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Six month outcomes of a peer-enhanced community reinforcement approach for emerging adults with substance misuse: A Preliminary Study

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Abstract

Little substance use disorder (SUD) treatment research with emerging adults ages 18–25 has been done in community settings, and it is well-known that peers influence emerging adult substance use. The purpose of this study was to develop and test the feasibility of a peer-enhanced behavioral treatment for emerging adults with substance use problems. Emerging adults ($n = 35$) received a peer-enhanced version of the Community Reinforcement Approach (Peer-CRA), in which their peers ($n = 34$) were trained to provide alcohol-specific social support. Both identified clients and peers were interviewed at treatment intake, and again three and six months later. Six month outcomes included days of abstinence adjusted for controlled environment days, social costs due to substance use, and binge drinking days in the past 90 days. Treatments were delivered with high fidelity, and a high proportion of participants were retained in treatment and follow-up assessments. Growth curve analyses revealed that emerging adults and their peers significantly increased their days of abstinence and reduced their binge drinking over time. Larger randomized trials should a) test whether peer-enhanced treatments are efficacious relative to treatment as usual, b) investigate whether secondary benefits exist for non-treatment seeking peers supporting another's treatment, and c) examine whether proposed mechanisms of change (i.e., peer support and peer reductions in substance use) account for any differences in outcomes.

Keywords

alcohol treatment; emerging adults; community reinforcement approach; alcohol use disorders

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Introduction 1.0

Emerging adulthood (EA) is a unique developmental stage spanning ages 18–29 and is the life stage during which the highest prevalence of alcohol and substance use occurs (Arnett, 2000; SAMHSA, 2014). Among individuals ages 15–34, 40% of all US deaths in 2005 were somewhat attributable to alcohol use, higher than for any other age group (Shield et al., 2013). Alcohol and other substance use in EA is also associated the highest rates of daily use, binge drinking, and drunkenness (Johnston, O'Malley, Bachman, & Schulenberg, 2005), academic problems, fighting and risky sexual behavior (Wechsler & Nelson, 2001), and mortality (Fingerhut & Anderson, 2008). In addition to these negative consequences, there are differences between emerging adults (EAs) and both adolescents and adults on treatment motivation and treatment outcomes (Satre, Mertens, Areán, & Weisner, 2003; D. C. Smith, Cleeland, & Dennis, 2010; D. C. Smith, Godley, Godley, & Dennis, 2011). Thus, more research is needed to test innovative treatments for EAs.

Few treatment studies involve EAs presenting for treatment in community, not-for-profit settings (Mason & Luckey, 2003), with most work on EA substance use disorder (SUD) treatment done on four-year university campuses. Community-based non-profit treatment centers treat clientele who are less educated and have more risk factors that are associated with poorer alcohol use treatment outcomes (Worden & McCrady, 2013). EAs obtaining little postsecondary education have higher substance use (Oesterle, Hawkins, & Hill, 2011; Thompson, Stockwell, Leadbeater, & Homel, 2014) and college attendance is associated with both treatment retention and completion (Sahker, Acion, & Arndt, 2014). As child development experts agree on the need for more research with EAs off college campuses (IOM & NRC, 2014), treatment research in community not-for-profit settings is important.

As interpersonal relationships shift toward peers in EA (Beyers & Seiffge-Krenke, 2007; Hartup & Stevens, 1997), SUD treatments involving close peers may be developmentally appropriate for EAs. This study investigated preliminary outcomes of a peer-enhanced treatment for EAs with SUD.

1.1. Peer Relationships and Substance Use

Close peer relationships are voluntary, non-romantic relationships based on mutual-liking, intimacy and interaction (K. H. Rubin, Bukowski, & Laursen, 2011). Starting in early adolescence, teens spend most of their free time interacting with peers (Csikszentmihalyi & Larson, 1987) and intimacy within close peer relationships steadily increases (Berndt, 2002). Peer relationships become more intimate in EA, and, in challenging times, emerging adults look to their peers for guidance and support (Collins & van Dulmen, 2006). Among persons seeking treatment for substance-related problems, EAs perceive their close peers as being more important than do older adults, regardless of whether or not peers also consume alcohol (Mohr, Averno, Kenny, & Del Boca, 2001). As EA is also a time during which young people reduce parental involvement and simultaneously postpone their own familial milestones (i.e., marriage and having children) (Arnett, 2004), close peers might be ideal supportive persons, or *concerned supportive others* (CSOs; (J. E. Smith & Meyers, 2004) in SUD treatment programs for EAs.

1.2. Including Peers in Emerging Adults' SUD Treatment

Involving CSOs in older adults' SUD treatments positively impacts outcomes (Hunter-Reel, Witkiewitz, & Zweben, 2012). Many mention the potential benefits of including peers as CSOs in EAs' interventions (Andrews, Tildesley, Hops, & Li, 2002; Goodman, Peterson-Badali, & Henderson, 2011; McCrady, 2004), but few studies exist. Only three studies incorporated EAs' peers into their SUD treatments. Students going on Spring Break trips randomized to treatments with and without peer involvement did not benefit from peer involvement (C. M. Lee et al., 2014). However, only 35% of students went on a trip, participated, had their peer participate, and had their peer accompany them on their Spring Break trip. Another study targeted college students' risky drinking on 21st birthday celebrations. Both individual and peer-enhanced treatment conditions were tested, with the peer condition delivering electronic feedback to participants' peers. These peers received normative feedback and tips on how to keep participants safe during celebrations (Neighbors et al., 2012). Participants in the peer condition had fewer drinking consequences, but not reduced drinking during birthday celebrations. In these two studies, no data on peer drinking outcomes were reported. Finally, one study ($n = 28$) targeted college students who violated university alcohol policy. Participants randomly assigned to peer-based motivational interviewing demonstrated larger reductions in alcohol consumption versus participants receiving individual motivational interviewing. Peers also demonstrated a reduction in heavy drinking days at follow-up (Tevyaw, Borsari, Colby, & Monti, 2007).

Although two of three studies support integration of peers in EAs' alcohol treatments, the literature has limitations. First, studies were located on college campuses, so it is unclear if findings would replicate with EAs treated in off campus community agencies. As noted above, publicly funded treatment agencies typically serve individuals with higher psychiatric comorbidity, lower socioeconomic status, higher unemployment and lower college attendance, as well as other risk factors (e.g., residential instability) that may moderate treatment effectiveness (Worden & McCrady, 2013). Second, although Tevyaw et al (2007) reported significant post-treatment reductions in peer drinking, this study used a short follow up period (i.e., one month). Further, two studies focused only on event-specific drinking outcomes (i.e., 21st birthday drinking; Spring Break), so studies using longer follow up periods are needed. Finally, peer outcomes have only been reported in one small study (Tevyaw et al., 2007).

1.2.1. Novel content in the Peer-Community Reinforcement Approach—In addition to addressing the methodological limitations above, this study involves novel procedures where peers act as concerned significant others (CSOs) to reinforce pro-abstinence behaviors by the identified client (Beattie & Longabaugh, 1997; Litt, Kadden, Kabela-Cormier, & Petry, 2009; Mohr et al., 2001). This treatment is adapted from the Community Reinforcement Approach with Family Training (CRAFT; (Meyers, Miller, Hill, & Tonigan, 1998; Meyers, Miller, Smith, & Tonigan, 2002; J. E. Smith, Meyers, & Miller, 2001). CRAFT teaches CSOs to set up prosocial activities that are relevant to the identified client and will compete with drinking or other drug use. CRAFT also instructs CSOs to not engage in heated discussions with intoxicated identified clients, but rather to allow the individual with the SUD to experience natural consequences. CRAFT is efficacious at

engaging treatment-resistant adults and adolescents into SUD treatments (Meyers, Smith, & Miller, 1998; Meyers et al., 2002; Waldron, Kern-Jones, Turner, Peterson, & Ozechowski, 2007). No attempts have been made to adapt CRAFT's procedures for use with EAs' peers, yet prior research found that peers are amenable to inclusion in a treatment like CRAFT (D. C. Smith, Cleeland, Middleton, & Godley, 2013).

1.3 Summary and Hypotheses

Emerging adults receiving treatment from community not-for-profit centers are rarely studied and integrating EAs' peers into their treatments may be an efficacious treatment approach. This preliminary outcome study tests whether EAs and peers participating in the Peer-Community Reinforcement Approach (Peer-CRA) will reduce their substance use at three and six months. Various indices of treatment feasibility and acceptability are also reported to assist with planning a larger trial.

2.0 Material and Methods

2.1 Participants and Procedures

2.1.1 Eligibility Criteria and Recruitment—All procedures were approved by the institutional review board (IRB) at the lead author's university prior to the study. Participants were recruited from consecutively screened individuals at a publicly-funded, not-for profit SUD treatment center ($n=20$), as well as through advertising on city buses ($n=15$). EA clients were eligible for this study if they were: 1) between the ages of 18 and 25, 2) amenable to inviting a peer to participate in treatment, c) above 4 on the Alcohol Use Disorders Identification Test or reported using alcohol or drugs on a weekly basis in the past 90 days (i.e., 13+ days). Participants were excluded if they reported more than 45 days of illicit drug use (other than marijuana) or sought more intensive treatment than the study provided. Ultimately, 220 potential clients were screened (See Figure 1). Of those screened, 131 were excluded due to: their substance use being too low ($n=56$) or too high ($n = 10$), missing initial appointments or having no contact after initial assessment ($n = 34$), being outside of the age range ($n = 17$), having no peer available to participate ($n = 6$), or needing a higher level of care (e.g. inpatient; $n = 8$). Out of 89 potentially eligible participants (i.e., 220 screened-131 deemed ineligible), 35 (39.3%) were successfully recruited into the study. There were no significant differences ($t = .03$, $df = 66$, ns) on AUDIT scores between those who did ($M=13.21$, $SD =10.0$) and did not ($M=13.28$, $SD =9.4$) participate in the study.

Peers were eligible for this study if they: 1) were roughly between the ages of 18–25 years of age (i.e., we allowed slightly older peers but not younger than 18), 2) had regular contact with the client but were never a romantic partner, and 3) were the same-gender as the client (unless identifying as LGBTQ). We recruited peers ($n = 34$) for practically all clients (97%). The sole peer that did not participate (age 17) came of age two weeks after the date of initial recruitment, and failed to respond after reaching the age of consent. The client in that dyad started treatment attended standard clients.

Clients ($n = 35$) and their peers ($n = 34$) were assessed at baseline with a battery of measures described below. Each dyad then scheduled their first treatment appointments. Participants were then reassessed at three and six months. We used intensive follow-up tracking

procedures (Scott, 2004) to contact all participants regardless of treatment participation, resulting in 76.9% retention at three months ($n = 53$) and 78.2% at 6 months ($n = 54$). Follow-up interviews were conducted by individuals with no clinical involvement. Figure 1 displays participant flow through the study.

2.2 Intervention Description and Therapist Training

2.2.1 Intervention Description—The Peer-Community Reinforcement Approach (Peer-CRA) is an adaptation of the Community Reinforcement Approach (CRA; Meyers et al., 2002) that adds peer sessions and Motivational Interviewing (Miller & Rollnick, 2012). The standard CRA model involves the flexible provision of cognitive behavioral sessions based on client needs, including: functional analysis of substance use behaviors, functional analysis of prosocial behaviors, happiness scaling and goal setting, sobriety sampling, urine testing, communication skills training, drug refusal training, job skills training, post-relapse behavioral chain analysis, and anger management skills. Sessions are delivered individually, and weekly sessions were provided to clients for 12 weeks. Numerous studies support the use of CRA with adults and adolescents (Miller et al., 1995; Roozen et al., 2004).

Procedures unique to Peer-CRA in chronological order, included: 1) (week one) a conjoint orientation session with the peer and client together (20–30 minutes) followed by separate brief individual sessions (20–30 minutes) of Motivational Interviewing for clients and peers; 2) (week 2) a one-hour peer training session where peers observed and role played behaviors that would support the clients' efforts at remaining abstinent, 3) (week 3) a one-hour conjoint session where therapists did functional analysis of one prosocial behavior that the peer and client would like to do together in place of substance use, and 4) an optional one-hour session with the peer on how to reengage the client in treatment were they to drop out prematurely. Peers and clients were given a \$25 voucher for completing a non-alcohol and drug related activity if they attended all peer sessions described above. (Note: for the one dyad without a peer, the client attended the MI session and orientation individually, and attended standard CRA sessions as described above.)

2.2.2 Therapist Training and Fidelity Monitoring—A treatment manual describing Peer-CRA's novel procedures guided the training of two Master's level, female therapists (one White and one Latino). Both had no prior substance use treatment experience. The lead author, a member of the Motivational Interviewing Network of Trainers (MINT), provided training on and monitoring of Motivational Interviewing sessions. This involved didactic training, audio recording role-played sessions of MI for review by the lead author, and weekly supervision with feedback from coded sessions. In sum, 17 sessions were coded (37.7%) with the reliable and valid observational coding measure called the Motivational Interviewing Treatment Integrity Scales (MITI version 3.1.1; Moyers, Martin, Manuel, Miller, & Ernst, 2010). Performance indices on the MITI included the ratio of reflections to questions (2:1 is recommended), the ratio of MI Adherent behaviors to total MI Adherent and Non-adherent behaviors (100% adherent is recommended), a global spirit rating that averaged mean ratings on five-point Likert scales of Autonomy Support, Collaboration, and Evocation (4.0 or higher is recommended), the percentage of open questions out of the sum of all open and closed questions (70% open is recommended), and the percentage of

complex reflections out of all reflections (1:1 is recommended). Additionally, both therapists (and the lead author) were certified to provide CRA by attending an initial didactic training with the developers, and then submitted tapes to expert reviewers until achieving certification. These procedures were used in widespread dissemination efforts of A-CRA (Godley, Garner, Smith, Meyers, & Godley, 2011). Post-certification tape reviews were completed by the lead author and reviewed in weekly supervision.

2.3 Measures

2.3.1 Global Appraisal of Individual Needs (GAIN)—The GAIN is a reliable and valid semi-structured assessment tool (Buchan, L. Dennis, Tims, & Diamond, 2002; M. L. Dennis, Funk, Godley, Godley, & Waldron, 2004) that has a validated training and supervision process (Titus et al., 2012) and has been normed for adolescents, emerging adults, and adults. Throughout the assessment, participants are asked a battery of questions that cover eight main areas, including: background, substance use, mental health, physical health, risk behaviors, legal problems, environment, and vocational. All substance use and mental health measures and items are consistent with the DSM-IV (American Psychiatric Association, 2000) criteria for SUDs as well as many common mental health diagnoses. Across the main scales all have alpha's over 0.9 and subscales have alphas over 0.7 (M. Dennis et al., 2002; M. L. Dennis et al., 2003). The main outcome measures we used, Adjusted days of Abstinence (ADA) and Days of binge Drinking (described below), are both derived from the GAIN's reliable and valid Substance Frequency Scale, which uses time-line follow back procedures (i.e., calendars and verbal anchors) to increase reliability of self-report. Participants completed the GAIN-I (initial assessment version) at baseline and the GAIN M90 (follow up version) at three and six months.

2.3.2 Adjusted Days Abstinent (ADA)—All participants were administered items that assess past 90 day abstinence (i.e., no use) for many substances (e.g. alcohol, marijuana). The adjusted days of abstinence (ADA) variable accounts for the days of no use and subtracts the number of days a participant has spent in a controlled environment (e.g. inpatient, jail). Sample questions include: "In the past 90 days how many days did you go *without* using any alcohol, marijuana, or other drugs?", and "In the past 90 days how many days have you been in jail/prison?" Values range from 0 to 90 with higher values indicating more days of abstinence in the previous three months.

2.3.3 Days of Binge Drinking (DBD)—One item that is part of the broader Substance Frequency Scale asked participants on how many days in the past 90 they got drunk or drank four (females) or five (males) or more drinks. Values range from 0 to 90, with higher values indicating more days of binge drinking and values of 13 or higher indicating weekly binge drinking.

2.3.4 Quarterly Cost to Society (QCS)—The QCS is a comprehensive estimate of the economic cost each participant incurs through utilization of various health, substance use treatment, and criminal justice services. The Drug Abuse Treatment Cost Analysis Program (DATCAP) was used to calculate the cost per individual (French, Salomé, Sindelar, & Thomas McLellan, 2002). Costs are updated yearly, and estimates for this study refer to

fiscal year 2013. Example questions include “In the past 90 days how many... days have you had to go to the emergency room for a health problem?” “...days were you in an intensive outpatient or day program for your drug or alcohol use?” DATCAP is widely used and was adapted for inclusion in the GAIN (French et al., 2003).

2.3.5. A-CRA Exposure Scale—The A-CRA Exposure Scale (AES) is a reliable clinician self-report measure of what CRA procedures occurred in each treatment session (Garner et al., 2009). This study used the 22-item version of AES (range = 0 – 22), which is a count of all core and optional treatment procedures listed in the A-CRA manual. Garner et al (2009) found that clinician self-reports were consistent with supervisor ratings, and AES scores mediated the association between mere treatment attendance and outcomes. A separate study showed higher AES scores predict lower substance use (Hunter, Godley, Hesson-McInnis, & Roozen, 2014).

2.4 Data Analysis

2.4.1 Analytic Method—With the exception of descriptive analyses, which were done in SAS 9.3 (SAS Institute Inc., 2011), data were analyzed using Hierarchical Linear Modeling in the statistical program HLM7 (Raudenbush, Bryk, Cheong, Congdon, & du Toit, 2011). We modeled outcomes (ADA, DBD and QCS) over time as linear growth curves, which treat observations over time as Level 1 effects that are nested within individuals (Level 2). First, we included Time as a Level 1 predictor of outcomes with both clients and peers in the same model. We tested for between-person variation on the random slope of Time (i.e., participants’ rates of change). If significant variation exists, HLM7 permits investigation of cross-level interactions, which examine whether person-level (Level 2) variables explain variation in outcomes over time. Second, we included Participant Type as a Level 2 (between-person) predictor, which identifies whether the participant was a peer or client (peer = 0, client = 1). Additionally, to examine if rates of change over time were similar or different for clients and peers, we tested a cross-level interaction of Time $\times$ Participant Type, which examines potential differences in outcome slopes over time as a function of participant type. (Note: The client without a participating peer was included in analyses. Post enrollment deletion of participants is controversial, so we followed best practices of analyzing findings with and without this participant (Fergusson, Aaron, Guyatt, & Hébert, 2002). Analyses were unchanged, so we present analyses that include this participant.) Lastly, quadratic effects of time were added to examine the appropriateness of a curvilinear trend to the data. Non-significant predictors were removed in final models to maintain statistical power. Significant cross-level interactions were analyzed according to the recommendations of (Aiken, West, & Reno, 1991), and simple slopes tests followed the procedures of Preacher, Curran, & Bauer (2006).

2.4.2 Missing Data—Missing data were handled using the built-in full information maximum likelihood (FIML) function in HLM7. Many researchers have established the detrimental effects of handling missing data by listwise deletion, mean substitution or regression substitution (L. H. Rubin, Witkiewitz, Andre, & Reilly, 2007; Schlomer, Bauman, & Card, 2010). These nonstochastic imputation methods for handling missing data produce very biased regression coefficients and standard errors compared to more nuanced

stochastic techniques (Johnson & Young, 2011; Schlomer et al., 2010). Multiple studies, however, have found that FIML techniques used here produce unbiased results for small sample sizes (e.g. $N = 100$) and produce similar results as Multiple Imputation (MI) and expectation maximization (EM) methods (Johnson & Young, 2011; Olinsky, Chen, & Harlow, 2003).

3.0 Results

3.1 Participant Characteristics

On average, peers reported knowing the client for 7.9 years ($SD = 7.5$). Participants were mostly male (60.9%), African-American (53.6%), and, on average, were 21.8 years old. Paternal education ($M = 8.3$ years, $SD = 6.61$) and EA college attendance (i.e., 26.1% enrolled) were lower and EA unemployment higher (44.9%) in this sample versus general samples upon which emerging adulthood theory is based (Arnett, 2000). Over half of clients (60%) met either DSM IV Alcohol Abuse (22.9%) or Alcohol Dependence (37.1%) criteria. Peers were less likely to meet criteria for these diagnoses (39.3%), but exhibited slightly higher rates of Cannabis Dependence (34.5%) when compared to clients (30.3%, *ns*). Clients (80%) were more likely to have one or more dependence diagnoses compared to peers (44.1%). See table 1 for more detail.

Surprisingly, clients and peers recruited from bus advertisements had significantly fewer adjusted days of abstinence at baseline (Mean = 19.0, $SD = 27.8$) versus clinic-recruited participants (Mean = 43.4, $SD = 32.1$). A significantly higher percent of bus ad-recruited participants (86.2%) reported ethnic minority backgrounds versus those recruited in the clinic (62.5%; $p < .05$). There were no differences between these groups in terms of treatment motivation or problem recognition, but clinic-recruited participants had significantly higher criminal justice involvement ($p < .05$).

3.2 Peer-CRA Treatment Integrity

3.2.1 MI Sessions with Peers and Clients—The average MI global spirit ratings across all supervisor coded ($n = 17$) tapes was 3.97 ($SD = .60$). Further, 65.8% of all questions asked were open, 45.9% of all reflections used were complex reflections, and 97.7% of the combined MI Adherent (i.e., affirmations, asking permission to give advice, supportive statements, emphasizing client control) and Non-adherent codes (i.e., confrontation, advising, directing) were deemed MI adherent. The only metric that was much lower than recommended (i.e., 2:1 ratio as benchmark) was the average reflection to question ratio, which was 1.03 ($SD = .58$).

3.2.2. Treatment attendance and CRA Fidelity—65.7% ($n = 23$) of peers attended at least one session and 29% ($n = 10$) completed all three sessions, averaging 1.51 ($SD = 1.68$) sessions. The average number of treatment minutes for peers was 41.7 ($SD = 50.7$). For clients, the average AES score was 4.94 ($SD = 4.52$). However, if counts of the novel Peer CRA procedures were added to the AES scale, scores rose (Mean = 7.31, $SD = 5.84$). This is slightly lower than the typical number of procedures done across four large adolescent CRA studies (Mean = 8.9, $SD = 3.9$ in Garner et al., 2009). On average, clients attended 4.57 total

sessions ($SD = 5.4$). Including peer and client sessions, the average treatment episode averaged approximately 291 minutes of treatment, or roughly 5 hours. Table 2 presents additional detail.

We also considered whether treatment attendance was associated with gender, peer self-reported length of friendship (in years), or recruitment source (i.e., bus ads versus clinic). There were no significant associations between any of these variables and the number of peer treatment sessions attended or AES scores. The correlation between length of friendship and number of peer sessions ($r = -.06$, ns) was trivial. However, there were non-significant trends for females and those recruited from bus advertisements to complete fewer sessions and AES procedures.

3.3 Longitudinal Analysis

3.3.1 Within-group effect size estimates—Table 3 presents means, standard deviations and standardized mean differences from baseline to 3 and 6 months (i.e., Cohen's d) for clients and peers. At three months, there were moderate and positive treatment effects for both clients ($d = .53$, $p = .03$) and peers ($d = .55$, ns) on Adjusted Days of Abstinence (ADA), small effects for clients ($d = .23$, ns) and moderate effects for peers ($d = .55$, ns) on Days of Binge Drinking (DBD), and no effects for clients ($d = .005$, ns) and small effects for peers ($d = .20$, ns) on Quarterly Cost to Society (QCS). Findings were similar at six months, although clients reduced their QCS ($d = .29$, ns) and further reduced their DBD at six months ($d = .56$, $p = .04$). At six months, the effects for QCS faded for peers ($d = .005$, ns).

3.3.2 HLM Results—Unconditional models revealed significant between-person variance in all outcome variables (50% of the total variance for ADA, 57% for DBD and 76% for QCS lie between persons), suggesting the appropriateness of multi-level modeling (see Table 4). For ADA, the Level-1 conditional model revealed a significant linear effect of time with number of days abstinent from substances increasing from intake to the 6-month follow-up. Results indicated significant between-person variability on the random slope of time ($\chi^2 = 734.38$, $p < .001$), which, as indicated by a non-significant cross-level interaction between participant type and time, was not accounted for by participants' status as a client versus peer. Model comparison based on deviance statistics ($-2 \log$ likelihood; (Raudenbush et al., 2011) revealed that the addition of a quadratic effect of time provided a significantly better fit to the data than the model with the linear effect alone ($\chi^2 = 4.45$, $p = .03$). The cross-level interaction between participant type and the quadratic effect of time was not significant, suggesting that quadratic trends in ADA did not differ significantly between clients and peers.

For DBD, the Level-1 conditional model revealed a significant linear effect of time with days of binge drinking decreasing from intake to the 6-month follow-up. Results indicated significant between-person variability on the random slope of time ($\chi^2 = 271.51$, $p < .001$). The Level-2 model revealed that although clients and peers differed initially on DBD, with peers scoring lower than clients (see intercept), there was not a significant difference between clients and peers on the rate of change in DBD. The quadratic effect of time did not help model fit ($\chi^2 = 0.30$, ns) and was removed from the final model.

For QCS, the Level-1 conditional model indicated no significant linear effect over time nor significant variability in the random slope of time ($\chi^2 = 68.15, p = 0.07$). Further, participant type was not a significant predictor of QCS. According to deviance statistics, the addition of a quadratic effect of time did not improve overall model fit ($\chi^2 = 0.70, ns$, respectively). Final models with non-significant quadratic and interaction terms removed are reported in Table 4. For ADA and DBD, these models were run with the Poisson function in HLM given that these outcome variables were count-based.

3.0 Discussion

3.1 Feasibility of Delivering Peer-CRA

3.1.1 Peer Recruitment, Retention and Treatment Engagement—Recruitment and retention data seem to support the feasibility of peer-enhanced treatment studies. First, we excluded only a very small percent (4%) of would-be eligible clients due to lack of participating peers, engaged 65.7% of peers in 1+ session, and retained 76.4% of peers at the six month follow up. Using a similar definition of treatment engagement (i.e., 25% of planned sessions), peer treatment engagement is comparable to adolescent clients' treatment engagement in CRA (M. T. Lee et al., 2012).

On the other hand, we only recruited 39% of all eligible participants. Their reasons for non-participation are largely unknown. Possible explanations could include that a) would-be participants did not have time or interest, b) they did not want to have peers involved in their treatment, or c) that study staffing patterns (i.e. use of student volunteers and one half-time research assistant) influenced recruitment rates. Regarding the latter, we note that the study was done on limited resources and recruitment rates varied across research assistants.

Although peers can be enlisted as concerned significant others (CSOs) in the treatment of emerging adults (Smith et al., 2013), they only attended half of the planned sessions. Attendance did not vary as a function of recruitment source, gender, or length of friendship between the client and peer, but we note that these analyses had limited power to detect differences. Additional research could focus on whether friendship qualities or gender differences exist for this peer-enhanced model. Additionally, peer participation may be increased through the development of a mobile application that targets peer CSOs willing to support EA clients. Increasing exposure to the peer training session is particularly important, as increases in peer supportive behaviors (i.e., arranging prosocial activities competing with substance use; praising pro-abstinence behaviors) constitute the proposed mechanism of change operating in this treatment (Smith et al., 2013). Future research may also consider using mixed methods to ask peers and clients what they found most helpful about this treatment.

3.1.2 Preliminary Outcomes—Outcomes were promising, as evidenced by significant linear effects for increased ADA and decreased DBD in HLM models. We observed non-significant quarterly cost to society effects for peers and clients, but note that cost to society reductions averaged approximately 2,000 USD for peers at three months and 4,000 USD for

clients at six months. Also notable is that peers experienced similar reductions in DBD and increases in ADA.

Although prior studies have found that CSOs relegated to helping roles experience treatment benefits (i.e., less depression, less anger, higher family cohesion), no prior study has ever demonstrated alcohol or drug use reductions for CSOs (Roozen, De Waart, & Van Der Kroft, 2010). Most of the effect may be attributable to the receipt of an MI session focused on eliciting change talk, or pro-change language, about helping one's friend, as this was the most frequently attended session by peers. Nevertheless, these findings imply that one low-cost way of increasing the generally poor reach of treatment to individuals in need is to have clients invite friends to their sessions. Future controlled trials should compare peers receiving Peer-CRA to peers in a no treatment condition (i.e., CRA only for client), to improve causal inferences.

3.2 Limitations

Study findings should be interpreted cautiously. This pilot feasibility study tested a novel treatment and did not randomize participants to treatments. Thus, we cannot be sure what peer or client outcomes would be relative to controls. Second, the small sample size prevented testing of whether or not outcomes differed for clients whose peers were heavier users. Concerns exist about including substance-using CSOs in supportive roles for another's treatment. For example, Magill and colleagues (2010) found that treatment engagement was lower among clients whose CSOs had higher baseline alcohol use (Magill et al., 2010). Further, alcohol-using CSOs were harder to engage in treatment. This underscores the rationale for our study's use of a private Motivational Interviewing session with substance-using peers to reduce ambivalence about supporting their friends. Also, clients experienced increases in days of abstinence, decreases in days of binge drinking, and decreases in cost to society at six months, with moderate to small effects. These findings are consistent with Tevyaw and colleagues' (2007) findings of positive, rather than iatrogenic effects, for clients receiving peer-enhanced treatments. We note that it is hard to interpret the effect sizes here in the absence of a comparison group, and are currently completing a meta-analysis to determine the typical within group effect sizes of interventions for EAs. Third, we only recruited 39% of eligible participants. Although clinical severity was no different between recruited and non-recruited individuals, it is possible that this low recruitment rate reflects problems with acceptability of the treatment. Alternatively, resources available to complete the study may have negatively affected recruitment, as prior research shows peers are highly amenable to helping their friends in treatment (Smith et al., 2013). Fourth, because of the size of this study, it was not possible to test whether proposed mechanisms of change operating in this model accounted for the clients' reductions in alcohol use. Future research should evaluate the impact of peer involvement on peer supportive behaviors, and whether changes mediate client outcomes. Finally, another limitation was that we did not collect treatment satisfaction data in this study for all participants due to a clerical error. Yet, among a small subset of individuals that did receive a validated treatment satisfaction scale ($n=16$), treatment satisfaction was high. (Data are available upon request.)

4.0 Conclusion

This study found preliminary support for the novel peer-enhanced version of CRA for use with emerging adults and their peers. In efforts to improve treatments for emerging adults, and possibly extend treatment benefits to otherwise non-treatment seeking peers, additional research should 1) use randomized designs to test the comparative efficacy of Peer-CRA against treatment as usual conditions, 2) increase exposure to core peer sessions and test whether peer outcomes differ relative to peers not receiving sessions (i.e., TAU), and 3) examine whether the proposed mechanisms of change operating in the model account for any differences in outcomes between Peer-CRA and control conditions.

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Biography

Douglas C. Smith is an Associate Professor of Social Work at the University of Illinois at Urbana-Champaign. Mr. Davis is a Doctoral Student at the University of Illinois at Urbana-Champaign. Mr. Ureche is deceased. Dr. Tara Dumas is Assistant Professor of Psychology at Huron University College at Western Ontario University, London, Ontario. Please address correspondence regarding this article to Dr. Smith at smithdc@illinois.edu.

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Highlights

- Tests preliminary outcomes for treatment delivered to peer dyads
- Uses understudied sample of emerging adults treated in a community setting (18–25 year olds)
- Found improvements in days of abstinence and reductions in binge drinking for clients and peers
- Implies that inviting peers to treatment may expand treatment benefits

Figure 1.
CONSORT Participant Flow Diagram

Table 1

Baseline Characteristics

	Client (<i>n</i> = 35) M (SD) or % (n)	Peer (<i>n</i> = 34) M (SD) or % (n)	Total (<i>n</i> = 69) M (SD) or % (n)
Age (in years)	21.5 (2.1)	22.1 (3.0)	21.8 (2.6)
% Female	38.2% (14.0)	40.0% (13.0)	39.1% (27.0)
<i>Socioeconomic Status</i>			
Paternal education (in years)	7.23 (6.33)	9.56 (6.80)	8.3 (6.61)
Maternal education (in years)	11.7 (3.56)	12.4 (3.29)	12.1 (3.42)
<i>Race/Ethnicity</i>			
White	25.7% (9.0)	29.4% (10.0)	27.5% (19.0)
African-American	57.4% (20.0)	50.0% (17.0)	53.6% (37.0)
Other	17.1% (6.0)	20.6% (7.0)	18.8% (13.0)
<i>Education/Occupation</i>			
Highest grade completed	12.1 (1.42)	12.6 (1.80)	12.3 (1.63)
Enrolled-four year university	3.10% (1.0)	16.7% (5.0)	9.68% (6.0)
Enrolled-two year university/tech	21.9% (7.0)	16.7% (5.0)	19.4% (12.0)
% Unemployed**	60.0% (21.0)	29.4% (10.0)	44.9% (31.0)
% Part time	14.3% (5.0)	11.8% (4.0)	13.2% (9.0)
% Full time	14.3% (5.0)	26.5% (9.0)	20.6% (14)
<i>Substance Use</i>			
Age first got drunk or used illicit substance*	13.7 (2.57)	15.1 (2.61)	14.4 (2.66)
Past year alcohol abuse*	22.9% (8.0)	10.7% (3.0)	17.5% (11.0)
Past year alcohol dependence*	37.1% (13.0)	28.6% (8.0)	33.3% (21.0)
Past year marijuana abuse	21.2% (7.0)	6.9% (2.0)	14.5% (9.0)
Past year marijuana dependence	30.3% (10.0)	34.5% (10.0)	32.2% (20.0)
Any past year dependence**	80.0% (28)	44.1% (15)	62.3% (43)
<i>Criminal Justice^a</i>			
Days on probation (past 90)**	44.8 (44.9)	7.27 (23.8)	26.6 (40.7)
Days in jail/prison (past 90)	2.06 (6.56)	.484 (2.61)	1.28 (5.05)

^a Variables for criminal justice involvement represent any days on probation or in jail/prison in the 90 days prior to treatment intake.

* $p < .05$;

** $p < .01$

Table 2

Sum of (AES) and Percent Receiving Each Procedure Plus Dosage (in minutes)

Measures	%(<i>n</i>) ^a	<i>M</i> (<i>SD</i>)
<i>Novel Peer-CRA procedures</i>		
MI with client	88.4 (23)	76.92(120.58)
Orientation	96.2 (25)	10.9(8.6)
MI with peer	84.6 (22)	25.77(22.24)
Peer training	42.3 (11)	15.35(19.61)
Functional Analysis of Prosocial Behavior	38.4 (10)	10.49 (16.9)
(Optional) Peer Session	3.8 (1)	1.14 (6.76)
Total Number of Peer Sessions	–	1.51 (1.68)
Total Peer Minutes of Treatment	–	41.7 (50.7)
<i>AES procedures^b</i>		
Orientation	100 (26)	20.77 (9.01)
Assign homework	96.2 (25)	44.81 (44.67)
Review homework	73.1 (19)	36.73 (45.23)
Happiness scale	69.2 (18)	18.00 (16.46)
Goals of counseling	69.2 (18)	34.04 (40.50)
Sobriety sampling	57.7 (15)	7.12 (6.51)
Problem-solving skills	46.2 (12)	18.92 (26.97)
Functional analysis of prosocial behavior	42.3 (11)	14.12 (18.38)
Functional analysis of substance use	42.3 (11)	16.81 (20.61)
Relapse prevention skills	34.6 (9)	17.38 (28.53)
Communication skills	30.8 (8)	12.50 (23.51)
Job-seeking skills	26.9 (7)	14.08 (25.90)
Anger-management skills	19.2 (5)	6.35 (15.85)
Refusal skills	15.4 (4)	2.88 (8.27)
Increasing prosocial recreation	8.6 (3)	1.23 (3.49)
Systematic encouragement	11.5 (3)	4.42 (15.45)
Other case management	11.5 (3)	0.96 (3.17)
Urine testing	7.7 (2)	1.35 (5.21)
AES score (count of AES components out of 22)	–	4.94 (4.52)
AES score plus count of novel peer procedures	–	7.31 (5.84)
Total Dosage (in minutes) for Target Client ^c	–	291.23 (349.35)

^a Percent receiving each treatment procedure is based on those dyads attending 1 or more sessions (n=26). Mean dosage based on intent to treat sample.

^b AES is the A-CRA Exposure Scale based on the adolescent version of the CRA model. As such, five AES procedures that applied only to A-CRA were not used in this study, which were procedures that included parents or romantic partners (modification for emerging adults in prior study).

^c Total treatment dosage for clients includes total peer minutes plus total client minutes.

Table 3

Means (SD) of Dependent Variables for Clients (n = 35) and Peers (n = 34)

Outcome Variable	Follow up		Effect size		Effect size	
	Baseline	3 month	d_{wp}	6 month	d_{wp}	
ADA						
Client	31.6 (30.1)	48.0 (31.8)*	.53	43.9 (36.4)		.37
Peer	34.7 (35.2)	53.5 (32.9)	.55	48.5 (33.5)		.41
Combined	33.1 (32.5)	50.4 (32.1)*	.53	46.2 (34.8)		.39
DBD						
Client	16.9 (24.7)	11.8 (19.4)	.23	6.23 (10.1)*		.56
Peer	9.39 (19.6)	1.68 (3.46)	.55	3.76 (6.09)		.39
Combined	13.3 (22.5)	7.45 (15.6)	.29	5.02 (8.41)*		.46
QCS						
Client	7259.1 (18205.9)	7340.5 (13413.1)	.005	3308.4 (5258.7)		.29
Peer	4939.9 (12822.6)	3030.2 (5169.4)	.20	4876.6 (11351.0)		.005
Combined	6117.3 (15707.7)	5444.0 (10735.8)	.05	4125.2 (8908.6)		.15

ADA = adjusted days abstinent; DBD = Days of Binge Drinking; QCS = quarterly cost to society (in 2013 dollars)

* $p < .05$

Table 4

Intraclass Correlation Statistics and Final Hierarchical Linear Models

	Adjusted Days Abstinent (ADA)	Days of Binge Drinking (DBD)	Quarterly Cost to Society (QCS)
<u>Intraclass Correlation</u>			
ICC (χ^2)	0.50 (234.41)**	0.57 (261.68)**	0.76 (405.16)*
<u>Final HLMs</u>			
Intercept $b(SE)$	4.07(0.16)**	2.66(0.31)**	4708.94(2370.77)*
Linear Time $b(SE)$	-0.45(0.18)*	-0.45(0.08)**	-110.47(761.27)
Quadratic Time $b(SE)$	0.20(0.04)**	—	—
Participant Type $b(SE)$	0.06(0.07)	0.69(0.29)*	3392.95(3251.70)

Note. $n = 69$;*
 $p < .05$,**
 $p < .001$