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The Impact of Disruptive Behavior Disorder on Substance Use Treatment Outcome in Adolescents

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Abstract

The current study examined the impact of disruptive behavior disorder (DBD) on substance use outcomes in an adolescent sample. Sixty-eight adolescents and their caregivers were randomized to one of two fourteen-week, outpatient treatments: Motivational Enhancement Therapy/Cognitive Behavior Therapy (MET/CBT) + Parent Management Training + Contingency Management (CM; experimental) and MET/CBT + Parent Drug Education (attention control). This study assessed abstinence, substance use, externalizing behavior, and parenting outcomes over five assessment periods for youth with DBD (DBD⁺) and without DBD (DBD⁻). Results showed DBD⁺/experimental adolescents reported fewer days of marijuana use than DBD⁺/control adolescents. Results also showed that parents of DBD⁻ adolescents in the experimental condition reported significantly better parenting outcomes compared to DBD⁻/control. Substance abuse treatment for adolescents with DBD which includes a component such as contingency management and parent training has the potential to contribute to substance use outcomes. Such treatment strategies, however, should include additional support for parents.

Keywords

contingency management; adolescents; substance abuse; disruptive behavior disorder; marijuana

1. Introduction

When compared to youth without substance use problems, youth with substance use disorders (SUDs) are approximately four times more likely to have a disruptive behavior disorder (DBD). Similar to this increased risk for DBD among adolescents with SUDs, there is an increased risk for substance use among youth with DBD. These youth are 5.9 times more likely to have SUDs than youth without a DBD.

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Results of longitudinal studies of treated adolescents have shown that those with SUD and psychiatric co-morbidity (primarily DBD) evidence higher rates of substance use 12 months after treatment when compared to adolescents without a co-morbid diagnosis. In addition, research has shown that following treatment, adolescents with SUD and externalizing behaviors relapse sooner and at higher rates than those with SUD and other psychiatric co-morbidity and those with SUD only. These results, however, are not unequivocal. For example, among adolescents who participated in the Cannabis Youth Treatment (CYT) project, Webb and colleagues found that reductions in substance use frequency and substance use problems were similar among adolescents involved and not involved in the juvenile justice system. In addition, reductions in substance use frequency and substance use problems were significantly greater among adolescents reporting recent criminal behavior.

Research has also sought to identify risk factors that are common to SUDs and DBDs. Of particular interest is parenting as a contextual variable. Parenting practices that are common in families of adolescents who use drugs include unclear expectations for behavior, poor monitoring of behavior, few and inconsistent rewards for positive behavior, and excessively severe and inconsistent punishment for unwanted behavior. Similarly, low parental involvement, poor monitoring, and harsh and inconsistent discipline are parenting factors that are associated with DBD in adolescents. As such, evidence-based treatments for both types of problems typically include treatments that integrate parenting interventions.

Randomized trials of integrated treatments for SUD and DBD show that while treatment effects are consistently related to greater reductions in substance use (e.g., Henggeler et al., 2006; Santisteban et al., 2003; Stanger et al., 2009), treatment effects on externalizing behaviors are mixed. Notable, for many of the studies that show significant treatment effects on externalizing behaviors, adolescent inclusion criteria included externalizing behavior problems, but did not require substance use. On the other hand, for many of the studies that show no significant treatment effects on externalizing problems, adolescent inclusion criteria included those seeking treatment for substance abuse, but did not require other conduct problems or externalizing behaviors.

Taken together, this research suggests that while many integrated treatments aim to target both SUD and symptoms of DBD, treatments may be less effective at reducing externalizing (an indicator of DBD severity) problems when the primary presenting problem is substance abuse. As such, studies that directly compare treatment outcome for adolescents with and without DBD who are receiving treatment for substance abuse are needed. At the time of this review, we found only one study that examined the impact of DBD on substance use outcomes within the context of an integrated treatment program. Specifically, in a comparison study of Multidimensional Family Therapy and CBT, Hendriks and colleagues found that when adolescents with conduct problems were compared to adolescents without conduct problems, those with conduct problems showed greater reductions in marijuana use from intake to 12-month follow-up when treated with Multidimensional Family Therapy (MDFT). This study, however, did not examine externalizing behavior or parenting outcomes (additional treatment targets of integrated programs). Two randomized trials have examined the interaction between behavior problems and treatment condition as a predictor of substance use and externalizing outcomes. In both studies, results were not significant for the interaction between externalizing problems and treatment condition. It is possible; however, that the externalizing measures in these studies were limited by a restriction of range (at the upper end), as both samples included adolescent juvenile offenders.

Given the importance of parenting as a contextual factor for SUD and DBD and given the variability in treatment effects on substance use vs. externalizing behavior, understanding the role of DBD in the effect of treatment on parenting within the context of substance abuse

is needed. Findings of treatment effects on parenting outcomes are mixed. Some studies report significant treatment effects, while others report no treatment effects. These studies were fairly consistent in their definition and assessment of parenting, and in their inclusion/exclusion criteria, so results may indicate true differential impact on parenting across these interventions. However, the extent to which the presence of DBD impacts treatment outcomes across substance use, externalizing, and parenting skills remains unclear.

We previously reported on an adolescent substance abuse intervention that integrates a parent management training program and individual cognitive-behavior therapy, enhanced with contingency management (CM; an abstinence-based reinforcement intervention that follows operant principles to enhance motivation to engage in treatment and engender abstinence). Within the context of a randomized clinical trial, we compared this experimental condition to a control condition that included MET/CBT, a parent psychoeducation program, and CM for attendance only. Adolescents treated in the experimental condition showed longer periods of abstinence during treatment; however, group differences were not significant during the 9-month follow-up period. In addition, there were no significant treatment effects on adolescent externalizing behavior problems or parenting skills; that is, adolescents and parents in both conditions showed the same pattern of improvements for both treatment conditions.

To explore how the presence of DBD affects treatment outcome for substance use, externalizing behavior, and parenting skills, secondary data analyses of the aforementioned randomized clinical trial were conducted. We hypothesized that youth with a DBD diagnosis would have higher rates of substance use across treatment conditions compared to youth without a DBD diagnosis. It was also predicted that DBD diagnosis would interact with treatment condition, such that there would be a greater effect of the experimental intervention, among adolescents with DBD, on youth substance use, externalizing behavior, and parenting (i.e., positive involvement, poor monitoring, ineffective discipline). We specifically hypothesized that adolescents with DBD who are treated in the experimental condition would show less substance use, more abstinence, decreased externalizing behavior, and improved parenting (i.e., more positive involvement, better monitoring, and more effective discipline strategies) over the course of the study (intake to 9-month follow-up) when compared to adolescents with DBD in the control condition.

2. Materials and Methods

2.1. Participants and Sample Selection

Participants for this treatment study included 69 adolescents (57 boys, 12 girls), ages 14-18 ($M = 16$; $SD = 1.05$) who were seeking treatment for marijuana use. Families were referred for substance abuse treatment by school administrators, the juvenile justice system, community therapists, physicians, or were self-referred. Inclusion criteria included a family with a son or daughter between the ages of 12 and 18 who reported use of marijuana during the prior 30 days or had a marijuana-positive urine drug test at the intake appointment. Adolescents were excluded from the study if they (1) displayed active psychosis or current suicidal behavior or had a severe medical illness limiting their participation, or (2) had alcohol or other drug dependence requiring an alternative or more intensive treatment.

2.2. Procedures

Eligible families were assigned to one of two treatment conditions using minimum likelihood allocation (MLA), balancing across conditions on therapist and baseline characteristics that may influence outcome: abstinence prior to treatment (0 vs. > 1 day), gender, legal status, age (> 17 vs. <17), tobacco smoker, prior participation in brief

treatment in our clinic. The MLA procedure was successful. Treatment comparisons showed no significant differences on these variables. Follow-up assessments were conducted at the end-of-treatment, 3 months, 6 months, and 9 months.

2.2.1 Treatment conditions—Both treatment conditions involved 90-minute, weekly individual therapy sessions for 14 consecutive weeks and twice-weekly drug testing. All parents were informed of drug toxicology results. All adolescents received the MET/CBT12 curriculum modified for individual therapy. There were no between-condition differences in retention. Additional details of the theoretical and empirical basis for this treatment model are presented in. Briefly, each treatment condition is described below.

MET/CBT + abstinence CM +family management training (EXP; experimental): This EXP condition included an abstinence-based incentive program modeled from that used in previous trials, but with one modification. Adolescents received monetary incentives in the form of a gift card if they submitted a urine specimen that was negative for all substances and parent and self-reports indicated no substance use between visits. Treatment for parents was 45 minutes in length and included: 1) development and implementation of a Substance Monitoring Contract and 2) completion of the Parent Management Training curriculum.

MET/CBT + attendance CM + parent psychoeducation (CONTROL): This CONTROL condition included an incentive program in which adolescents were provided with a \$5.00 voucher for every appointment they attended. The goal for providing these incentives was to engender attendance and compliance. Parents received a structured psychoeducational substance counseling curriculum. To match the EXP condition, each parent session was 45 minutes.

2.3. Measures

2.3.1. Substance Use—A bachelor's level research assistant administered The Vermont Structured Diagnostic Interview to adolescents to assess for the presence of Cannabis Abuse or Cannabis Dependence. Interviewers were trained to administer the instruments via manual review, observation, and supervised practice interviews. All diagnoses were confirmed by one of the project investigators, Dr. Stanger or Dr. Budney. The VSDI has demonstrated good psychometric properties. Abstinence was assessed by urine drug testing, which was administered under same-gender, staff observation twice a week. An onsite Enzyme-Multiplied Immunoassay Technique (EMIT; Dade-Behring, San Jose, CA) was used to test for cannabinoids, with a cut-off level of 50ng/ml. Adolescents with invalid drug tests were asked to provide a replacement sample within 4-24 hours. Specimens were considered invalid if the creatinine level was less than 30ng/ml. Failure to submit a valid, scheduled specimen was treated as a positive result. Self-reported use of marijuana was assessed via the Time-Line Follow-Back interview. At intake, youth reported on the 90 days prior to the intake appointment. During the treatment period, youth reported on use since their last appointment; and at 3, 6, and 9 months post-treatment youth reported on use since their last assessment.

2.3.2. Disruptive Behavior Disorder and Externalizing Symptoms—At intake, parents were individually administered the VSDI to assess for DBDs. The presence of a DBD was defined by either parent report of Oppositional Defiant Disorder (ODD) or Conduct Disorder (CD). Although Attention-Deficit/Hyperactive Disorder (ADHD) is often co-morbid with ODD and CD, ADHD is distinct in etiology, developmental course, and recommended treatments. Thus, the presence of ADHD was not included in this definition. One participant was missing the parent report of DBD and was excluded from these analyses (final N = 68). At intake, post-treatment, and each follow-up assessment, the Child Behavior

Checklist was completed by each parent ($n=68$ mothers and $n=51$ fathers) to assess for externalizing behavior problems. The Externalizing Problems scale includes rule breaking and aggressive behavior syndromes. Maternal and paternal reports of CBCL Externalizing Problems (T-scores) were examined separately in analyses.

2.3.3. Parenting—At intake, end-of-treatment, and at the follow-up assessments, parents were individually administered the Alabama Parenting Questionnaire. The APQ subscales are: Positive Involvement, Deficient Monitoring, and Ineffective Discipline. Positive Involvement measures the degree to which parents show interest and offer praise, affection, and positive reinforcement to their teen; Deficient Monitoring measures the degree to which youth are outside parental supervision; Ineffective Discipline measures the predictability and consistency of discipline practices. Maternal and paternal reports of parenting on these subscales were examined separately in analyses. Data for each subscale was available for all mothers ($n=68$). For the Positive Involvement and Deficient Monitoring subscales, data was available for 50 fathers; and for the Negative Discipline subscale, data was available for 51 fathers.

2.3.4. Data Analyses—Marijuana abstinence outcomes included: (1) weeks of continuous abstinence achieved during treatment, (2) point prevalence abstinence at intake and each follow-up assessment (treatment discharge and 3, 6, and 9 months after discharge); and (3) percentage of days youth reported using marijuana prior to each assessment. To examine weeks of continuous abstinence achieved during treatment, mixed model analyses were performed. Generalized Estimating Equation (GEE) analyses were used to test differences in marijuana abstinence at each assessment point (i.e., the odds of a positive urine drug screen at each assessment); and a mixed-model repeated measure analysis was used to examine changes in daily self-report of marijuana use. Externalizing symptoms, as well as APQ scores on positive involvement, deficient monitoring, and ineffective discipline over the course of the five assessment periods were modeled by mixed-model repeated measures analyses.

Consistent with the intent-to-treat model, families who attended one or more sessions were included in all analyses. All analyses included two models. Model 1 examined the main effects of DBD and treatment condition. Model 2 examined the interaction between DBD status and treatment. Models including longer-term effects controlled for the significant highest order linear, quadratic, and/or cubic effects of time. All analyses included two contrasts, adolescents with DBD (DBD⁺): EXP vs. CONTROL and adolescents without DBD (DBD⁻): EXP vs. CONTROL. Last, effect size (Cohen's d) was calculated for all effects in standard deviation units of the outcome variable, with an effect size of <0.20 considered as small, $0.30 - 0.50$ considered as medium, and >0.60 considered as large.

3. Results

3.1. Participant Characteristics

Demographic and substance use characteristics across DBD status groups are shown in Table 1. Forty-one youth (60.3%) met criteria for DBD. Assignment to the EXP vs. CONTROL conditions, demographic characteristics, and all but one substance use characteristic were similar across diagnostic status groups; that is, a significantly higher percentage of DBD⁺ adolescents met criteria for Cannabis Dependence. As expected, at intake, significantly more DBD⁺ adolescents received higher maternal and paternal ratings of externalizing behaviors. Also, mothers of DBD⁺ adolescents reported significantly more deficient monitoring and ineffective discipline practices.

Notably, eight (12%: $n = 2$ DBD⁺/EXP; $n = 1$ DBD⁺/CONTROL, $n = 4$ DBD⁻/EXP; $n = 1$ DBD⁻/CONTROL) adolescents did not meet criteria for Cannabis Abuse or Dependence. They did not endorse enough symptoms to meet criteria, but met all other inclusion criteria. The only difference between adolescents meeting DSM criteria and adolescents not meeting DSM criteria was the number of days marijuana was used in the 30 days prior to intake (Stanger, et al., 2009). To determine whether to retain these eight youth, all analyses were conducted twice, including and excluding them from the analyses. Results were highly similar, thus, results presented below include all 68 adolescents and their parents.

3.2. During-treatment Marijuana Abstinence

Mixed-model analysis of weeks of continuous abstinence showed no significant main effects of DBD status ($\beta = -0.14$, $p = .26$; $d = 0.28$), no significant main effect of treatment condition ($\beta = 0.23$, $p = .06$; $d = 0.45$), and no significant interaction effects ($\beta = 0.82$, $p = .41$; $d = 0.41$). Although DBD⁺ adolescents treated in the EXP condition had 3.2 more weeks of continuous abstinence ($M_{\text{EXP}} = 7.43$; $SD = 5.50$ vs. $M_{\text{CONTROL}} = 4.25$; $SD = 3.95$) than DBD⁺ adolescents treated in the CONTROL condition, planned comparisons were not significant for the DBD⁺: EXP vs. CONTROL contrast, $\beta = 0.28$, $p = .05$; $d = 0.61$. In addition, planned contrasts were not significant ($\beta = 0.23$, $p = .59$; $d = 0.20$) for DBD⁻ adolescents ($M_{\text{EXP}} = 7.90$; $SD = 5.81$ vs. $M_{\text{CONTROL}} = 6.83$; $SD = 5.15$).

3.3. Intake to Post-treatment Marijuana Abstinence

Table 2 provides the *point prevalence* of marijuana positive urine drug tests at each assessment (intake, end of treatment and 3-month, 6-month, and 9-month follow-up), across DBD status and treatment condition. As shown in Table 3, the GEE analysis of these data showed no significant main effect for DBD status ($p = .18$), treatment condition ($p = .37$), or the interaction between DBD status and treatment condition ($p = .28$). Planned comparisons showed that the odds of marijuana positive urine drug tests were similar for youth across treatment condition and DBD status (DBD⁺: EXP vs. CONTROL, $p = .99$; DBD⁻: EXP vs. CONTROL, $p = .16$). There was a significant cubic effect of time across the assessment periods: odds of a marijuana positive urine drug test decreased during treatment, but then increased during the early follow-up period, and leveled off again by the end of the follow-up period, OR = 0.86, $p = .01$, 95% CI [0.77, 0.96].

Table 2 also shows percent days of self-reported marijuana use at each assessment (intake, end of treatment and 3-month, 6-month, and 9-month follow-up), across DBD status and treatment condition. As shown in Table 3, mixed model repeated measures analyses of these data showed a significant main effect of DBD status on days of self-reported marijuana use ($p = .03$), indicating that when accounting for the effects of treatment, DBD⁺ adolescents reported more days of marijuana use (see Table 3). Main effects of treatment were also significant ($p = .01$), indicating that when accounting for the effects of DBD status, adolescents in the EXP condition reported fewer days of marijuana use. The interaction was not significant ($p = .38$). Planned contrasts revealed that DBD⁺ adolescents in the EXP condition averaged 10% fewer days of marijuana use than DBD⁺ adolescents in the CONTROL condition ($p = .01$). DBD⁻ adolescents in the EXP condition were not significantly different from DBD⁻ adolescents in the CONTROL condition ($p = .33$). The cubic effect of time was significant: percentage of days that youth reported using marijuana decreased substantially throughout treatment, began to increase after treatment, and stabilized at a level lower than at intake at the last follow-up assessment, $\beta = -5.11$, $p < .001$, $d = 0.12$.

3.4. Intake to Post-treatment Externalizing Symptoms

A large, significant main effect of DBD status was observed for maternal ($p < .001$) and paternal ($p < .001$) reports of externalizing behavior, indicating that, when accounting for the effects of treatment condition over the entire assessment period, reports of externalizing behavior was higher for DBD⁺ adolescents (see Table 3). Main effects of treatment condition were significant for maternal report ($p = .04$), but not paternal report ($p = .77$) of externalizing behavior, indicating that when accounting for the effects of DBD status, maternal report of externalizing behavior was lower for youth in the EXP condition. Interaction effects were not significant for maternal ($p = .76$) or paternal ($p = .85$) reports of externalizing behavior.

As shown in Table 3, planned contrasts showed no significant results for DBD⁺ comparisons (i.e., EXP vs. CONTROL) of maternal ($p = .09$) and paternal ($p = .91$) ratings of externalizing behavior. In addition, no significant results were observed for planned contrasts of the DBD⁻ comparisons of maternal ($p = .28$) and paternal ($p = .74$) ratings of externalizing behavior. Also indicated in Table 3, the effect sizes for the contrast analyses were small. For all participants, maternal ratings revealed significant cubic change over time: symptoms sharply declined during treatment, flattened during the post-treatment phase, and dropped again near the final follow-up assessment, $\beta = -2.92$, $p = .03$, $d = 0.07$; and paternal reports revealed a significant quadratic pattern of change over time, $\beta = .62$, $p = .04$, $d = 0.07$.

3.5. Intake- to Post-treatment Parenting

Positive Involvement—Results showed a significant main effect of DBD on paternal positive involvement ($p = .03$), but not maternal positive involvement ($p = .17$) (see Table 4), indicating that, over the entire assessment period and when accounting for the effects of treatment, fathers reported significantly less positive involvement with their adolescent if the youth had DBD. No significant main effects of treatment condition (Maternal: $p = .42$; Paternal: $p = .87$) or interaction effects (Maternal: $p = .67$; Paternal: $p = .10$) were observed. Planned comparisons showed no significant differences (Maternal: DBD⁺ EXP vs. CONTROL, $p = .73$; Paternal: DBD⁺ EXP vs. CONTROL, $p = .38$; Maternal: DBD⁻ EXP vs. CONTROL, $p = .40$; Paternal: DBD⁻ EXP vs. CONTROL, $p = .16$) (see Table 4). Also shown in Table 4, most effects were medium in size for paternal report, however, small for maternal report. Linear changes (increases) over time in maternal ($\beta = 0.04$, $p = .54$, $d = 0.03$) and paternal ($\beta = 0.08$, $p = .28$, $d = 0.03$) ratings were not significant.

Deficient Monitoring—Significant main effects of DBD status on maternal ($p = .04$) but not paternal ($p = .11$) deficient monitoring indicated that mothers of DBD⁺ adolescents showed more deficient monitoring across the assessment period when accounting for the effects of treatment condition (see Table 4). Main effects of treatment condition were not significant for maternal ($p = .76$) or paternal ($p = .40$) deficient monitoring, interaction effects were not significant (Maternal: $p = .96$, Paternal: $p = .32$), and none of the planned contrasts showed significant differences. Effect sizes ranged from small to medium for paternal report, but mostly small in size for maternal report (Maternal: DBD⁺ EXP vs. CONTROL, $p = .80$; Paternal: DBD⁺ EXP vs. CONTROL, $p = .95$; Maternal: DBD⁻ EXP vs. CONTROL, $p = .87$; Paternal: DBD⁻ EXP vs. CONTROL, $p = .19$) (see Table 4). Changes in maternal ($\beta = 1.00$, $p = .001$, $d = 0.12$) and paternal ($\beta = 0.78$, $p = .03$, $d = 0.09$) deficient monitoring revealed a significant quadratic effect of time, with levels decreasing (improving) from intake to 3-month follow-up and then increasing (worsening) to nearly intake levels.

Ineffective Discipline—Significant main effects of DBD status on maternal ($p = .001$) but not paternal ($p = .57$) ineffective discipline indicated that when accounting for the effects of treatment condition, mothers of DBD⁺ adolescents used more ineffective discipline practices

(see Table 4). Main effects of treatment condition were significant for maternal ($p = .003$) ineffective discipline but not paternal ($p = .69$) ineffective discipline, suggesting that when accounting for DBD status and the assessment period, mothers in the EXP condition reported more effective discipline. As can be seen in Table 4, the effect sizes for these results were medium. Interaction effects were significant for paternal ($p = .002$) ineffective discipline, but not for maternal ($p = .23$) ineffective discipline. The effect sizes ranged from medium (maternal report by treatment condition) to large (paternal report by treatment condition).

Planned contrasts showed no significant difference between maternal ($p = .12$) and paternal ($p = .12$) ineffective discipline for DBD⁺ adolescents in the EXP and CONTROL conditions. As shown in Table 4, effect sizes for these analyses were small. Significant differences were shown between maternal ($p = .005$, medium effect) and paternal ($p = .007$, large effect) levels of ineffective discipline for DBD⁻ adolescents, indicating that parents of DBD⁻ adolescents in the EXP condition showed lower rates of ineffective discipline. Maternal ineffective discipline revealed a significant cubic effect of time ($\beta = -5.31$, $p < .001$, $d = 0.12$; see Figure 1), with levels decreasing (improving) sharply from intake to 3-month follow-up, increasing (worsening) slightly until the 6 month follow-up (still at levels below intake), and then decreasing (improving) to discharge levels at the 9-month assessment. Paternal ratings showed a significant linear decline over time ($\beta = -0.15$, $p = .04$, $d = 0.10$; see Figure 1).

4. Discussion

We examined the hypotheses that (1) youth with DBD would have higher rates of marijuana use across treatment conditions compared to youth without DBD; and (2) DBD diagnosis would interact with treatment condition, such that there would be greater effect of the EXP treatment among DBD⁺ adolescents – decreasing marijuana use and externalizing behavior and improving parenting skills. We found that DBD⁺ adolescents reported a higher frequency of marijuana use across the assessment period. As predicted, analyses also revealed that among DBD⁺ adolescents, those who received the EXP treatment showed a significantly greater reduction in frequency of marijuana use than those who received the CONTROL treatment. Changes in externalizing behaviors were not significant; and parenting outcomes were contrary to our prediction. Specifically, parents of DBD⁻ adolescents in the EXP condition improved their parenting (in the area of negative discipline) compared to parents of DBD⁻ adolescents in the CONTROL condition, but no differences in parenting were observed among parents across the treatment conditions for DBD⁺ adolescents.

4.1. Abstinence and Substance Use Outcomes

Our finding that DBD⁺ adolescents reported less marijuana use when treated with the EXP treatment is consistent with a prior study which found that youth with conduct disorder reported significantly less marijuana use over the course of treatment and a 12-month follow-up period when treated with MDFT compared to CBT only. Although the current findings and research by Hendriks et al. (2011) found that family-based treatment was related to greater reductions in substance use among adolescents with SUD and DBD, a study that did not test interactions between DBD status and treatment condition found that adolescent juvenile offenders participating in the Cannabis Youth Treatment project (CBT only treatment) showed substance use improvements that are comparable to adolescents not involved in the juvenile justice system (Webb et al., 2002). Prior studies of non evidence-based treatment programs, on the other hand, have found that adolescents with SUD and DBD return to use more quickly than those with SUD only and have poorer long-term outcomes when treated in residential programs and 12-step based programs.

Taken together, these prior results and findings from our study suggest that specific types of structured outpatient treatments may be particularly important for obtaining relatively good outcomes with DBD youth. For example, DBD⁺ adolescents may show better outcomes following participation in outpatient treatments that involve parent interventions and such structured, behaviorally-based counseling as MET/CBT or CM.

4.2. Externalizing Behavior Outcome

Our results are consistent with previous studies finding significant reductions in externalizing problems with no treatment condition differences. These results suggest that when substance use is treated, there are improvements in the severity of externalizing behavior problems across treatments. Improvements in externalizing behavior for both the EXP and CONTROL conditions may have occurred because parents in the CONTROL condition might have responded to urine drug test results by implementing consequences or other parenting practices that are active in the EXP condition. This is supported by the significant main effects of time on parental monitoring and discipline, but not positive involvement. Furthermore, DBD⁺ adolescents showed significant improvements in both the EXP and CONTROL conditions following the same pattern of decreases and increases over time with no significant time by group interactions.

4.3. Parenting Outcomes

Contrary to our hypothesis, parental positive involvement, deficient monitoring and ineffective discipline outcomes were similar across the EXP and CONTROL conditions for DBD⁺ adolescents. In addition, there was a significant main effect of time and no time by group interactions. Given that the EXP condition included a well-established parenting curriculum shown to improve parenting skills of adolescents with behavior problems, these results were unexpected. These results were also surprising given that adolescents with DBD treated in the EXP condition reported significantly less marijuana use compared to DBD⁺/CONTROL youth. Previous research showing better substance use outcomes among youth assigned to an evidence-based family treatment have associated improvements with changes in parenting. In the current study, both the parent training and CM treatment components were included in the EXP condition, making it impossible to draw conclusions about the specific role of either parent training or CM. As discussed above, our non-significant treatment effects might have resulted from active treatment components in our CONTROL condition (i.e., parents received adolescent urine drug test results and parents participated in drug education), and this is supported by the significant improvement over time for parental monitoring and discipline practices. Future research capable of isolating the effect of CM from parent training is necessary. Parenting could still be a mechanism of change in adolescent substance use, across treatment conditions, as indicated by Stanger et al. (2009) who found that parental monitoring was a strong predictor of post-treatment marijuana use.

For parents of DBD⁻/EXP adolescents, maternal and paternal ineffective discipline improved compared to parents of DBD⁻/CONTROL adolescents, revealing medium effect sizes. Interestingly, DBD⁻ adolescents in the EXP condition did not have significantly better marijuana use outcomes compared to DBD⁻ adolescents in the CONTROL condition. This may have been due to a floor effect; that is, DBD⁻ adolescents receiving the CONTROL treatment had good marijuana outcomes, making it more difficult for the EXP treatment to demonstrate further reductions in marijuana use. For example, mean weeks of continuous abstinence for DBD⁻ adolescents in the CONTROL condition was 6.8, while mean weeks for DBD⁻/EXP was 7.9.

Noteworthy, other experimental research has shown that improvements in deficient monitoring and ineffective discipline lead to better substance use outcomes, irrespective of

treatment condition, if parents are included as part of the treatment and comparison condition. In support of these experimental studies, Henderson et al. found greater change in parenting among parents assigned to receive Multidimensional Family Therapy than the control group that did not involve parents (i.e., adolescent group CBT). Results of our study highlight the importance of considering DBD status when examining the effects of parental involvement on substance use outcomes. The current findings that mothers of adolescents with DBD reported higher ineffective discipline practices, that fathers of adolescents with DBD reported less positive involvement, and the non-significant difference in parenting between the DBD⁺/EXP and DBD⁺/CONTROL conditions, suggest that parents of adolescents with co-occurring SUD and DBD may experience more difficulty implementing effective parenting strategies. Thus, additional parenting support (i.e., more than a weekly evidence-based parent training curriculum) may be necessary for families with an adolescent who has a DBD. Such additional parenting support may need to differentially target maternal and paternal parenting behaviors. This is supported by the observed results for significant main effects of treatment on maternal report, but not paternal report of ineffective discipline. In addition, the current findings suggest that parent training may be particularly beneficial for parents of substance using adolescents without DBD.

4.4. Limitations

Some limitations should be considered while interpreting the current findings. First, participants were predominantly Caucasian, middle-class, intact families, which limits the generalizability of our findings to other populations. Second, our sample size across the DBD by treatment comparisons was relatively small. With a larger sample size, similar interaction and contrast effects might have been significant. This is supported by the medium to large effect sizes for non-significant results. Third, our sample size precluded the addition of other potential moderators such as marijuana use severity at intake.

4.5. Summary and Clinical Implications

The current study examined a treatment combination designed to increase adolescents' motivation to achieve and maintain abstinence, parents' abilities to use effective parenting to decrease substance use and other behavior problems, and adolescents' coping skills to help them adapt to a substance-free lifestyle. Results showed that adolescents with co-occurring SUD and DBD respond better to this treatment combination than the comparison treatment. Not only did adolescents with co-occurring SUD and DBD reduce their substance use, there was a large effect for longer periods of continuous abstinence during treatment. However, there were no significant treatment effects for externalizing behavior. In addition, parents treated in the DBD⁻/EXP condition evidenced better parenting outcomes than parents treated in the DBD⁻/CONTROL condition.

Adolescents with co-occurring SUD and DBD are a particularly high-risk group that likely requires tailored intensive treatments. Results of this study suggest that treatment strategies for adolescent substance use should include more intensive support for parents of adolescents with DBD. One option is to provide incentives for parental participation in parent training. For example, Stanger et al. found that parents randomly assigned to parent-training plus parent CM for daily monitoring of parenting and child behaviors, showed higher rates of daily monitoring and their children evidenced larger reductions in child externalizing behaviors compared to parents assigned to a parent-training only condition (no parent CM). Furthermore, it appears that parents of adolescents without DBD do benefit from intensive parenting interventions, suggesting that parents of adolescents without DBD may also need to improve their parenting skills.

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Figure 1.

Mixed-model repeated measures of ineffective discipline from intake to 9-months post-treatment. Geometric shapes represent observed means for the DBD status/treatment condition combinations. The estimated cubic (maternal report) and linear (paternal report) curves for each DBD status/treatment condition combination is displayed. DBD = Disruptive behavior disorder; EXP = Experimental condition; CONTROL = Control condition.

Table 1
Characteristics of adolescents at intake

	DBD (<i>n</i> = 41)	No DBD (<i>n</i> = 27)	
	<i>M</i> (<i>SD</i>) or %(<i>N</i>)		<i>t</i> or χ^2 (<i>df</i>)
EXP	48.8% (21)	44.4% (15)	
CONTROL	51.2% (20)	55.6% (12)	
Age	16.02 (1.08)	15.89 (1.01)	-.43(66)
% Male	78.0% (32)	89.9% (24)	1.32(1)
% Caucasian	92.7% (38)	88.9% (24)	.29(2)
SES (9 step scale) ^b	6.71 (2.01)	7.31 (1.41)	1.36(66)
% two parent participation	80.4% (33)	70.0% (17)	2.57(1)
% Attention-Deficit/Hyperactivity Disorder	53.7% (22)	40.7% (11)	1.09(1)
% Cannabis Abuse	39.0% (16)	55.6% (15)	1.79(1)
% Cannabis Dependence	53.7% (22)	25.9% (7)	5.12(1)*
Cannabis use per day	2.02 (1.55)	1.45 (.91)	-1.75(66)
Cannabis use 30 days prior to intake	14.66 (10.20)	10.89 (10.26)	-1.45(66)
CBCL Externalizing – Maternal Report ^c	70.76 (7.13)	57.63 (6.75)	-7.58(66)***
CBCL Externalizing – Paternal Report ^c	67.88 (7.10)	54.44 (5.29)	-7.02(49)***
Deficient Monitoring – Maternal Report	22.87 (5.10)	19.87 (4.45)	-2.50(66)*
Deficient Monitoring – Paternal Report	22.35 (4.52)	20.82 (4.65)	-1.12(48)
Ineffective Discipline – Maternal Report	23.53 (4.88)	20.93 (3.66)	-2.37(66)*
Ineffective Discipline – Paternal Report	21.91 (5.17)	20.28 (4.60)	-1.12(49)
Positive Involvement – Maternal Report	58.31 (7.25)	59.75 (6.22)	.85(66)
Positive Involvement – Parental Report	53.53 (6.65)	56.00 (7.48)	1.20(48)

Note. DBD = Disruptive behavior disorder; EXP = Experimental Condition; CBCL= Child Behavior Checklist; SES = Socioeconomic status.

^a *t*-tests for continuous variables/ χ^2 for categorical variables.

^b A score of 7 on the Hollingshead scale represents the following types of occupations: social worker, teacher, and manager.

^c Mean values represent T-scores.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Table 2

Marijuana abstinence and rates of use at each assessment

Rates of THC Positive Urine Drug Screens					
	Intake	End of Treatment	3-month	6-month	9-month
DBD+/EXP	0.71	0.38	0.62	0.62	0.81
DBD+/CONTROL	0.70	0.40	0.70	0.65	0.70
DBD-/EXP	0.47	0.33	0.40	0.53	0.40
DBD-/CONTROL	0.67	0.42	0.75	0.58	0.67
% days of Marijuana Use					
	Intake	End of Treatment	3-month	6-month	9-month
DBD+/EXP	47.95	7.80	7.59	17.21	20.63
DBD+/CONTROL	61.26	14.87	21.15	20.57	35.07
DBD-/EXP	38.60	9.61	6.05	14.65	9.36
DBD-/CONTROL	44.59	8.33	10.43	19.40	20.42

Note: DBD = Disruptive behavior disorder; EXP = Experimental. Table 3 provides results for the main effects of DBD, the main effects of treatment condition, and the DBD+; EXP vs. CONTROL and DBD-; EXP vs. CONTROL contrasts.

Table 3
The effect of DBD status on youth marijuana abstinence, marijuana use, and externalizing behavior from intake to 9 month follow-up

Estimated Model Parameter	THC Positive		% days of			Externalizing Behavior			
	Urine Drug Screen ^a	OR	95% CI	β	SE	Marijuana Use ^b	β	SE	Parental Report ^d
Model 1									
DBD Status		1.63	[0.80, 3.32]	0.11*	0.05	0.23	0.47***	0.05	0.46***
Treatment Condition ^e		0.72	[0.36, 1.46]	-0.13*	0.05	0.26	-0.10*	0.05	0.02
Model 2									
DBD $\times$ Treatment Condition		2.20	[0.52, 9.25]	-0.77	0.86	0.18	-0.25	0.83	-0.16
Contrasts									
DBD:EXP vs. CONTROL		0.99	[0.40, 2.50]	-0.15*	0.06	0.34	-0.11	0.06	0.01
DBD:EXP vs. CONTROL		0.45	[0.15, 1.36]	-0.13	0.05	0.16	-0.10	0.05	0.02

Note:

^a Results are from Generalized Estimation Equation analysis.

^b Results are from Mixed Model Repeated Measures analysis. OR = odds ratio; CI = Confidence interval; β = standardized beta estimates; SE = standard error; d = Cohen's effect size.

^c $n = 68$.

^d $n = 51$.

^e Treatment condition was coded as 1 = EXP, 0 = Control. DBD = Disruptive behavior disorder. EXP = Experimental.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

The effect of treatment condition and DBD status on changes in maternal and paternal parenting behavior from intake to 9 month follow-up

Table 4

Estimated Model Parameter	Maternal Positive Involvement			Maternal Deficient Monitoring			Maternal Ineffective Discipline			Paternal Positive Involvement			Paternal Deficient Monitoring			Paternal Ineffective Discipline		
	β	SE	d	β	SE	d	β	SE	d	β	SE	d	β	SE	d	β	SE	d
Model 1																		
DBD Status	-0.09	0.06	0.17	0.12*	0.06	0.25	0.18**	0.06	0.36	-0.16*	0.07	0.33	0.11	0.07	0.23	0.04	0.07	0.08
Treatment Condition	0.05	0.06	0.10	-0.02	0.06	0.04	-0.17**	0.06	0.33	-0.01	0.07	0.02	-0.06	0.07	0.12	-0.03	0.07	0.06
Model 2																		
DBD × Treatment Condition	-0.43	1.01	0.11	-0.04	0.98	0.01	1.05	0.90	0.26	1.68	1.00	0.50	0.99	1.00	0.29	3.07**	0.99	0.90
Contrasts																		
DBD ⁺ : EXP/COTROL	0.03	0.07	0.06	-0.02	0.07	0.04	-0.10	0.07	0.22	0.07	0.08	0.16	-0.01	0.08	0.01	0.13	0.08	0.28
DBD ⁻ : EXP/CONTROL	0.05	0.06	0.16	-0.02	0.06	0.03	-0.17**	0.06	0.48	-0.01	0.07	0.34	-0.06	0.07	0.30	-0.03**	0.07	0.62

Note: DBD = Disruptive behavior disorder. EXP = Experimental. β = standardized beta estimates; SE= standard error. d= Cohen's effect size. Maternal reports $n = 68$. Paternal reports $n = 50$ for Positive Involvement and Deficient Monitoring and $n = 51$ for Negative Discipline.

* $p < .05$.

** $p < .01$.

*** $p < .001$.