



## Effectiveness of Motivational Incentives for Adolescent Marijuana Users in a School-Based Intervention



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### ARTICLE INFO

#### Article history:

Received 18 March 2015

Received in revised form 26 May 2015

Accepted 1 June 2015

#### Keywords:

Motivational incentives

Contingency management

Adolescent substance abuse

Marijuana

School-based intervention

Propensity scores

Motivational interviewing

### ABSTRACT

**Purpose:** This study examined whether adolescents receiving Motivational Interviewing (MI) intervention have different outcomes compared to those receiving Motivational Incentives (Motivational Interviewing combined with Contingency Management; MI + CM).

**Method:** A total of 136 adolescents (from a parent study of 220 adolescents) with problematic substance use were recruited from 8 high schools in Washington State, where they completed either 8-weeks of MI or MI + CM. Frequency of marijuana use was assessed at baseline, at the end-of-treatment, and at 16-week follow-up.

**Results:** A balanced and matched sample was created using propensity scores, then analyzed using Hierarchical Linear Modeling (HLM). Multilevel regression analyses revealed that adolescents who received MI + CM exhibited a greater reduction in use across time ( $p < .05$ ). Reductions at the end-of-treatment were greater for the MI + CM condition (Cohen's  $d = -.82$ ) compared to MI alone (Cohen's  $d = -.33$ ), but did not differ at 16-week follow-up. Adolescents receiving MI + CM showed significantly fewer negative consequences of marijuana use at the end-of-treatment ( $t(1, 124) = 2.26, p < .05$ ), higher use of coping strategies ( $t(1, 124) = 3.01, p < .01$ ), and increased likelihood to attend additional treatment for substance use ( $\chi^2(1, 124) = 4.12, p < .05$ ), though hypothesized improvements in motivation and school attendance were not found. Use of coping strategies at the end-of-treatment had a significant indirect effect on the relationship between the intervention condition and marijuana use at the end-of-treatment ( $F(3, 121) = 10.20, R^2 = .20, p < .01$ ).

**Conclusion:** These results suggest that the inclusion of contingencies into adolescent marijuana treatment decreases the end-of-treatment frequency of marijuana use and related consequences while increasing the use of coping strategies and the pursuit of additional treatment.

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Marijuana use in adolescence is prevalent and associated with significant psychosocial and physical problems, yet the vast majority of adolescents with substance use disorders in general go untreated (National Center on Addiction and Substance Abuse at Columbia University (CASA), 2011). According to a recent National Household Survey of Drug Use and Health (US Department of Health and Human Services, 2010) marijuana is the substance most likely to be used and misused by teens and is the most likely to cause adolescents to enter treatment. Initiation of marijuana use before age 18 imparts nearly 9 times the risk of developing substance dependence as an adult. For 1.2 million youth each year, substance dependence occurs before 18. Of these, 1.1 million (92%) go untreated; most often due to a lack of access to care and a lack of desire to be treated (United States Department of Health and Human Services, Substance Abuse and Mental Health Services Administration, & Office of Applied Studies, 2010).

Implementation of evidence-based interventions for adolescents not only requires demonstrated efficacy in reducing substance use and concomitant risk, but also must be effectively delivered within existing adolescent serving systems including schools. The purpose of this study was to evaluate the comparative effectiveness of Motivational Incentives or motivational interviewing with contingency management (MI + CM) vs. motivational interviewing alone (MI) in reducing marijuana use and related consequences in adolescents seen for substance abuse treatment in a school-based setting. In addition to examining the incremental effectiveness of MI + CM in reducing substance use over time, we also investigated mechanisms of effectiveness, secondary reductions in negative psychosocial consequences, and moderators of the treatment effect.

### 1. School-based interventions for adolescent substance abuse

School-based prevention and intervention for adolescent substance use have been widely implemented and demonstrated a range of effectiveness (Faggiano, Minozzi, Versino, & Buscemi, 2014). Teacher and counselor delivered prevention programs ranging from universal

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school-wide prevention to targeted group and individual prevention programs for children and adolescents at risk have been shown to be effective when delivered with rigor (Dusenbury, Brannigan, Falco, & Hansen, 2003). General and specific resources for implementation of prevention programs are available to school personnel and are widely supported through funding streams. Brief interventions in schools for adolescents who have begun using substances problematically have also demonstrated effectiveness (Belur, Dennis, Ives, Vincent, & Muck, 2014; Winters, Fahnhorst, Botzet, Lee, & Lalone, 2012; Winters, Leitten, Wagner, & O'Leary Tevyaw, 2007), but a larger research base is needed to elucidate which evidence based treatments are effective, for which adolescents, and what mechanisms mediate their effectiveness.

Of particular interest are combined and blended treatments for adolescents with substance use problems. One of the lessons from the prevention literature is that one size does not fit all and that adolescent serving systems benefit from a menu of approaches that can be implemented in response to particular individual or systemic characteristics. Two evidence based interventions that have proven independently effective for adolescents with problematic substance use are Motivational Interviewing and Contingency Management (CM). In adult populations these interventions have also been successfully blended and found to synergistically produce a potent response to both moderate and severe substance use disorders in adults (Budney, Higgins, Radonovich, & Novy, 2000; Carroll & Onken, 2005). This blended Motivational Incentives intervention may be particularly promising for adolescents in school settings.

### 1.1. MI for adolescents

Motivational interviewing was developed by Miller and Rollnick (2013) as a set of principles and practices designed to engage individuals in behavior change through a counseling style that is empathetic and non-argumentative yet develops discrepancy in a client that motivates change. MI can be delivered throughout an intervention as the primary method of talk therapy and can be further specified with a set of procedures often referred to as motivational enhancement therapy (Sampl & Kadden, 2001). MI interventions for adolescent substance users have demonstrated efficacy in individual clinical trials (Peterson & Baer, 2006). Meta analytic reviews of MI have also demonstrated clinically significant effect sizes (Burke, Arkowitz, & Menchola, 2003; Lundahl, Kunz, Brownell, Tollefson, & Burke, 2010). MI has been associated with decreased substance use, increased motivation for change and increased engagement. Some limitations to MI interventions have included relatively short term gains in substance use outcomes; though these are notably absent in the Cannabis Youth Treatment (CYT) clinical trials (Dennis et al, 2004; Sampl & Kadden, 2001).

Over the last 12-years since the CYT outcomes were presented, there has been a significant cultural shift in how youth perceive and engage in illicit drug use. Adolescents are also using marijuana during a period of decriminalization and legalization, which may have effects of increasing the perceived availability and acceptability of use. According to the *Monitoring the Future Survey* (Johnston, O'Malley, Miech, Bachman, & Schulenberg, 2014), high school students are using marijuana at rates higher than other drugs, while alcohol use and illicit drug use in general have declined. Thirty-six percent of high school seniors report use of the drug in the prior year, with 6.5% reporting daily use. In addition, the perceived risk of marijuana is at an all-time low, with only 20% of high school seniors perceiving marijuana use as harmful. These trends in adolescent marijuana use and prevailing attitudes may serve as an additional challenge in treatment using motivational approaches which rely on the development of cognitive discrepancy to effect change. Thus, effective enhancements to Motivational Interviewing interventions are needed. Conjunctive treatments that are theoretically compatible but also address the need for extrinsic motivators, intensification of treatment, and more directive follow up after change inducement, may be helpful to leveraging the strengths of MI.

### 1.2. Contingency Management for adolescents

CM interventions have been found to have compelling outcomes in reducing substance use among adults and adolescents in treatment for a variety of primary substances (Krishnan-Sarin et al., 2013; Lott & Jencius, 2009; Kamon, Budney, & Stanger, 2005; Reynolds, Dallery, Shroff, Patak, & Leraas, 2008). CM has been effectively integrated into other psychosocial treatment interventions for adolescents, most notably Multisystemic Therapy (Henggeler et al., 2008) and Motivational Enhancement Therapy and Cognitive Behavioral Therapy (Stanger & Budney, 2010); in each of these blended treatments, contingency management procedures were integrated into parent interventions for delivery. These methods highlighted the general efficacy of providing contingencies for abstinence from substances but also leveraged the involvement and relationships of parents. Other combined trials of CM and cognitive behavioral interventions for substance use have had mixed effects but shown general efficacy in reducing substance use (Carroll, Nich, Lapaglia, Easton, & Petry, 2012).

The mechanisms of substance use reduction in contingency management have not been widely investigated. Stanger, Budney, and Bickel (2013) proposed a neurodevelopmental mechanism whereby the rewards of contingency management may “(shift) the preference from the immediate rewards of use to delayed rewards for choosing not to use” (p. 403). Embedded in this theory are actions associated with the choice not to use substances which may include coping strategies, help-seeking or engagement in alternate behaviors such as school attendance. Winters et al. (2012), have demonstrated that help-seeking mediates the effect of school based substance abuse interventions on substance use outcomes in general, while Litt, Kadden, Kabela-Cormier, and Petry (2008) demonstrated that the endorsement of coping skills served as mechanism of change for adolescents engaged in contingency management interventions.

Motivational Incentives interventions which combine traditional motivational interviewing procedures of feedback, goal setting, decisional balance exercises and change planning with prize based contingency management procedures administered for clients by therapists have been successfully developed and implemented with effectiveness in adults with stimulant use disorders (Benishek et al., 2014; Stitzer, Petry, & Peirce, 2010). These interventions have shown moderate effect sizes (Cohen's  $d = .33$  to  $.46$ ) and have led to dissemination to the broader treatment community.

Challenges to implementing to CM interventions, include relatively intensive staffing necessary to administer them, difficulty in managing reinforcement schedules to maximize generalizability of learning and the need to apply reinforcers to behaviors beyond biological markers of drug absence. Despite these challenges, a growing body of evidence suggests that these interventions are robustly effective, adaptable and cost effective (Branson, Barbuti, Herman, Bhutia, & Clemmey, 2012).

### 1.3. Summary and hypotheses

Given the efficacy of MI and CM in reducing substance use and related problems in adolescents, as well as the effectiveness of school-based intervention programs in producing positive changes, an examination of the effectiveness of Motivational Incentives in the school setting is warranted. The addition of contingencies to MI in the school setting is novel in adolescent treatment, as previous blended interventions have been tested in outpatient clinics and in the context of family (Stormshak & Dishion, 2009). Providing incentives in the school intervention will leverage the advantages of school-based treatment (e.g., access to the adolescent, convenience of treatment attendance, low cost) and may serve to address some of the challenges inherent to this context (e.g., lower intensity, short-term intervention). Furthermore, the specificity of MI + CM in targeting marijuana use may have the advantage of increasing motivation for change, a

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