevention as compared to treatment as usual on the self-reported HIV risk behaviors among homeless youth.

The hypothesis of this study, that youth assigned to the integrated intervention would report fewer HIV risk behaviors post-treatment compared to youth assigned to treatment as usual, was partially supported. Condom use increased among youth receiving the integrated intervention in comparison to those assigned to treatment as usual. This suggests that interventions, which address the context of youths' lives in addition to providing HIV prevention may be most effective for increasing condom usage. Further, the findings showed an interaction between time, treatment, and age of youth on condom usage. Younger (14–18) and older youth (19–22) assigned to the integrated treatment increased their use of condoms at follow-up compared to youth assigned to treatment as usual. Frequency of condom use was least improved for younger youth assigned to treatment as usual suggesting that these youth are most in need of targeted intervention efforts. To our knowledge, this is the first study reporting an increase in condom use among homeless, street living youth regardless of age and gender. Among youth recruited through runaway shelters, Rotheram-Borus et al. (2003) also reported reductions in sexual risk behaviors but only for females. However, youth recruited from shelters represent a less at-risk population of youth, making comparison of outcomes difficult. Shelter residing youth tend to be younger, have fewer risk behaviors, and often have never spent a night on the streets (Clements et al. 1997; Robertson and Toro 1999). Since housing status is a predictor of injection drug use and condom use, Clements et al. (1997) notes the importance of examining street based homeless youth as separate from more stable youth recruited from shelters.

Findings also showed that youth reduced the number of sexual partners regardless of treatment condition. In particular, youth reported a reduction in having sex with more than one person in 24 h as well as in the number of different sexual partners in the prior 3 months. Although this cannot be confirmed in the current study, it is possible that youth assigned to the integrated intervention condition reduced their sexual contact with those in treatment as usual, who were, most likely, their primary social network, and those in treatment as usual were thus influenced to reduce their sexual contacts. Given this possibility, future studies might be strengthened by

including an open ended assessment of social network relationships among participants in the study in order to more fully examine the potential impact of treatment on behavioral outcomes.

There was no interaction effect involving gender and treatment, however, a main effect for gender was found. Females reported engaging in more high-risk behaviors across all time points than did males. Though not treatment evaluation studies, one study similarly found that homeless females engage in more high-risk behaviors than do homeless males (Clements et al. 1997) while another study found that homeless males engage in more high-risk behaviors than homeless females (Anderson et al. 1994). Thus, our findings add to a mix of findings in the literature for homeless youth, which might be due to the heterogeneity of the youth evaluated in these different samples (e.g., combining shelter and street sampled youth) across different areas of the country. The current findings suggest the need for gender specific intervention efforts. Intervention efforts that focus on addressing the power differential among males and females in high-risk situations might be especially salient for homeless female youth. For example, among a sample of housed female adolescents experiencing gender-based violence, Wingood et al. (2006) reported significantly reduced sexual risk behaviors among youth assigned to a gender-tailored HIV prevention intervention based on the theory of gender and power. Such treatment development might entail identifying areas of risk specific to males and females and tailoring intervention approaches to individuals' risks.

In order to better understand those factors associated with change, three groups were identified —one whose total risk behavior score was reduced at time three from time one (26%), one whose risk behavior score did not change (54%), and one whose risk behavior score increased over time (20%). The group whose risk behavior score was reduced over time was best predicted by the baseline HIV risk behavior score. In sum, high-risk behaviors in which youth engaged in at baseline were stronger predictors of change in HIV risk behaviors than were treatment, BDI depression and other demographic variables. Although these findings need to be explored further, possibly, those youth at highest risk are more responsive to any intervention effort (such as through a drop-in center), while youth who engage in relatively less risk behavior need focused intervention targeted to their unique risks.

Limitations

Some limitations of the study need to be considered. The design of the study cannot elucidate to what extent the cognitive-behavioral intervention, the HIV prevention or the combination of the two contributed to the observed findings. Participants in this project were recruited from a southwestern urban center and the behaviors, cultural influences, environmental demands, and interactional characteristics of the homeless youth in this sample may differ from those living in other parts of the country. These regional differences and characteristics of the drop-in center could influence youths' response to the treatment. Studies report a greater representation of males living on the streets compared to females (Roy et al. 2004; Yoder et al. 2001), and this study similarly had a higher representation of males (66%) than females. The length of follow-up was short (6 months post-baseline), and conclusions regarding the generalization of treatment effects beyond this post-treatment point cannot be made. We cannot ensure that contamination between the intervention and control condition did not occur, nor can we make conclusions regarding important mediating factors including peer interaction on outcome. Protocol contamination is always a concern when working with homeless youth engaged through a drop-in center. Youth who may have learned strategies to lower their high-risk behaviors may have experienced opposition to engaging in these behaviors by their peers as research notes the powerful effect of peers on homeless youths' behaviors (Ennett et al. 1999). Also, the supportive environment of the drop-in center, through which all youth were engaged, may have contributed to some of the observed effects. For example, baskets of condoms were offered in the lobby and restrooms, staff from AIDS taskforce came to the center

weekly to offer free HIV testing, and the culture among staff was that of promoting safe and healthy behaviors.

Completion of only 6.8 treatment sessions may be considered a limitation in that youth received less than half of the available treatment sessions. Alternatively, 6.8 sessions can be considered very high given the level of system mistrust and lack of stability among homeless youth. The overall HIV risk score on the Health Risk Questionnaire had only moderate internal reliability for this sample (alpha = .73) as did the Condom Attitude Scale (alpha = .67), suggesting that the behaviors did not strongly correlate with one another. Kline (1999) notes that alpha over . 80 is considered strongly reliable. However, for the Health Risk Questionnaire, this concern is somewhat ameliorated since we focused on individual behaviors in the main analyses, and did not utilize the overall risk score. The final identified limitation is that RA's were not blind to participant's treatment condition, which we considered necessary to maintain adequate follow-up rates. However, this is a potential threat to internal validity since RA's expectancy of treatment effects may have influenced youths' responses.

Conclusion and future directions

Even with these limitations, this study adds to the small body of research focused on evaluating intervention strategies for reducing and eliminating potentially deadly risk behaviors among homeless, street living youth (Booth et al. 1999; Gleghorn et al. 1997). In a meta-analytic review of HIV risk reduction interventions integrated into substance abuse treatment programs, Pendergast et al. (2001) found that the only factor associated with HIV risk reduction was the degree that each session was involving, emotional, and memorable. Pendergast et al. (2001) also found that the total number of HIV prevention contact hours was only marginally (and insignificantly) associated with effect size. This suggests that the quality of the integrated HIV prevention sessions is more important than the quantity of sessions. For homeless youth, fewer, but more involving/engaging sessions may be especially potent given the potentially lower feasibility of meeting with youth over many weeks. Future efforts to impact risk behaviors among homeless youth may need to consider the context of their lives when designing interventions as prior research with homeless youth indicates that HIV prevention alone is not sufficient to effect positive change. That is, a teen whose basic needs are not met may have less motivation to reduce high-risk behaviors than a housed teen partly because he or she is focused on surviving the moment. Concern over housing, food and other basic needs is likely a greater concern than is acquiring HIV. In sum, future efforts to reduce HIV risk behaviors among this group likely will need to utilize integrated interventions that focus on the totality of the youth's life.

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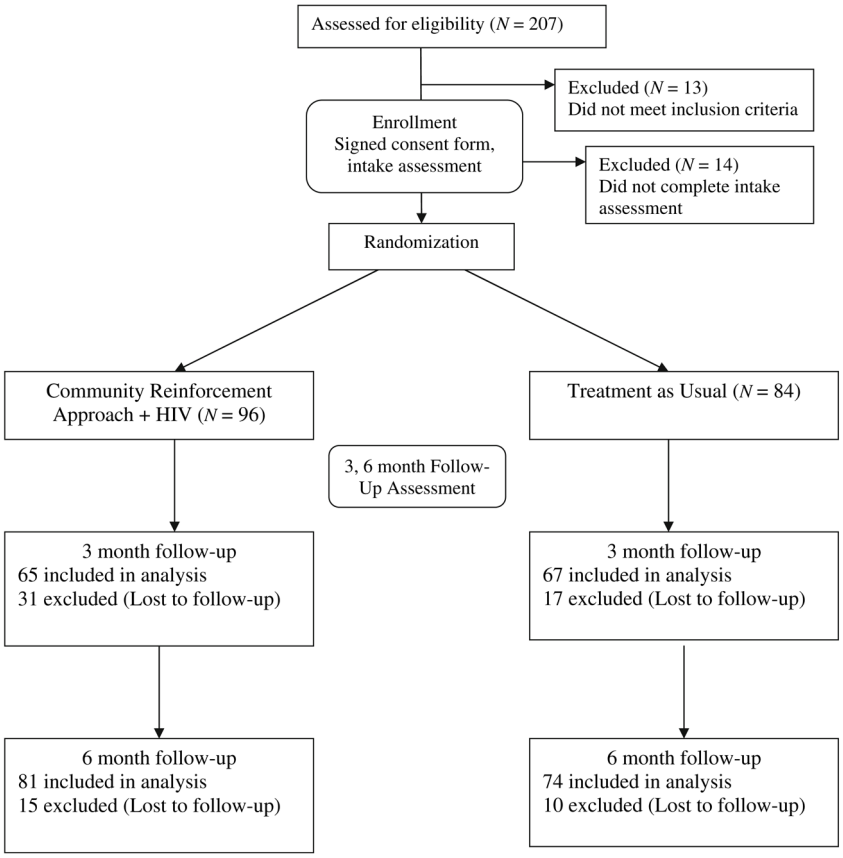

Fig. 1.
Research design

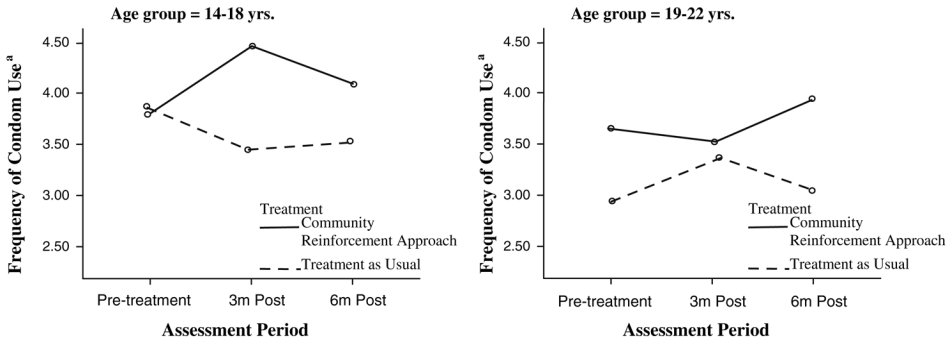

Fig. 2.

Interaction effect between time, age, and treatment types for frequency of condom use reported. *Note*. [a]Frequency of Condom Use = Mean scores; 1 = Never; 2 = Rarely; 3 = Sometimes; 4 = Usually; 5 = Always

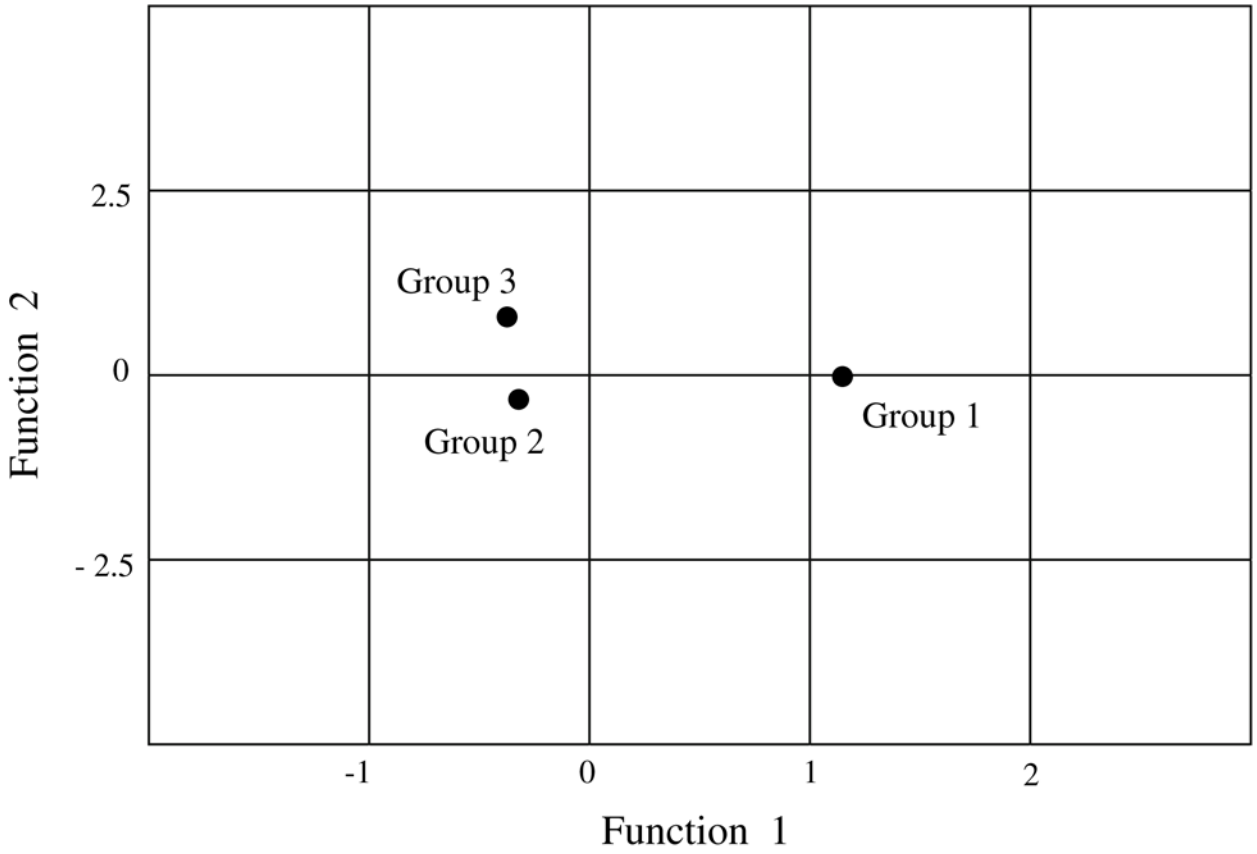

Fig. 3.

Group centroids plot from discriminant function analysis. *Note*. Group 1 = T1 > T3 (significant reduction of HIV risk behaviors at post-treatment) Group 2 = T1 = T3 (nonsignificant change from pre- to post-treatment) Group 3 = T1 < T3 (significant increase of HIV risk behaviors at post-treatment)

Table 1

Baseline differences by treatment modality

Variable	Community reinforcement approach (*n* = 96)	Treatment as usual (*n* = 84)	Differences *n* = 180
			t(*p*), *df* = 178
Age (*M*, *SD*)	19.03 (2.45)	19.40 (1.73)	−1.17 (.25)
Education level (*M*, *SD*)	10.03 (1.91)	10.48 (1.90)	−1.56 (.12)
BDI total score[a]	19.96 (10.56)	17.63 (11.38)	1.42 (.16)
CAS total score[b]	3.63 (3.31)	4.77 (3.71)	−2.20 (.03)*
			χ^2(*p*), *df* = 1
Gender (*n*, %male)	61 (63.5%)	57 (67.9%)	.37 (.54)
Ethnicity (*n*, %)			
Anglo	45 (46.9%)	34 (40.5%)	.75 (.39)
Hispanic	33 (34.4%)	24 (28.6%)	.70 (.40)
Native Am	8 (8.3%)	14 (16.7%)	2.90 (.09)t
African Am	4 (4.2%)	3 (3.6%)	.04 (.84)
Mixed Ethn.	6 (6.3%)	9 (10.71%)	1.17 (.28)

t*Note*. $p < .10$;

* $p < .05$. All *p*-values are two-tailed

[a] BDI = Beck Depression Index (Range = 0–48)

[b] CAS = Condom Attitude Scale (Range = 0–16)

Table 2

Descriptive statistics of HIV risk behaviors at pre-treatment (T1), 3-month (T2), and 6-month (T3) post-intake

Variables[a]	T1		T2		T3	
	Total (*n* = 180)		Total (*n* = 132)		Total (*n* = 155)	
	Community reinforcement approach (*n* = 96)	Treatment as usual (*n* = 84)	Community reinforcement approach (*n* = 65)	Treatment as usual (*n* = 67)	Community reinforcement approach (*n* = 81)	Treatment as usual (*n* = 74)
	M (*SD*)					
HIV risk behavior (overall score)	.96 (1.03)		.86 (1.00)		.79 (0.92)	
Number of people shared needles to inject any drugs[b]	.82 (0.99) .04 (0.21)	1.12 (1.05)	.80 (1.11) .03 (0.19)	.93 (0.89)	.73 (1.05) .04 (0.24)	.86 (0.76)
Number of people having sexual intercourse*,[b]	.05 (0.23) .82 (0.70)	.03 (0.18)	.04 (.22) .73 (0.67)	.02 (0.17)	.05 (.29) .67 (.66)	.03 (0.18)
Number of times having sexual intercourse[b]	.78 (0.82) 2.04 (1.68)	.86 (0.54)	.70 (.77) 2.05 (1.69)	.77 (0.56)	.67 (0.77) 1.98 (1.73)	.67 (0.51)
How often do you/your partner use a condom?[c]	1.74 (1.67) 3.41 (1.42)	2.38 (1.64)	1.76 (1.64) 3.59 (1.40)	2.33 (1.71)	1.82 (1.63) 3.51 (1.40)	2.14 (1.83)
HIV knowledge	3.66 (1.36) 12.92 (1.75) 12.88 (1.91)	3.11 (1.44) 12.96 (1.56)	3.82 (1.38) 12.98 (1.81) 13.05 (1.90)	3.35 (1.39) 12.91 (1.73)	3.81 (1.23) 13.34 (1.67) 13.49 (1.59)	3.16 (1.50) 13.18 (1.75)
	n (%)[d]					
Injected drug use	18 (10.0)		11 (8.33)		10 (6.45)	
Shared needles to inject any drugs	12 (12.5) 7 (3.9)	6 (7.1)	7 (10.77) 3 (2.27)	4 (5.97)	7 (8.64) 5 (3.22)	3 (4.05)
Engaged in casual sex	4 (4.2) 47 (26.1)	3 (3.6)	2 (3.08) 27 (20.45)	1 (1.49)	3 (3.70) 23 (14.83)	2 (2.70)
Had sex with more than one partner within 24-h*	24 (25.0) 12 (6.7)	23 (27.4)	13 (20.0) 4 (3.03)	14 (20.90)	12 (14.81) 7 (0.45)	11 (14.86)
Had sex with high-risk sex partner	6 (6.3) 13 (7.2)	6 (7.1)	2 (3.08) 8 (6.06)	2 (2.99)	6 (7.41) 6 (3.87)	1 (1.35)
Engaged in anal sex	6 (6.3) 17 (9.4)	7 (8.3)	4 (6.15) 12 (9.09)	4 (5.97)	3 (3.70) 9 (5.81)	3 (4.05)
Engaged in survival sex	7 (7.3) 10 (5.6) 3 (3.1)	10 (11.9) 7 (8.3)	4 (6.15) 4 (3.03) 2 (3.08)	8 (11.94) 2 (2.99)	4 (4.94) 3 (1.94) 3 (3.70)	5 (6.76) 0 (0)

*Note. Risk behaviors, which showed significant time effect in univariate follow-up analyses

[a]The behaviors engaged "in the last 3 months"

[b]Due to skewness (skewness > 2), the log transformed scores were used

[c] 1 = Never; 2 = Rarely; 3 = Sometimes; 4 = Usually; 5 = Always

[d] Number and percentage within the group who answered “yes”

Table 3

3 × 2 × 2 × 2 Repeated measures MANOVA results for HIV risk behaviors and related variables[a] (n = 116)

Multivariate effect	λ	*F*	*df*	*p*	Power[f]
Time[b]	**.72**	**1.96**	**18, 88**	**.02**	**.96**
Treatment[c]	.87	1.64	9, 97	.11	.73
Gender[d]	**.81**	**2.47**	**9, 97**	**.01**	**.91**
Age[e]	.93	.86	9, 97	.57	.40
Treatment × Gender	.88	1.51	9, 97	.16	.68
Treatment × Age	.92	.89	9, 97	.54	.42
Gender × Age	.95	.57	9, 97	.82	.26
Treatment × Gender × Age	.94	.74	9, 97	.67	.35
Time × Treatment	.90	.55	18, 88	.92	.36
Time × Gender	.83	1.02	18, 88	.44	.66
Time × Age	.83	1.00	18, 88	.47	.65
Time × Treatment × Gender	.80	1.19	18, 88	.29	.75
Time × Treatment × Age	**.72**	**1.88**	**18, 88**	**.03**	**.94**
Time × Gender × Age	.84	.93	18, 88	.55	.61
Time × Treatment × Gender × Age	.79	1.34	18, 88	.19	.81

Note. MANOVA = multivariate analysis of variance. Bolded items are statistically significant ($p < .05$)

[a] HIV risk behaviors and related variables = iv drug use; more than 1 partner in a 24 h time span; number of people having sex with in last 3 months (log transformed value); having sex with HIV risk partner; frequency of condom use; anal sex; survival sex; HIV knowledge; and Condom Attitude Scale total score

[b] Time = Pre-treatment, 3-month post-intake, and 6-month post-intake

[c] Treatment = Community reinforcement approach versus Treatment as usual

[d] Gender = Female versus male

[e] Age = 14–18 years versus 19–22 years

[f] Computed using alpha = .05

Table 4

Discriminant analysis: classification analysis for HIV risk behavior change

Actual group membership	Predicted group membership					
		T1 > T3		T1 = T3		T1 < T3
	n	*n*	%	*n*	%	*n*	%
T1 > T3	41	27	65.9	6	14.6	8	19.5
T1 = T3	83	13	15.7	43	51.8	27	32.5
T1 < T3	31	5	16.1	7	22.6	19	61.3

Note. Overall percentage of correctly classifies cases = 57.4%

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Table 5

Canonical discriminant analysis: standardized discriminant function coefficients

Attributes/discriminating variables	Standardized discriminant function coefficients	
	Function 1	Function 2
Age	−.14	−.52
Gender	−.17	.31
Ethnicity	.02	.36
Education level	−.19	.24
BDI total score[a]	.26	.66*
CAS total score[b]	−.26	−.03
Treatment type	−.02	−.05
HIV risk behavior	1.02*	−.21
HIV knowledge	.03	.04

Note. All attributes used in this analysis were the data collected at pre-treatment

*Largest absolute correlation between each variable and any discriminant function

[a]BDI = Beck Depression Index

[b]CAS = Condom Attitude Scale