Published in final edited form as:

J Subst Abuse Treat. 2017 January ; 72: 56–65. doi:10.1016/j.jsat.2016.08.019.

First Evaluation of a Contingency Management Intervention Addressing Adolescent Substance Use and Sexual Risk Behaviors: Risk Reduction Therapy for Adolescents

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Abstract

There is a need for interventions that comprehensively address youth substance use disorders (SUD) and sexual risk behaviors. Risk Reduction Therapy for Adolescents (RRTA) adapts a validated family-focused intervention for youth SUD to include sexual risk reduction components in a single intervention. In this first evaluation of RRTA, drug court involved youth were randomly assigned to RRTA ($N=45$) or usual services (US; $N=60$) and followed through 12-months post-baseline. RRTA included weekly cognitive behavior therapy and behavior management training and contingency-contracting with a point earning system managed by caregivers targeting drug use and sexual risk antecedents. Longitudinal models estimated within-group change and between-group differences through 6- and 12-month follow-up on outcomes for substance use, sexual risk behaviors, and protective HIV behaviors. Robust effects of the intervention were not detected under conditions of the study that included potent background interventions by the juvenile drug court. Considerations about future development and testing of sexual risk reduction therapy for youth are discussed, including the potential role of contingency management in future interventions.

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Keywords

adolescent; substance abuse; sexual risk; HIV; prevention; randomized controlled trial

1. Introduction

Youth with substance use disorders (SUD) are a large and underserved population at high risk for deleterious outcomes and long-term costs for themselves, their families, and society. Roughly 2 million U.S. adolescents meet criteria for SUD (Godley et al., 2010). However, only about 200,000 U.S. youth received treatment for SUD in 2012 (Substance Abuse and Mental Health Services Administration, 2013). When left untreated, many youth with SUD continue abusing substances into adulthood, with detrimental effects pertaining to education, mental and physical health, and employment (Alford, Koehler, & Leonard, 1991; Brown, Myers, Mott, & Vik, 1994; Chan, Dennis, & Funk, 2008; Crowley, Mikulich, MacDonald, Young, & Zerbe, 1998; Godley, Godley, & Dennis, 2001; Henggeler, Clingempeel, Brondino, & Pickrel, 2002; Kaminer & Bukstein, 2008; Ringel, Ellickson, & Collins, 2007). Such outcomes cost society more than \$180 billion each year, stemming from health care, drug-related crime, and reduced work productivity (Office of National Drug Control Policy, 2004). Even when youth do receive services for SUD, the vast majority of those services are not evidence-based (Fixsen, Blasé, Duda, Naoom, & Van Dyke, 2010; McCarty et al., 2007; Santa Ana et al., 2008). Another concern is that the services for SUD among youth often are delivered in isolation from interventions for other common co-occurring problems.

One prevalent co-occurring problem among adolescents with SUD is sexually transmitted infection (STI), including HIV. Youth with SUD are 2-8 times more likely to acquire STI relative to their peers without SUD (Cook et al., 2006; Staras, Tobler, Maldonado-Molina, & Cook, 2011; Tapert, Aarons, Sedlar, & Brown, 2001). This increased risk is at least partially attributed to elevated rates of unsafe sexual behavior among adolescents with SUD (Belenko & Dembo, 2003; Bell et al., 2003). Compared to non-substance using adolescents, substance using youth initiate sexual activity at a younger age and engage in higher rates of unprotected sex (Houck et al., 2006; Malow, Devieux, Rosenberg, Samuels, & Jean-Gilles, 2006). Among a national sample of high school seniors, the number of sexual partners increased across cohorts with substance use intensifying from no use to heavy use (Cavazos-Rehg et al., 2011). Further, longitudinal research shows that many youth with SUD continue displaying high rates of risky sexual behavior in adulthood (Khan, Berger, Wells, & Cleland, 2012; Strachman, Impett, Henson, & Pentz, 2009; Wu, Witkiewitz, McMahon, Dodge, & Conduct Problems Prevention Research Group, 2010). Experts have, therefore, called for interventions that target STI-related sexual risk behaviors among youth with SUD (Bell et al., 2003; Houck et al., 2006) and several such interventions have been developed. However, results do not clearly support the efficacy of these programs (Marvel, Rowe, Colon-Perez, DiClemente, & Liddle, 2009; Tolou-Shams et al., 2011).

For example, Tolou-Shams and colleagues developed and evaluated a group-based affect management intervention that aimed to improve juvenile drug court involved youths' self regulation in risky situations (e.g., when negotiating condom use), as well as increase

motivation and skills for HIV prevention. Analyses from this small ($N = 57$) randomized controlled trial showed no statistically significant between-group differences at 3 months post-intervention on key outcomes including condom use, number of sexual partners, and substance use during sex, but trends for increased communication with partners about condom use and lower odds of using substances during sex in the experimental versus control treatment conditions. Tolou-Shams and colleagues hypothesized that a more intensive family-focused (vs. adolescent-only) intervention that integrated SUD treatment with sexual risk reduction intervention might yield better results.

Risk Reduction Therapy for Adolescents (RRTA) adapts a validated family-focused Contingency Management (CM) intervention for youth with SUD to include sexual risk reduction components in a single comprehensive treatment (McCart, Sheidow, & Letourneau, 2014).

The family-focused CM intervention for youth with SUD was developed and evaluated extensively by Henggeler and colleagues (Henggeler, Cunningham et al., 2012)⁵ and is based on a variation of the Community Reinforcement Approach (CRA; Budney & Higgins, 1998). It maintains a strong focus on caregiver involvement, an element previously shown critical for improving adolescent outcomes (Dowell & Ogles, 2010; Hawley & Weisz, 2005; Stanton & Shadish, 1997). It incorporates a contingency contracting procedure in which objective youth behavior including urine test results receive consequences based on a structured point system developed at the start of therapy in collaboration between the therapist, youth, and family members. Further, it incorporates cognitive behavioral strategies to help youth identify the antecedents (i.e., triggers) and consequences of their substance use and to develop plans for avoiding and/or managing substance use triggers.

Previous trials have shown that the family-based CM intervention improves outcomes among youth with SUD (Henggeler et al., 2006; Henggeler, McCart, Cunningham, & Chapman, 2012)⁶. In one recent study, Henggeler and colleagues compared the family-based CM intervention to usual treatment services in a multi-site randomized controlled trial focused on youth in juvenile drug courts (Henggeler, McCart, et al., 2012). Urine drug test results indicated that groups had similar rates of positive tests early in treatment, but that at later assessments CM was associated with significant reductions in marijuana use relative to the control condition.

Within the context of the family-based CM intervention, RRTA was designed to add new behavioral targets in addition to substance use reduction, specifically, sexual risk behaviors and HIV/STI testing. RRTA aims to reduce both substance use and sexual risk by targeting three factors that underlie those outcomes: maladaptive parenting, deficiencies in youth self-control, and low youth HIV/STI knowledge and skills. Specifically, maladaptive parenting (e.g., limited supervision, poor communication) predicts both substance use (Brown &

⁵While Dr. Henggeler's prior research has used a family-based treatment called Multisystemic Therapy (MST), the research cited here focuses on a different treatment called Contingency Management (CM). MST therapists sometimes use CM strategies, but the CM discussed in this paper is a standalone treatment separate from MST.

⁶In some articles, the family-based aspect of this intervention was denoted by the label CM-FAM. It is the same intervention detailed in Henggeler, Cunningham, et al., 2012.

Abrantes, 2006) and risky sexual behavior (Kotchick, Armistead, & Forehand, 2006) among youth. Conversely, when caregivers engage in adaptive parenting, adolescents exhibit reduced substance use (Henggeler et al., 2009; Huey, Henggeler, Brondino, & Pickrel, 2000) and healthier sexual outcomes (Aspy et al., 2007; Crosby et al., 2006). A similar pattern exists between adolescent self-control (i.e., the ability to delay gratification and consider consequences before acting) and both substance use (Brody & Ge, 2001; Wills, Walker, Mendoza, & Ainette, 2006) and risky sex (Caspi et al., 1997; Cooper, Wood, Orcutt, & Albino, 2003). In addition, accurate HIV/STI knowledge positively affects motivation regarding healthy sexual decision-making (Swenson, Rizzo, & Romer, 2010), as does increased communication about HIV, particularly communication with parents (MacPhail, Pettifor, Moyo, & Rees, 2008). Thus, RRTA uses contingency contracting, cognitive-behavioral strategies, and skills-based practice to (a) improve caregivers' parenting skills, (b) build youths' self-control abilities, and (c) increase HIV/STI knowledge and interactive discussion for both parents and youth. The components of RRTA (described later) are derived from the aforementioned family-based CM intervention for youth SUD, with CM also providing the platform for strategies that target sexual risk reduction.

This study presents results from a small randomized controlled trial that compared RRTA, delivered as a treatment attached to juvenile drug court (JDC), with usual treatment services (US) provided to youth in the same JDCs. The JDC setting was chosen because of the research team's focus on justice-involved populations, the dire need for simultaneously reducing the high risk behaviors of drug use and risky sexual behaviors particularly among justice populations, and the direction of research funding opportunities specifically for justice populations and JDC-involved samples. While these settings provide a highly structured environment with monitoring, accountability, and often its own potent contingencies, research on juvenile court outcomes in fact shows mixed results (Aos, Miller, & Drake, 2006). We hypothesized that RRTA would be more effective than US at reducing both substance use and sexual risk behaviors among these drug court-involved youth.

2. Materials and Methods

2.1 Design and Procedures

A randomized design with intent-to-treat analyses evaluated the preliminary efficacy of RRTA for targeting key outcomes measured at baseline and 3-, 6-, 9-, and 12-month post-baseline. All youth were recruited from one of two JDCs⁷. Given that more boys than girls present in juvenile justice populations including JDCs, youth gender was balanced across treatment conditions via stratified randomization. Youth assent and parent/caregiver consent procedures emphasized the voluntary nature of participation. Research assessments were typically conducted in families' homes and at times convenient to youth and parents. Families were compensated \$30 for each completed assessment. All procedures were approved by the lead author's Institutional Review Board and a federal certificate of confidentiality was obtained to further protect participants and their data.

⁷We originally planned to conduct the study at a single JDC with 160 participants; however, after 15 years of operation, the original JDC program was terminated unexpectedly. In response, we recruited a second JDC site for the trial, located in a nearby state. The delay and expense associated with moving the study to a distal location contributed to the study's small final sample size.

Of 137 eligible youth referred to the study (216 referred minus 79 ineligible), 114 (83%) consented, including 107 randomized cases and 7 nonrandomized “beta” cases (see CONSORT Figure 1; [ClinicalTrials.gov](https://clinicaltrials.gov/ct2/show/study/NCT01511380) Identifier: NCT01511380). Of the 107 randomized cases, 105 ($N=45$ for RRTA and 60 for US) provided useable data (i.e., completed at least the baseline assessment) for this study.

Most participating youth were boys (83.8%) between the ages of 11 and 17 ($M=14.9, \pm 0.14$ years) who self-identified as heterosexual (90.4%). Youth self-identified in approximately equal proportions as non-Latino White (33.3%), non-Latino Black (29.5%), and Latino (30.5%). Their primary caregivers were predominantly biological or adoptive mothers (76.2%) or fathers (16.2%) with a mean age of 42.5 ± 0.87 years and a median household income of \$20,001-30,000. Consistent with the fact that all youth were involved in JDC, most (93.3%) self-reported substance use in the last 90 days at baseline, including marijuana ($n=91, 86.7\%$), alcohol ($n=42, 40.0\%$), cocaine ($n=3, 2.9\%$), and polysubstance use ($n=24, 22.9\%$). Youth also completed a urine drug screen (UDS) at baseline, which tested for marijuana, methamphetamine, amphetamine, cocaine, and opioid use. One-third of the sample (31.1%) tested positive for a substance, including marijuana ($n=30, 28.6\%$), methamphetamine ($n=1, 1.0\%$), and amphetamine ($n=1, 1.0\%$); no participants tested positive for cocaine or opioids. At baseline, more than one-third of the sample reported having engaged in vaginal or anal intercourse in their lifetime (35.2%) and 17% reported having been tested for HIV in their lifetime. There were no statistically significant differences between the intervention conditions in demographic or baseline clinical characteristics.

2.2 Intervention Conditions

All participating youth were recruited upon entering a JDC. The two participating JDCs were well established (e.g., each had been in continuous operation for 15 years) and each adhered to national guidelines for drug court programs (National Association of Drug Court Professionals, Drug Court Standards Committee, 1997). As such, the JDCs were both administered by a team that included a judge and representatives from other disciplines (e.g., treatment providers, probation officers, prosecution, and defense attorneys). Youth in the JDCs were mandated to participate in substance abuse treatment. Each court also required frequent (often 1-2 times per week) urine drug testing of program participants and provided close oversight of each case through regular status hearings. During a status hearing, the judge obtained reports on each youth's progress from treatment providers and other JDC team members, and then swiftly dispensed rewards (e.g., gift cards to local stores or restaurants) or sanctions (e.g., earlier curfew, community service hours) based on each youth's drug screen results and behavior in other domains (e.g., treatment, family and school). The JDCs consisted of three levels (i.e., weekly, biweekly, and monthly required attendance in court), with graduation from one level to the next dependent on clean drug screens and acceptable behavior in the other domains. The standard duration of JDC involvement was 12 months. At the point of JDC entry, study staff solicited fully informed consent from parents/legal guardians and assent from youth and then randomized youth/parent dyads to the RRTA or US treatment conditions. Thus, JDC services were identical for

all participating youth, with the exception of the substance abuse treatment received (i.e., RRTA or US).

2.2.1 Experimental Condition: RRTA—For the current study, RRTA was delivered to youth-parent dyads by one of two study therapists, both of whom held a Master's degree in social work. Treatment appointments were held once weekly in a traditional outpatient clinic, with sessions lasting 60-90 minutes each. RRTA is family-based and as such, parents are required to attend every session and actively collaborate with therapists in addressing their youth's behavior problems. RRTA also is criterion-based, with treatment duration determined by the youth's achievement of reduced substance use and sexual behavior goals. However, for this trial, RRTA typically was completed within 24 sessions, conducted over a period of 6-7 months. RRTA is comprised of both CM and sexual risk reduction components.

2.2.1.1 Contingency Management: As noted previously, the CM portion of RRTA is based on our work implementing CM with substance abusing juvenile offenders (Henggeler, McCart et al., 2012) and training community-based practitioners in delivery of the model (Henggeler et al., 2008; McCart, Henggeler, Chapman, & Cunningham, 2012). As specified in a published treatment manual (Henggeler, Cunningham et al., 2012), CM consists of the following components: clinical and behavioral assessments, including extent and severity of substance use, triggers for use, and positive and negative consequences for use; self-management planning; and drug testing with contingency contracting.

Once the assessments have identified the triggers and consequences of use (using an approach similar to behavioral functional analyses), self-management planning directly targets the antecedents (environmental, cognitive, and affective triggers) to drug use identified in assessments. Plans are developed together with the youth and family and commonly include: (a) avoiding triggers (e.g., certain peers), (b) rearranging the environment (e.g., discarding drug paraphernalia, heightened parental monitoring), and (c) developing drug refusal skills for unavoidable triggers (e.g., peer pressure). Components of the self-management plans are practiced in session via structured role-plays and assigned to youth as homework to try in real-life situations.

Concurrent with development of self-management plans, the therapist conducts UDS and alcohol breath scans at every scheduled weekly treatment session and randomly twice per month. For the current study, clinic-based tests assessed for marijuana, synthetic marijuana, methamphetamine, amphetamine, cocaine, opioids, and alcohol metabolites (EtG/EtS). In addition to the clinic tests, the therapist taught the parent how to conduct random UDS and alcohol breath scans in the home approximately once per week and immediately after high-risk situations (e.g., if youth missed curfew). These home-based instant tests assessed for marijuana, methamphetamine, amphetamine, cocaine, and opioids (instant tests were unable to test for synthetic marijuana or alcohol metabolites).

The therapist, youth, and parent create a contingency contract that specifies consequences based on the results of the UDS. The contingency contract follows a well-specified protocol. First, the therapist, youth, and parent generate a menu of rewards that can effectively

compete with the youth's substance use. The therapist ensures a balance between natural incentives parents can provide (e.g., cell phone access; later curfew) and items to be purchased with gift cards (i.e., therapists have access to \$100/youth for gift cards). From this reward menu, the family chooses the youth's "most valued privilege" (MVP), almost always a natural incentive. Remaining menu items are assigned point values, usually 1 point $\approx$ \$1. Once the menu is finalized, a point-and-level system is implemented and the youth receives a 50-point starting balance. The youth earns or loses MVP access depending on each UDS result. During the first month (Level I of contract), youth keep their points if they have negative screens, but lose 12 points for each week they test positive. Regardless of screen results, youth cannot redeem points in this period. From the fifth week on (Level II of contract), negative screens result in youth being able to earn additional points and also to use their points to "purchase" items on the reward menu. To provide greater incentive (i.e., escalating reinforcer), the number of points youth can earn each week starts at 12 and increases to 24 after eight consecutive weeks of negative screens (Level III of contract). Rewards are provided as immediately as possible, consistent with behavioral principles. If a youth has a positive screen from the fifth week on, the youth does not earn points and cannot make a "purchase" until the next negative screen. Consistent with family therapy principles, parents directed the development of the reward menu, were primarily responsible for awarding or subtracting points, and provided all rewards from the menu.

Of note, the MVP and point-and-level system just described was used to target youth substance use for all RRTA cases and for the full duration of RRTA treatment. However, as treatment progresses and sexual risk reduction interventions are introduced to the family (typically by the 3rd month of treatment), the contract is expanded to also target sexual risk behaviors with "bonus points." That is, in addition to rewarding youth with the MVP and 12 (or 24) points for negative UDS, a parent can reward a youth with a pre-determined number of 2-3 "bonus points" when adhering to sexual risk-related rules (described below in section 2.2.1.2).

2.2.1.2 Sexual Risk Reduction: The SRR portion of RRTA is structured on the CM intervention platform and is consistent with both a family systems intervention for sexual risk (Letourneau, Ellis et al., 2013) and federally funded HIV intervention and prevention protocols (Hadley et al., 2009; Lightfoot, Rotheram-Borus, & Tevendale, 2007; NIMH Multisite HIV Prevention Trial, 1997). It has been previously described (Letourneau, McCart, Asuzu, Mauro, & Sheidow, 2013), and a brief overview is provided here. SRR consists of seven components; the first three components (i.e., clinical and behavioral assessments, self-management planning, and contingency contracting) are parallel to that previously described for the CM intervention targeting youth substance use. Here, however, interventions target consensual sexual risk behavior (i.e., vaginal and/or anal intercourse without a condom, sex after substance use). For youth reporting a history of sexual risk behavior during the clinical assessment, behavioral assessments identify triggers for and the positive and negative consequences of that behavior. Self-management planning then targets the triggers identified in these assessments. For youth without any history of sexual risk behavior, plans are generated for likely situations the youth might encounter in the future. Examples of plans generated by families include (1) avoiding high-risk situations (e.g.,

being at a party with unknown peers), (2) rearranging the environment (e.g., having condoms available, increased parental monitoring), and (3) use of effective refusal skills (e.g., savvy methods to refuse unprotected consensual sex).

Concurrent with self-management planning, rules pertaining to the youth's observable sexual risk behavior are incorporated into the existing contingency contract for substance use. Of importance, the rules for youth in this sample were individualized, but tended to have applicability to youth regardless of their history of consensual sexual intercourse. Therapists encourage parents to develop at least two rules for their adolescent; in the sample the average number of rules generated was 3 (range = 2-4). As an example, all parents in this sample established a rule that they be introduced to a youth's partner before going out on dates. All parents also required that doors remain open when the youth is visiting with his or her partner and/or that parents are home any time a youth's partner is visiting. Some, but not all parents, required meeting a new partner's parents (or at least speaking with them by phone) before permitting dates. As noted previously, identified dating and monitoring rules are added to the CM contingency contract, and youth earn 2-3 bonus points for adherence to each rule.

The next four components of SRR include education about sexual risks and safety, obtaining birth control, HIV/STI testing, and condom use skills, provided by the therapist to both youth and parents. Structured handouts are used to educate the family about sexual risks and safety (e.g., http://www.cdc.gov/std/healthcomm/fact_sheets.htm). The therapist discusses the probability of pregnancy when no protection is used and reviews the signs, symptoms, and treatment methods for various STIs. Methods for protecting against risk (abstinence and barrier, hormonal, and implantable devices) are reviewed, including pregnancy prevention versus STI prevention. Information about all forms of birth control is provided, regardless of the youth's gender, and parents take an active role in the discussion.

For each youth/parent dyad, a handout provides locations where condoms can be purchased or obtained for free (e.g., state health department clinics, HIV testing centers, Planned Parenthood, stores and pharmacies). The therapist, youth, and parent develop a plan for obtaining condoms, and the youth implements the plan as homework. For female clients, the therapist ensures youth already using hormonal or implantable birth control have regularly scheduled medical check-ups and prescription refills. For female clients not using one of these methods, the therapist assists the youth and parent in scheduling a medical appointment to learn more about birth control options. The therapist ensures attendance and problem-solves any attendance barriers. As with HIV testing and condom use, use of contraceptives is addressed within general parenting skills training and not via the contingency contract (see below).

The importance of HIV/STI testing is reviewed with the family, and the therapist provides information on local HIV/STI testing agencies, including location, hours of operation, and testing fees/procedures. For youth with a history of sex (regardless of whether protection was used), the therapist encourages the youth and parents to make a testing appointment for the youth. If they are amenable, the therapist has them schedule an appointment with an agency during the session and follows up with the youth and parent to ensure attendance or

to problem-solve attendance barriers. For youth who test positive for HIV or another STI, the therapist ensures that the youth and parent understand and are adhering to treatment. HIV testing was not added to the youth's contingency contract but rather addressed within the context of general parenting skills. That is, disincentives were limited to the occurrence of unwanted behavior (i.e., substance use) rather than the absence of desired behaviors (e.g., HIV/STI testing). Given national efforts to overcome stigma and other barriers to youth obtaining HIV and STI testing, we thought it unwise to link contingencies with the absence of such behaviors.

Finally, the therapist teaches all youth and parents about correct condom usage (i.e., 15 steps) using a model penis. Of note, if an opposite-sex parent has been the primary person involved in the sessions, the therapist will first assess whether the youth would feel more comfortable having a same-sex parent (or another trusted adult) participate in the training. The therapist meets individually with the parent to conduct the condom skill demonstration, and then the parent demonstrates correct condom use to the youth with assistance from the therapist. The youth practices the demonstration in session until all of the steps are mastered. Of note, parents were encouraged to ensure that children had unexpired condoms on hand when going out for the evening. However, availability of condoms was not typically included within the contingency contract, which, again, limited disincentives to the commission of unwanted behavior rather than the omission of desired behavior. Instead, ensuring consistent access to and use of condoms was addressed within general parenting skills training.

2.2.1.3 Therapist Training and Fidelity: RRTA therapists were trained using a well-developed protocol that includes proven engagement strategies (Tuerk, McCart, & Henggeler, 2012) as well as supervision strategies (Cunningham, Randall, Donohue, & Henggeler, 2004), and ongoing quality assurance. For this study, the 2nd and 3rd authors provided therapist training, supervision, and quality assurance support. The therapist training protocol began with an in-person, 3-day workshop that oriented therapists to program philosophy and intervention methods and included training specific to SUD as well as STI/HIV prevention. RRTA therapists met with their supervisor weekly to review cases and problem-solve barriers to progress. In addition, the supervisor reviewed audiotaped therapy sessions weekly and provided feedback focused on ensuring high therapist adherence to the RRTA protocol.

2.2.2 Usual Services—All youth in the US condition received SUD services delivered by state- or privately-funded drug treatment providers. Youth were directed to attend group treatment for 90 minutes, 4 days a week for the first 12 weeks, and then 1-2 days a week for a second 12-week period. The groups had a cognitive-behavioral theoretical orientation and focused on substance use risk reduction, peer influence, conflict resolution, and anger management. Random UDS were typically conducted by the treatment agency once or more per week. Individual sessions could be added, as needed, to a youth's group treatment regimen. However, parental inclusion in treatment was rare, per parent report. Of note, in one of the two JDC jurisdictions, the local detention facility made an effort to conduct HIV testing of youth while they were detained following initial arrest.

2.3 Measures

2.3.1 Demographic Characteristics—A baseline questionnaire assessed youth and parent age, race, ethnicity, gender, relationship and economic status as well as youth psychiatric and substance abuse treatment history.

2.3.2 Substance Use—Adolescent substance use was assessed through two well-validated methods: youth biological indices and self-reports. At each assessment, youth were administered a UDS that measured their use of marijuana, amphetamine, methamphetamine, cocaine, and opioids. Self-reported substance use was examined using a variation of the Form 90 (Miller, 1991), which is an interview based on the timeline follow back methodology of quantifying specific amounts of substances (i.e., alcohol, marijuana, cocaine, polysubstance use) consumed by individuals during the previous 90 days. Research with adolescents indicates that the timeline follow back method is reliable (Waldron, Slesnick, Brody, Turner, & Peterson, 2001) and yields data that correspond with biological markers and collateral reports of youth substance use (Donohue et al., 2004). Distribution of results dictated the need to dichotomize the UDS and self-reported substance use data, separately, to reflect “any” versus “no” substance use.

2.3.3 Sexual Risk Behaviors—Sexual risk behaviors were assessed using a standardized set of items validated across numerous studies with at-risk adolescents (Jemmott, Jemmott, & Fong, 1992; Jemmott, Jemmott, Fong, & McCaffree, 1999; Jemmott, Jemmott, Spears, Hewitt, & Cruz-Collins, 1992).

At baseline, youth reported on their lifetime history of vaginal and/or anal intercourse. At baseline and all follow-up assessments, youth also reported whether they had engaged in vaginal and/or anal intercourse in the past 3 months and, if so, the number of intercourse acts and number of acts in which condoms were used. We created dichotomous variables that indicated “any” versus “no” sex in the past 3 months and “any” versus “no” sex without a condom in the past 3 months. Frequency of sex acts in the past 3 months was retained as a continuous variable, with zero values imputed for participants reporting no vaginal and/or anal intercourse in the past 3 months. Although frequency of sex acts (when with the same partner and using protection) was not a direct target of the RRTA intervention, each act carries an inherent risk so reduction is desirable. Further, measurement of sex act frequency affords direct comparison to past studies.

2.3.4 HIV Counseling and Testing—Well-validated items from the International Project Accept HIV prevention trial (Genberg et al., 2008) were used to assess youths’ lifetime history of HIV testing (baseline only) and HIV testing in the past 6 months (6- and 12-month follow-ups only). Likewise, at the 6- and 12-month assessments, youth were asked whether they had spoken with anyone about HIV in the preceding 6 months. Specifically, a youth would be asked about “conversations that you might have had about HIV/AIDS” and would be given specific examples. Follow-up items (not analyzed here) assessed reasons for/for not talking about HIV and with whom HIV was discussed, if anyone. Then youth were asked whether they had been tested for HIV and whether they received the results. As

with all research questions, confidentiality was assured. Again, follow-up items (not analyzed here) explored reasons for obtaining/not obtaining HIV testing.

2.4 Analytic Strategy

Longitudinal models used generalized estimating equations with robust standard errors to account for within-person correlations of repeated measures (Liang & Zeger, 1986; MacKinnon & Lockwood, 2003). Due to low base rates for some outcomes, data from the 3- and 6-month assessments were collapsed, as were data from the 9- and 12-month assessments. Logistic regression was used to evaluate dichotomous outcomes, while negative binomial regression was used for the count outcome (number of sex acts) to account for over-dispersion. Predictors in the regression models included intervention condition (i.e., RRTA vs. US), time, and group-time interactions. Linear combinations were used to derive estimates and confidence intervals at the 6- and 12-month time points. Given the relatively small sample size, we conducted a sensitivity analysis power calculation matching the longitudinal analytic strategy using R (Diggle, Heagerty, Liang, & Zeger, 2002; Donohue, Gamst, & Edland, 2015; Liu & Liang, 1997; R Core Team, 2013). In our sample, we had .80 power to detect a delta of .4, considered a medium effect size (Cohen, 1988). This indicated that we were underpowered to detect smaller effect sizes; that is, our statistical tests would be significant if the true difference between groups was relatively large, but not if the true difference between groups was small. In the results, we reported trends above the traditional threshold of $p < .05$ up to $p < .15$, increasing our power to detect a smaller and still clinically significant delta of .3.

3. Results

Supporting the randomization process, intervention conditions did not significantly differ on youth demographic characteristics or baseline substance use, sexual risk, or HIV testing experiences (all p -values $> .05$). Results for all outcome analyses are presented in Table 1.

3.1 Substance Use

Compared to baseline, there were significant declines at the 6- and 12-month follow-ups in the odds of self-reported substance use for both the RRTA and US conditions. The between-group difference in the change from baseline to 12 months was significant ($p < .05$), with RRTA demonstrating greater reductions in substance use (from 96% to 14% of participants reporting any use) relative to US (from 92% to 37% reporting any use). At 12 months, the most commonly used substance self-reported by youth was marijuana (RRTA $n=5$; US $n=14$), followed by alcohol (RRTA $n=4$; US $n=2$); only 3 participants reported polysubstance use (RRTA $n=1$; US $n=2$), and no participants reported cocaine use.

From baseline to the 6-month follow-up, RRTA demonstrated a significant 82% decline in the odds of any positive screen (from 39% to 10% with a positive screen; time effect $p < .01$) whereas US demonstrated a nonsignificant 50% decline (from 25% to 15% with a positive screen). The two groups were similar in absolute proportion of positive screens at 6 months (10% for RRTA, 15% for US) and the between-group difference in the change from baseline to 6 months was not significant. From baseline to the 12-month follow-up, there was a

nonsignificant 35% decline in the odds of a positive screen for RRTA (from 39% to 29% with a positive screen) and a nonsignificant 49% increase in the odds of a positive screen for US (from 25% to 34% with a positive screen). Thus, the two groups were similar in their absolute proportion of positive screens at 12 months (29% for RRTA, 34% for US) and as above, the between-group difference in the change from baseline to 12 months did not reach significance. At 12 months, 23 urine samples tested positive for marijuana (RRTA $n=9$; US $n=14$), while two samples tested positive for amphetamine use (RRTA $n=1$; US $n=1$); there were no positive cocaine, opioid, or methamphetamine screens at 12 months.

3.2 Sexual Risk

At baseline, 33% and 37% of youth in the US and RRTA conditions, respectively, reported vaginal and/or anal sexual behavior. These proportions increased over time for youth in both conditions with 42% and 47% of youth in US and RRTA, respectively, reporting sexual behavior at the 12-month follow-up. None of the within- or between-group comparisons were significant.

Across the whole sample, few participants reported having sex without a condom (11% for RRTA and 12% for US). This increased slightly to 16% in the US group at 12 months and remained at 11% for the RRTA group at 12 months after a dip to around 5% at 6 months. From baseline to the 6-month follow-up, youth in the RRTA condition exhibited a nonsignificant 62% reduction in the odds of sex without a condom while youth in the US condition exhibited a nonsignificant 33% increase in the odds of sex without a condom. The between-group difference in the change from baseline to month 6 approached significance ($p = .11$). From baseline to the 12-month follow up, RRTA was associated with a nonsignificant 12% decline in the odds of sex without a condom while US was associated with a nonsignificant 58% increase in the odds of sex without a condom. The between-group difference in the change from baseline to month 12 did not reach significance. When conditioning on reporting any sex in the last 3 months, the proportion of RRTA youth who reported sex without a condom decreased from 29.4% at baseline to 23.5% at 12 months, while the proportion of US youth increased from 35.0% at baseline to 38.9% at 12 months.

Mean number of sex acts increased from baseline for both groups and was similar at an average of 3.2 – 3.7 per 3-month period for both groups at both follow-up time points.

Compared to baseline, youth in both conditions evidenced increased number of sex acts over time and this increase approached or reached significance for US at the 6- and 12-month follow-ups (incidence rate ratio = 1.32 at 12 months for US, $p\text{-value} < .05$), but remained nonsignificant for RRTA. The between-group differences in the change were not significant.

3.3 HIV-Related Outcomes

Prevalence of HIV testing increased from 16% at baseline to 25% at 12-months for the RRTA group but declined in the US group from 17% at baseline to 14% at 12-months. From baseline to the 6-month follow-up, RRTA was associated with a nonsignificant 49% increase in the odds of HIV testing whereas US was associated with a nonsignificant 28% decrease in the odds of HIV testing. The between-group difference in the change from baseline to month 6 was not significant. Likewise, from baseline to the 12-month follow-up, RRTA was

associated with a nonsignificant 80% increase in the odds of HIV testing whereas US was associated with a nonsignificant 16% decline in the odds of HIV testing. The between-group difference in the change from baseline to month 12 was not significant.

Talking about HIV was considered an important outcome because, as noted previously, increased communication about HIV positively affects motivation regarding healthy sexual decision-making (MacPhail et al., 2008). Prevalence of this behavior increased for both groups at 6-months compared to baseline and decreased by 12-months. However, RRTA maintained a higher rate of HIV talk at 12 months (18% overall increase in proportion reporting talk) compared to US (7% overall decrease in proportion reporting talk). From baseline to the 6-month follow-up, the odds of having talked to someone about HIV increased 344% for RRTA ($p < .001$) and 211% for US ($p < .01$). The between-group difference in the change from baseline to month 6 was not significant. From baseline to the 12-month follow up, the odds of having talked to someone about HIV increased 132% for RRTA and this change approached significance ($p = .06$) and declined 24% for US ($p = ns$). The between-group difference in the change from baseline to month 12 approached significance ($p = .06$). A sensitivity analysis of HIV testing with HIV talk added as a fixed effect covariate (with treatment condition and time points) indicated that HIV talk in the last 6 months was associated with 2.3 times the odds of HIV testing in the last 6 months ($p < .005$; 95% CI 1.3-4.2).

4. Discussion

This study provides an initial evaluation of RRTA, a treatment designed to utilize a family-based intervention that incorporates contingency contracting to address both adolescent substance use and sexual risk behaviors in youth with SUD. All youth in this RCT were participants in JDC, engaged in court-ordered SUD treatment, and were subjected to frequent random UDS. In lieu of group-based SUD interventions (sometimes supplemented with individual and family sessions), youth randomized to the RRTA condition participated in treatment with their parents that focused not only on substance use but also sexual risk reduction. All other JDC procedures were applied equivalently across both groups. During the 12 months post baseline, we examined seven outcomes assessing substance use, sexual risk behaviors, and HIV specific behaviors.

Overall, there was little evidence of a robust effect of RRTA on outcomes. On some measures, youth in the RRTA condition evidenced greater improvement than youth in the US condition, although these differences rarely reached statistical significance. Youth in both conditions evidenced sizeable reductions in self-reported substance use and in the odds of positive drug screens, effects that may be the result of frequent UDS testing and related contingencies conducted by the drug courts. Youth in both conditions also evidenced increased likelihood over time of engaging in intercourse and more instances of intercourse, most likely as a result of developmentally normative changes as they aged during the 12-month study. The other measures of sexual risk (sex without a condom; obtaining HIV testing) were difficult to interpret due to low overall rates of reporting of these behaviors.

As noted, few of the within-group changes or between-group differences reached statistical significance. Indeed, between-group differences reached or approached significance for just three of the seven outcomes: self-reported substance use (12-month follow-up), sex without a condom (6-month follow-up), and talking about HIV (12-month follow-up). Youth substance use and unprotected sexual activity increase the risk for numerous deleterious outcomes and reductions in these behaviors have clear implications for improving the well-being of youth with SUD. Engaging in conversations about HIV is a less obvious but nevertheless important measure of improvement. As we and others have found, youth who engage in conversations about HIV, particularly conversations with their parents, are more likely to obtain HIV testing (MacPhail et al., 2008).

CM without the sexual risk reduction component have shown efficacy in the past by reducing substance use including one recent study (Henggeler, McCart et al., 2012) conducted in a drug court. There are several reasons why more robust effects may not have been seen here, including:

1. Inadequate training of parents and inadequate implementation of the CM strategies by parents. Parent behavior, knowledge and skills are, we believe, key to achieving desired youth outcomes and consequently parents are substantively involved in all aspects of the RRTA intervention. Yet our study lacked evaluation of parent skill acquisition and implementation. More fundamentally, we suspect that more in-depth skill building with (for example) recorded role plays coupled with immediate corrective feedback may be necessary for parents to successfully acquire and implement behavior plans in their homes. Future research plans include evaluating parent skill acquisition and the relationship of skill acquisition to youth outcomes.
2. Good outcomes produced by the base drug court procedures. Given the stringency with which JDCs monitor youth participation in treatment coupled with the norms of usual treatment services within JDCs (e.g., multiple sessions per week for several weeks or months), we believe that some courts may produce strong effects, particularly on youth substance use outcomes.
3. Addition of SRR targets may have diverted attention from drug use targets. We developed RRTA in response to calls for more comprehensive interventions that address common co-occurring and even synergistic problem behaviors such as youth substance use and sexual risk behaviors (Bell et al., 2003; Houck et al., 2006). Yet more is not always better and research in other child-focused areas has indicated that adding new targets to an evidence based intervention may dilute effects on the original outcomes (e.g., Chaffin et al., 2004). Moreover, the relatively low base rates of sexual risk behaviors may also have reduced our ability to achieve and/or identify intervention effects.

Additional limitations of this study include our inability to directly compare RRTA and US groups on treatment dosage, intensity, or duration. If groups differed with respect to these unmeasured program factors, it is possible that such differences account for differences in outcomes. We also failed to include assessment of youth sex while under the influence of alcohol or drugs. Lastly, as is typical of juvenile justice-related settings, most of the youth in

JDCs are boys and this was reflected in our study sample, which was 84% male. Conducting our evaluation of RRTA within the context of JDC may therefore limit the extent to which findings generalize to girls or to youth who are not involved in JDC or other juvenile justice settings. An important point about our sample is that it was one-third African American and one-third Hispanic, providing reasonable representation with respect to race and ethnicity.

In summary, there is a need to determine whether interventions can comprehensively and effectively address youth SUD and common co-occurring problems including sexual risk behaviors (Bell et al., 2003; Houck et al., 2006). Family-based treatments are among the most promising intervention for addressing youth SUD and delinquency (McCart & Sheidow, in press; Tanner-Smith, Wilson, & Lipsey, 2013) and for addressing youth sexual risk behaviors (Pequegnat & Szapocznik, 2000). RRTA, built upon a successful family-based protocol with a strong contingency contracting component (Henggeler et al., 2006; Henggeler, Cunningham, et al., 2012), was designed explicitly as an integrated, family-based model. Additional work will be needed to explicitly assess the types of interventions that are effective for SRR including whether CM is a viable approach. We suspect that more effort is needed to ensure that parents as well as youth acquire the skills and knowledge necessary to counter inherently pleasurable activities. But there remains an even more fundamental question of whether the sexual behavior of youth is amenable to intervention via a CM approach. Such behavior is usually very private, not subject to direct observation, and consequently difficult to measure. CM is, therefore, restricted to antecedent behaviors (e.g., having an unexpired condom readily available) that may or may not have the desired impact. Reporting bias is also a concern with any behavior that can't be directly observed. Careful consideration of these issues may be useful to inform future development of both RRTA and other therapies for SRR. There may also be a cautionary methodology lesson from this study about advisable settings for the conduct of clinical trials. In particular, it will always be difficult to detect effects of added interventions under background conditions that themselves may produce substantial and sustained behavior change effects.

Acknowledgements

The work reported in this publication was supported by the National Institute on Drug Abuse of the National Institutes of Health under awards R01DA025880, T32DA007292, and T32DA031099. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health. The authors sincerely thank the youth and their family members who participated in the research and made this work possible. We also thank the editors and reviewers whose feedback helped improve this paper.

References

- Alford GS, Koehler RA, Leonard J. Alcoholic Anonymous-Narcotics Anonymous model inpatient treatment of chemically dependent adolescents: A 2-year outcome. *Journal of Studies on Alcohol*. 1991; 52:118–126. [PubMed: 2016871]
- Aos, S., Miller, M., Drake, E. Evidence-based public policy options to reduce future prison construction, criminal justice costs, and crime rates. Washington State Institute for Public Policy; Olympia: 2006.
- Aspy C, Vesely SK, Oman RF, Rodine S, Marshall L, McLeroy K. Parental communication and youth sexual behavior. *Journal of Adolescence*. 2007; 30:449–466. [PubMed: 16750265]
- Belenko S, Dembo R. Treating adolescent substance abuse problems in the juvenile drug court. *International Journal of Law and Psychiatry*. 2003; 26:87–110. [PubMed: 12554002]

- Bell DN, Martinez J, Gotwinick G, Shaw K, Walker LE, Dodds S, Siciliano C. Case finding for HIV-positive youth: A special type of hidden population. *Journal of Adolescent Health*. 2003; 33:10–22. [PubMed: 12888283]
- Brody GH, Ge X. Linking parenting processes and self-regulation to psychological functioning and alcohol use during early adolescence. *Journal of Family Psychology*. 2001; 15:82–94. [PubMed: 11322087]
- Brown, SA., Abrantes, AM. Substance use disorders.. In: Wolfe, DA., Mash, EJ., editors. *Behavioral and emotional disorders in adolescents: Nature, assessment, and treatment*. Guilford Press; New York, NY: 2006. p. 226-256.
- Brown SA, Myers MG, Mott MA, Vik PW. Correlates of success following treatment for adolescent substance abuse. *Applied and Preventive Psychology*. 1994; 3:61–73.
- Budney, AJ., Higgins, ST. A community reinforcement plus vouchers approach: Treating cocaine addiction (NIH Publication No. 98-4309). U.S. Department of Health and Human Services, National Institutes of Health, National Institute on Drug Abuse; Rockville, MD: 1998.
- Caspi A, Begg D, Dickson N, Harrington H, Langley J, Moffitt TE, Silva PA. Personality differences predict health-risk behaviors in young adulthood: Evidence from a longitudinal study. *Journal of Personality and Social Psychology*. 1997; 73:1052–1063. [PubMed: 9364760]
- Cavazos-Rehg PA, Krauss MJ, Spitznagel EL, Schootman M, Cottler LB, Bierut LJ. Substance use and the risk for sexual intercourse with and without a history of teenage pregnancy among adolescent females. *Journal of Studies on Alcohol and Drugs*. 2011; 72:194–198. [PubMed: 21388592]
- Chaffin M, Silovsky JF, Funderburk B, Valle LA, Brestan EV, Bonnder BL. Parent-child interaction therapy with physically abusive parents: Efficacy for reducing future abuse reports. *Journal of Consulting and Clinical Psychology*. 2004; 72:500–510. [PubMed: 15279533]
- Chan YF, Dennis ML, Funk RR. Prevalence and comorbidity of major internalizing and externalizing problems among adolescents and adults presenting to substance abuse treatment. *Journal of Substance Abuse Treatment*. 2008; 34:14–24. [PubMed: 17574804]
- Cohen, J. *Statistical power analysis for the behavioral sciences*. 2nd ed.. Lawrence Erlbaum Associates; Hillsdale, NJ: 1988.
- Cook RL, Comer DM, Wiesenfield HC, Chang CC, Tarter R, Lave JR, Clark DB. Alcohol and drug use and related disorders: An unrecognized health issue among adolescents and young adults attending sexually transmitted disease clinics. *Sexually Transmitted Diseases*. 2006; 33:565–570. [PubMed: 16572042]
- Cooper ML, Wood PK, Orcutt HK, Albino A. Personality and the predisposition to engage in risky or problem behaviors during adolescence. *Journal of Personality and Social Psychology*. 2003; 84:390–410. [PubMed: 12585812]
- Crosby R, Voisin D, Salazar LF, DiClemente RJ, Yarber WL, Caliendo AM. Family influences and biologically confirmed sexually transmitted infections among detained adolescents. *American Journal of Orthopsychiatry*. 2006; 76:389–394. [PubMed: 16981818]
- Crowley TJ, Mikulich SK, MacDonald M, Young SE, Zerbe GO. Substance-dependent, conduct-disordered adolescent males: Severity of diagnosis predicts 2-year outcome. *Drug and Alcohol Dependence*. 1998; 49:225–237. [PubMed: 9571387]
- Cunningham, PB., Randall, J., Donohue, B., Henggeler, SW. *Contingency management supervision manual*. Family Services Research Center, Medical University of South Carolina; 2004.
- Diggle, PJ., Heagerty, PJ., Liang, K., Zeger, SL. *Analysis of longitudinal data*. Second Edition. Oxford Statistical Science Series; 2002.
- Donohue B, Azrin NH, Strada MJ, Silver NC, Teichner G, Murphey H. Psychometric evaluation of self- and collateral timeline follow-back reports of drug and alcohol use in a sample of drug-abusing and conduct-disordered adolescents and their parents. *Psychology of Addictive Behaviors*. 2004; 18:184–189. [PubMed: 15238061]
- Donohue MC, Gamst AC, Edland SD. R package version 1.0-11. 2015; longpower: Sample size calculations for longitudinal data.
- Dowell KA, Ogles BM. The effects of parent participation on child psychotherapy outcome: A meta-analytic review. *Journal of Clinical Child and Adolescent Psychology*. 2010; 39:151–162. [PubMed: 20390807]

- Fixsen, DL., Blase, KA., Duda, MA., Naoom, SF., Van Dyke, M. Implementation of evidence-based treatments for children and adolescents: Research findings and their implications for the future.. In: Weisz, JR., Kazdin, AE., editors. Evidence-based psychotherapies for children and adolescents. 2nd edition. Guilford Press; New York, NY: 2010. p. 259-276.
- Genberg BL, Kulich M, Kawichai S, Modiba P, Chingono A, Kilonzo GP, NIMH Project Accept Study Team. HIV risk behaviors in sub-Saharan Africa and Northern Thailand: Baseline behavioral data from Project Accept. *Journal of Acquired Immune Deficiency Syndromes*. 2008; 49:309–319. [PubMed: 18845954]
- Godley SH, Garner BR, Passetti LL, Funk RR, Dennis ML, Godley MD. Adolescent outpatient treatment and continuing care: Main findings from a randomized clinical trial. *Drug and Alcohol Dependence*. 2010; 110:44–54. [PubMed: 20219293]
- Godley, SH., Godley, MD., Dennis, ML. The assertive aftercare protocol for adolescent substance abusers.. In: Wagner, EF., Waldron, HB., editors. Innovations in adolescent substance abuse interventions. Pergamon; New York, NY: 2001. p. 313-331.
- Hadley W, Brown LK, Lescano CM, Kell H, Spalding K, Diclemante R, Project STYLE Study Team. Parent-adolescent sexual communication: associations of condom use with condom discussions. *AIDS and behavior*. 2009; 13:997–1004. [PubMed: 18841462]
- Hawley KM, Weisz JR. Youth versus parent working alliance in usual clinical care: Distinctive associations with retention, satisfaction, and treatment outcomes. *Journal of Clinical Child and Adolescent Psychology*. 2005; 34(1):117–128. [PubMed: 15677286]
- Henggeler SW, Chapman JE, Rowland MD, Halliday-Boykins CA, Randall J, Shackelford J, Schoenwald SK. Statewide adoption and initial implementation of contingency management for substance abusing adolescents. *Journal of Consulting and Clinical Psychology*. 2008; 76:556–567. [PubMed: 18665685]
- Henggeler SW, Clingempeel WG, Brondino MJ, Pickrel SG. Four-year follow-up of multisystemic therapy with substance abusing and dependent juvenile offenders. *Journal of the American Academy of Child & Adolescent Psychiatry*. 2002; 41:868–874. [PubMed: 12108813]
- Henggeler, SW., Cunningham, PB., Rowland, MD., Schoenwald, SK., Swenson, CC., Sheidow, AJ., Randall, J. Contingency management for adolescent substance abuse: A practitioner's guide. Guilford Press; New York, NY: 2012.
- Henggeler SW, Halliday-Boykins CA, Cunningham PB, Randall J, Shapiro SB, Chapman JE. Juvenile drug court: Enhancing outcomes by integrating evidence-based treatments. *Journal of Consulting & Clinical Psychology*. 2006; 34:658–670.
- Henggeler SW, Letourneau EJ, Chapman JE, Borduin CM, Schewe PA, McCart MR. Mediators of change for multisystemic therapy with juvenile sexual offenders. *Journal of Consulting and Clinical Psychology*. 2009; 77:451–462. [PubMed: 19485587]
- Henggeler SW, McCart MR, Cunningham PB, Chapman JE. Enhancing the effectiveness of juvenile drug courts by integrating evidence-based practices. *Journal of Consulting and Clinical Psychology*. 2012; 80:264–275. [PubMed: 22309470]
- Houck CD, Lescano CM, Brown LK, Tolou-Shams M, Thompson J, DiClemente R, Project-SHIELD Study Group. Islands of risk: Subgroups of adolescents at risk for HIV. *Journal of Pediatric Psychology*. 2006; 31:619–629. [PubMed: 16120764]
- Huey SJ Jr. Henggeler SW, Brondino MJ, Pickrel SG. Mechanisms of change in Multisystemic Therapy: Reducing delinquent behavior through therapist adherence, and improved family and peer functioning. *Journal of Consulting and Clinical Psychology*. 2000; 68:451–467. [PubMed: 10883562]
- Jemmott JB III, Jemmott LS, Fong GT. Reductions in HIV risk-associated sexual behaviors among Black male adolescents: Effects of an AIDS prevention intervention. *American Journal of Public Health*. 1992; 82:372–377. [PubMed: 1536352]
- Jemmott JB, Jemmott LS, Fong GT, McCaffree K. Reducing HIV-risk associated with sexual behavior among African American adolescents: Testing the generality of intervention effects. *American Journal of Community Psychology Special Issues: Adolescent Risk Behavior*. 1999; 27:161–187.
- Jemmott JB III, Jemmott LS, Spears H, Hewitt N, Cruz-Collins M. Self-efficacy, hedonistic expectancies, and condom-use intentions among inner-city Black adolescent women: A social

cognitive approach to AIDS risk behavior. *Journal of Adolescent Health*. 1992; 13:512–519. [PubMed: 1390819]

Kaminer, Y., Bukstein, OG. Adolescent substance abuse: Psychiatric comorbidity and high-risk behaviors. Taylor & Francis Group; New York, NY: 2008.

Khan MR, Berger AT, Wells BE, Cleland CM. Longitudinal associations between adolescent alcohol use and adulthood sexual risk behavior and sexually transmitted infection in the United States: Assessment of differences by race. *American Journal of Public Health*. 2012; 102:867–876. [PubMed: 22493999]

Kotchick, BA., Armistead, L., Forehand, RL. Sexual risk behavior.. In: Wolfe, DA., Mash, EJ., editors. Behavioral and emotional disorders in adolescents: Nature, assessment, and treatment. Guilford Press; New York, NY: 2006. p. 563-588.

Letourneau EJ, Ellis DA, Naar-King S, Chapman JE, Cunningham PB, Fowler S. Multisystemic therapy for poorly adherent youth with HIV: Results from a pilot randomized controlled trial. *AIDS Care*. 2013; 25:507–514. [PubMed: 22909294]

Letourneau EJ, McCart MR, Asuzu K, Mauro PM, Sheidow AJ. Caregiver involvement in sexual risk reduction with substance using juvenile delinquents: Overview and preliminary outcomes of a randomized trial. *Adolescent Psychiatry*. 2013; 3:342–352. [PubMed: 26413463]

Liang KY, Zeger SL. Longitudinal data analysis using generalized linear models. *Biometrika*. 1986; 73:13–22.

Lightfoot M, Rotheram-Borus MJ, Tevendale H. An HIV-preventive intervention for youth living with HIV. *Behavior Modification*. 2007; 31:345–363. [PubMed: 17438347]

Liu G, Liang KY. Sample size calculations for studies with correlated observations. *Biometrics*. 1997; 53(3):937–47. [PubMed: 9290224]

MacKinnon DP, Lockwood CM. Advances in statistical methods for substance abuse prevention research. *Prevention Science*. 2003; 4:155–171. [PubMed: 12940467]

MacPhail C, Pettifor A, Moyo W, Rees H. Factors associated with HIV testing among sexually active South African youth aged 15-24 years. *AIDS Care*. 2008; 21:456–467.

Malow RM, Dévieux JG, Rosenberg R, Samuels DM, Jean-Gilles MM. Alcohol use severity and HIV sexual risk among juvenile offenders. *Substance Use & Misuse*. 2006; 41:1769–1788. [PubMed: 17118815]

Marvel F, Rowe CL, Colon-Perez L, DiClemente RJ, Liddle HA. Multidimensional family therapy HIV/STD risk-reduction intervention: an integrative family-based model for drug-involved juvenile offenders. *Family Process*. 2009; 48:69–84. [PubMed: 19378646]

McCart MR, Henggeler SW, Chapman JE, Cunningham PB. System-level effects of integrating a promising treatment into juvenile drug courts. *Journal of Substance Abuse Treatment*. 2012; 43:231–243. [PubMed: 22154039]

McCart MR, Sheidow AJ. Evidence-based psychosocial treatments for adolescents with disruptive behavior. *Journal of Clinical Child and Adolescent Psychology*. in press.

McCart MR, Sheidow AJ, Letourneau EJ. Risk Reduction Therapy for Adolescents (RRTA): Targeting substance use and HIV/STI-risk behaviors. *Cognitive and Behavioral Practice*. 2014; 21:161–175. [PubMed: 25419101]

McCarty D, Fuller BE, Arfken C, Miller M, Nunes EV, Edmundson E, Wendt WW. Direct care workers in the National Drug Abuse Treatment Clinical Trials Network: Characteristics, opinions, and beliefs. *Psychiatric Services*. 2007; 58:181–190. [PubMed: 17287373]

Miller, WR. Form 90: Structured Assessment for drinking related behavior. NIAAA; Washington, DC: 1991.

National Association of Drug Court Professionals, Drug Court Standards Committee. Defining drug courts: The key components. Drug Courts Program Office, Office of Justice Programs, U.S. Department of Justice; Washington, DC: 1997. <https://www.ncjrs.gov/pdffiles1/bja/205621.pdf>

NIMH Multisite HIV Prevention Trial. Conceptual basis and procedures for the intervention in a multisite HIV prevention trial. *AIDS*. 1997; 11:S29–S35. [PubMed: 9475709]

Office of National Drug Control Policy. The economic costs of drug abuse in the United States, 1992-2002. Executive Office of the President; Washington, DC: 2004. (Publication No. 207303)

- Pequegnat, W., Szapocznik, J. The role of families in preventing and adapting to HIV/AIDS: Issues and answers.. In: Pequegnat, W., Szapocznik, J., editors. Working with families in the ERA of HIV/AIDS. Sage; Thousand Oaks, CA: 2000. p. 3-26.
- R Core Team. R: A language and environment for statistical computing. R Foundation for Statistical Computing; Vienna, Austria: 2013. Retrieved from <http://www.R-project.org/>
- Ringel JS, Ellickson PI, Collins RL. High school drug use predicts job-related outcomes at age 29. *Addictive Behaviors*. 2007; 32:576–589. [PubMed: 16822622]
- Santa Ana E, Martino S, Ball SA, Nich C, Frankforter T, Carroll KM. What is usual about ‘treatment as usual’: Audiotaped ratings of standard treatment in the Clinical Trials Network. *Journal of Substance Abuse Treatment*. 2008; 35:369–379. [PubMed: 18337053]
- Stanton MD, Shadish WR. Outcome, attrition, and family-couples treatment for drug abuse: A meta-analysis and review of the controlled, comparative studies. *Psychological Bulletin*. 1997; 122(2): 170–191. [PubMed: 9283299]
- Staras SA, Tobler AL, Maldonado-Molina MM, Cook RL. Riskier sexual partners contribute to the increased rate of sexually transmitted diseases among youth with substance use disorders. *Sexually Transmitted Diseases*. 2011; 38:413–418. [PubMed: 21139514]
- Strachman A, Impett EA, Henson JM, Pentz MA. Early adolescent alcohol use and sexual experience by emerging adulthood: A 10-year longitudinal investigation. *Journal of Adolescent Health*. 2009; 45:478–482. [PubMed: 19837354]
- Substance Abuse and Mental Health Services Administration. Results from the 2012 National Survey on Drug Use and Health. U.S. Department of Health and Human Services, Office of Applied Statistics; 2013. Retrieved from <http://archive.samhsa.gov/data/NSDUH/2012SummNatFindDetTables/NationalFindings/NSDUHresults2012.pdf>
- Swenson RR, Rizzo CJ, Romer D. HIV knowledge and its contribution to sexual health behaviors of low-income African American adolescents. *Journal of the National Medical Association*. 2010; 102:1173–1182. [PubMed: 21287898]
- Tanner-Smith EE, Wilson SJ, Lipsey MW. The comparative effectiveness of outpatient treatment for adolescent substance abuse: A meta-analysis. *Journal of Substance Abuse Treatment*. 2012; 44:145–158. [PubMed: 22763198]
- Tapert SF, Aarons GA, Sedlar G, Brown SA. Adolescent substance use and sexual risk-taking behavior. *Journal of Adolescent Health*. 2001; 28:181–189. [PubMed: 11226840]
- Tolou-Shams M, Houck C, Conrad SM, Tarantino N, Stein LA, Brown LK. HIV prevention for juvenile drug court offenders: a randomized controlled trial focusing on affect management. *Journal of Correctional Health Care*. 2011; 17:226–232. [PubMed: 21474529]
- Tuerk EH, McCart MR, Henggeler SW. Collaboration in family therapy. *Journal of Clinical Psychology*. 2012; 68:168–178. [PubMed: 23616297]
- Waldron HB, Slesnick N, Brody JL, Turner CW, Peterson TR. Treatment outcomes for adolescent substance abuse at four- and seven-month assessments. *Journal of Consulting and Clinical Psychology*. 2001; 69:802–812. [PubMed: 11680557]
- Wills TA, Walker C, Mendoza D, Ainette MG. Behavioral and emotional self-control: Relations to substance use in samples of middle and high school students. *Psychology of Addictive Behaviors*. 2006; 20:265–278. [PubMed: 16938064]
- Wu J, Witkiewitz K, McMahon RJ, Dodge KA, Conduct Problems Prevention Research Group. A parallel process growth mixture model of conduct problems and substance use with risky sexual behavior. *Alcohol and Drug Dependence*. 2010; 111:207–214.

Highlights

- Risk Reduction Therapy for Adolescents targets substance use and sexual risk.
- Although RRTA was associated with some improvements in substance use, sexual risk, and HIV-related outcomes, results of this initial trial were not robust
- This study raises questions about testing new interventions in juvenile drug court settings, the need for more in-depth parent training, and whether CM is an effective model for addressing youth sexual risk behaviors.

Figure 1.
CONSORT 2010 Flow Diagram.

Table 1

Descriptive data and results from generalized estimating equations examining within- and between-group differences for Risk Reduction Therapy for Adolescents and usual treatment services on key outcomes

Outcome	Baseline		6 Month		12 Month		Baseline		6 Month vs. Baseline		12 Month vs. Baseline	
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	RRTA vs. US	RRTA	OR ^a (95% CI)	rOR ^b (95% CI)	OR ^a (95% CI)	rOR ^b (95% CI)
<i>Self-reported substance use-any</i>												
RRTA	43 (95.56)	7 (16.67)	5 (13.89)						1.95 (0.36, 10.65)	0.01*** (0.00, 0.04)	0.01*** (0.00, 0.04)	0.05*** (0.02, 0.15)
US	55 (91.67)	5 (10.42)	16 (37.21)						0.89 (0.11, 7.30)	0.89 (0.11, 7.30)	0.01*** (0.00, 0.04)	0.14* (0.02, 0.95)
<i>UDS-any</i>												
RRTA	17 (38.64)	4 (10.26)	10 (29.41)						1.84 (0.79, 4.30)	0.18** (0.06, 0.59)	0.50 (0.18, 1.42)	0.36 (0.08, 1.72)
US	15 (25.42)	7 (15.22)	14 (34.15)						0.50 (0.18, 1.42)	0.36 (0.08, 1.72)	0.65 (0.27, 1.55)	1.49 (0.69, 3.20)
<i>Any sex</i>												
RRTA	17 (37.78)	17 (40.48)	17 (47.22)						1.21 (0.54, 2.73)	1.11 (0.62, 2.00)	1.03 (0.56, 1.91)	1.08 (0.46, 2.51)
US	20 (33.33)	17 (35.42)	18 (41.86)						0.38~ (0.12, 1.24)	0.38~ (0.12, 1.24)	1.32 (0.72, 2.42)	1.38 (0.68, 2.80)
<i>Condomless sex</i>												
RRTA	5 (11.36)	2 (4.76)	4 (11.11)						0.96 (0.28, 3.28)	0.38~ (0.12, 1.24)	1.33 (0.45, 3.91)	0.28~ (0.06, 1.41)
US	7 (11.67)	7 (14.58)	7 (16.28)						1.13 (0.83, 1.54)	1.12~ (0.96, 1.31)	1.29~ (0.96, 1.73)	0.87 (0.62, 1.22)
<i>Sex acts^{ab}</i>												
RRTA	2.11 ± 0.60	3.24 ± 1.26	3.55 ± 1.01						1.13 (0.83, 1.54)	1.12~ (0.96, 1.31)	1.29~ (0.96, 1.73)	0.87 (0.62, 1.22)
US	1.50 ± 0.48	3.42 ± 1.67	3.72 ± 1.36						1.13 (0.83, 1.54)	1.12~ (0.96, 1.31)	1.32* (1.02, 1.72)	0.85 (0.62, 1.18)
<i>HIV test</i>												
RRTA	7 (15.56)	9 (21.43)	9 (25.00)						0.92 (0.32, 2.66)	1.49 (0.49, 4.55)	0.72 (0.24, 2.12)	2.07 (0.44, 9.80)
US	10 (16.67)	6 (12.50)	6 (13.95)						0.92 (0.32, 2.66)	1.49 (0.49, 4.55)	1.80 (0.64, 5.09)	0.84 (0.30, 2.38)
<i>HIV talk</i>												
RRTA	13 (28.89)	27 (64.29)	17 (47.22)						0.75 (0.33, 1.74)	4.44*** (2.02, 9.77)	3.11** (1.51, 6.41)	1.43 (0.49, 4.17)
US	21 (35.00)	30 (62.50)	12 (27.91)						0.75 (0.33, 1.74)	4.44*** (2.02, 9.77)	2.32~ (0.97, 5.54)	0.76 (0.35, 1.65)

Notes: RRTA=Risk Reduction Therapy for Adolescents; US= usual services; F90= Timeline follow-back 90 days; UDS= Urine drug screen; OR = Odds ratio; rOR= Relative odds ratio

^aEstimates for sex acts are incidence rate ratios for group estimates at each time point.

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Estimates for sex acts are relative incidence rate ratios measuring the interaction of group and time.

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$p < 0.15$

$p < 0.05$

$p < 0.01$

$p < 0.001$