**1.**

**Effects of two voucher-based interventions for smoking cessation among treatment-seeking patients**

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The aim of this study was to assess the effectiveness of two Contingency Management (CM) procedures in combination with a Cognitive-Behavioral Treatment (CBT) for smoking cessation among treatment-seeking patients from the general population.

A randomized controlled trial was conducted with 120 participants who were randomly assigned to one of three treatment conditions in a community setting: CBT (N=40), CBT plus CM for abstinence (CMA) (N=40), and CBT plus CM for shaping cessation (CMS) (N=40).The CM procedures included a voucher program through which nicotine abstinence (CMA) or closer approximations to abstinence (CMS) were reinforced on a schedule of escalating magnitude of reinforcement with a reset contingency. Self-reported smoking status was confirmed with both carbon monoxide (CO) level in expired air and cotinine levels in urine.Of the patients who received CBT, 80%, completed 6 weeks of treatment, versus 97.5% of those who received CBT+CMA, and 100% of the CBT+CMS group (*p* < .05). At the post-treatment assessment, 55% of the patients assigned to the CBT condition achieved abstinence in comparison to the 95% in the CBT+CMA group, and 92.5% in the CBT+CMS group (*p<*.05). At the one-month follow-up, 32.5% of the patients who received CBT maintained smoking abstinence, versus 60% in the CBT+CMA group, and 57.5% in the CBT+CMS group (*p* < .05). Results showed that treating smoking by combining CBT with vouchers was more effective than CBT alone. Both CM procedures were equally effective.

**2.**

**Does the magnitude of reduction in cigarettes per day predict smoking cessation?**

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**Background:** Reducing the number of cigarettes per day (CPD) using NRT is an effective method of increasing cessation in smokers. However, whether this is due to use of NRT or reduction per se is unclear. This review identifies relationships between the magnitude of reduction in CPD and likelihood of cessation.

**Methodology:** The authors searched PubMed, Cochrane, PsychINFO, ClinicalTrials.gov and their personal libraries. Ten of the 71 identified reduction trials reported on the magnitude of reduction in relationship to the likelihood of cessation and provided a total of 12 tests of the magnitude of reduction as it relates to cessation.

**Findings:** Ten of the 12 identified tests found that the magnitude of reduction predicts abstinence. Two of 4 tests with no medication and 4 of 4 tests with medication found that the magnitude of reduction predicts abstinence. Four tests combined conditions to include participants with and without medication and found that the magnitude of reduction predicts abstinence. Five tests reported effect sizes for a dichotomous measure of reduction indicating that reductions greater than 50% are associated with 20% to 430% increases in likelihood of achieving abstinence. One test reported that each 1% decrease in CPD is associated with a 3% increase in likelihood of cessation.

**Discussion:** These findings suggest increased reduction in CPD per se is associated with increased cessation. Future research should examine the effect of reduction in CPD without pre-treatment NRT in participants randomly assigned to reduction and non-reduction conditions.

**3.**

**Cost-effectiveness of a voucher-based intervention for smoking cessation**

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**Aim:** This study analyzed the cost-effectiveness of using a voucher-based CM protocol in combination with a cognitive-behavioral treatment (CBT) for smoking cessation among treatment-seeking patients from the general population.

**Method:** This cost-effectiveness analysis is based on a randomized clinical trial conducted at the Addictive Behaviors Clinic of the University of Oviedo (Spain). A total of 92 patients were randomly assigned to one of two treatment conditions: CBT (n= 49) or CBT + CM (n= 43). The CM procedure included a voucher program through which nicotine abstinence was reinforced on a schedule of escalating magnitude with a reset contingency. CM participants earned voucher-based incentives contingent on providing biochemical evidence of smoking abstinence. Incremental cost-effectiveness was used to evaluate both alternatives. The primary patient outcome was the longest duration of confirmed abstinence (LDA) at a 6-month follow-up.

**Results:** The average cost per participant in the CBT condition was $208.82 (95% CI = 205.01-212.62), and $543.27 (95% CI: 506.07-580.48) in the CBT + CM condition. The incremental cost of lengthen the LDA by 1 day using a voucher-based CM protocol was $14.01.

**Conclusions:** Although adding a CM protocol to a CBT required additional costs, the effectiveness of the CBT + CM condition was significantly greater at 6-month follow-up assessment. In a cost-effectiveness plane, the CBT + CM intervention would be place on the north-east quadrant (more costly but also more effective).

**4.**

**Behavioral Analysis of Nicotine Self-Administration in Non-human Primates**

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Despite the high prevalence of nicotine use in humans, robust nicotine self-administration has been difficult to demonstrate in laboratory animals. In the present study, we conducted a parametric analysis of nicotine self-administration in non-human primates to better understand the conditions that support nicotine intake. Male (n=3) and female (n=3) rhesus monkeys were trained to self-administer intravenous nicotine (0.01 mg/kg) under a fixed ratio (FR) 1 schedule of reinforcement during daily 90 min sessions. After self-administration of vehicle and a range of nicotine doses (0.001-0.1 mg/kg) was evaluated, the dose was returned to 0.01 mg/kg nicotine and the FR was increased across multiple sessions in an ascending order (i.e. 1, 3, 6, 10, 18, 30, 60, 100, etc.). To compare nicotine self-administration with that of another stimulant, monkeys were subsequently given access to 0.01 mg/kg cocaine using identical testing procedures. Results indicate that nicotine self-administration followed an inverted-U pattern with the peak injections per session at 0.0032 (48 inj) and 0.01 (43 inj) mg/kg. Both nicotine and cocaine self-administration gradually decreased as the fixed ratio size was increased.

Application of the exponential model of demand to the FR data found that essential value for cocaine was significantly higher than that for nicotine. These data show that high levels of nicotine self-administration can be achieved in non-human primates but that its reinforcing strength is limited.

Additional studies with other nicotine doses are ongoing.

**5.**

**Self-Tailored Online Deposit Contracting to Promote Smoking Abstinence**

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More innovative and effective treatments are required to aid the millions of smokers who attempt to quit unsuccessfully each year. In two studies, we evaluated whether an Internet-based smoking cessation program would promote abstinence and whether participants would find it acceptable. Participants tracked and submitted their smoking levels twice per day using carbon monoxide (CO) meters and a study website. In addition to receiving educational information, participants made a monetary deposit of their choosing, which they could earn back for meeting individualized smoking goals. Following baseline, participants attempted to gradually reduce their smoking across 4 days and to completely abstain for the remaining 10 days of the study. Eight smokers participated in Study 1. During the reducing and abstaining phases, 15% and 53% of the samples were negative for recent smoking compared to 1% during baseline. Average ratings of treatment acceptability were favorable across all components. Study 1 suggests that an online monetary deposit contract system is a feasible, acceptable, and efficacious intervention to promote smoking abstinence. Abstinence rates were similar to previous deposit studies but lower than traditional contingency management treatments. In Study 2, participants selected a family member or peer who agreed to support them in their quit attempt. Supporters could track participant’s smoking progress and offer encouragement in an online forum. In addition, supporters were asked to pledge support for the smoker by matching his/her monetary deposit, which the smoker could earn for meeting treatment goals. Study 2 is ongoing but available data will be presented.

**6.**

**Predictors of Treatment Response for Cannabis Use Disorders:**

**Tobacco Use and Delay Discounting**

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**Geisel School of Medicine at Dartmouth**

**Background:** While efficacious treatments for cannabis use disorders (CUD) have been developed, relapse rates remain high and predictors of treatment outcome are unclear. Previous research has suggested that two variables, tobacco use and delay discounting, are associated with treatment outcomes. The objectives of this study were to determine whether tobacco use and delay discounting predict treatment outcomes for CUD, and examine the relationship between tobacco use and delay discounting.

**Method:** The study sample was composed of adults (age 18-60) seeking treatment for CUD. Participants were enrolled in a 12-week randomized clinical trial which included twice-weekly visits with urine screenings to assess cannabis abstinence throughout the duration of the study. Participants completed a delay discounting task during intake for cannabis and monetary rewards, and timeline follow-back assessed tobacco and cannabis use at intake and throughout treatment.

**Results:** Cannabis + tobacco users had fewer cannabis-negative urine screenings relative to cannabis only users, however this difference was not statistically significant. Cigarettes smoked per day prior to and during treatment were not associated with cannabis-abstinence rates. Cannabis + tobacco users also did not show greater delay discounting than cannabis only users on any of the discounting tasks. However, greater discounting of $1000 of money predicted fewer cannabis-negative tests during treatment.

**Conclusion**: Adults that discount monetary rewards have poorer treatment outcomes, which is consistent with a previous study among adolescents with CUD. Unexpectedly, tobacco use did not significantly alter treatment outcomes, and cannabis + tobacco users did not show significantly higher discounting rates relative to cannabis only users. Further analyses with larger sample sizes will be conducted to more comprehensively explore the relationship between tobacco use, discounting, and treatment outcomes.

**7.**

**An Incentive-Based Intervention for Smoking Cessation in Opioid-Maintained Patients**

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Smoking is highly prevalent in opioid-dependent individuals and associated with significant morbidity and mortality. We have developed a contingency-management (CM) intervention for reducing smoking among methadone- and buprenorphine-maintained patients, wherein participants earn financial incentives contingent upon biochemical verification of abstinence. In two initial studies, we demonstrated its efficacy in producing smoking abstinence during the initial two weeks of a quit attempt, a period crucial for longer-term success (Dunn et al., 2008, 2010). More recently, we replicated these results and extended them to demonstrate that ongoing reinforcement is likely necessary for favorable longer-term outcomes (Sigmon et al., in prep).With the completion of these three randomized trials, we have also begun examining predictors of success and relapse among the 120 participants that received the intervention. This poster will review the primary outcomes of the above three trials and present new data on the potential utility of the construct of craving, as measured by the Questionnaire on Smoking Urges-Brief (Cox, Tiffany, & Christen, 2001), as a predictor of smoking relapse within this rigorous behavioral intervention. Our preliminary analyses suggest a strong positive relationship between daily craving and biochemical smoking status across study visits, particularly in the ability of craving to predict subsequent urinary cotinine levels (*γ* = 40.01, *SE* = 8.01, *p*< 0.001). A complete analysis of this association will be presented in the poster. In summary, our poster will highlight the efficacy of CM for promoting abstinence in opioid-maintained smokers and explore the utility of craving for identifying individuals at risk for relapse before it occurs.

**8.**

**Using Financial Incentives to Promote Smoking Abstinence in Patients with Pulmonary Disease**

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**Aim:** Chronic obstructive pulmonary disease (COPD) is a leading cause of morbidity and mortality, with an estimated 90% of all COPD deaths in the U.S. attributable to smoking. While smoking cessation is identified as the most effective intervention to reduce COPD-related morbidity and mortality, rates of cessation among COPD patients are often poor.

We are conducting a pilot study to evaluate the efficacy of a contingency management intervention for promoting initial smoking abstinence in patients with COPD.

**Methods:** Daily smokers (N=30) with COPD (FEV1/FVC<70%) will be randomized to an Incentives or Control experimental group. All visit the clinic daily for 14 days and provide breath and urine samples for biochemical verification of smoking status. Incentives participants earn financial incentives delivered contingent upon smoking abstinence. Controls receive vouchers of the same value but independent of smoking status.

**Results:** Thus far, 23 participants have been randomly assigned to the Incentives (n=11) or Control (n=12) experimental group. Participants have moderate COPD (FEV1=59% normal), report smoking 24 cigs/day, and have smoked regularly for 38 years. Preliminary analyses reveal a trend toward greater smoking-abstinent participants in the Incentives vs. Control group at final study visit (36.4% vs. 8.3%; p=0.10).

**Conclusions:** Preliminary results suggest an intensive, incentive-based intervention is feasible and may be effective in producing initial smoking abstinence in these hard-to-treat smokers with COPD. Upon study completion, we will seek to characterize nicotine withdrawal and examine whether smoking abstinence in pulmonary patients is associated with improvements in respiratory symptomatology and associated quality of life.

**9.**

**Incentive-Based Smoking Cessation Treatment Reduces Severity of Psychiatric Symptoms in Pregnant & Newly Postpartum Women**

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**Vermont Center on Behavior and Health, University of Vermont**

Previously, Lopez, Skelly & Higgins (in press) found that, in addition to decreasing smoking, financial incentives for smoking cessation decreased postpartum depressive symptoms, as measured by the Beck Depression Inventory (BDI), in pregnant and newly postpartum women at-risk for depression.

The purpose of the present study was to assess whether the intervention impacts a broader array of psychiatric symptoms as measured by the Brief Symptom Inventory (BSI). Participants were 289 pregnant cigarette smokers who participated in smoking cessation efficacy trials examining voucher based financial incentives. They were assigned to an abstinence-contingent intervention or non-contingent voucher control condition. Based on their history of depression and BDI scores at intake, 120 participants were categorized as Depression-Prone (Dep+) and 169 as Depression Negative (Dep-). The BSI was administered at 8 time points starting in pregnancy through 24 weeks postpartum. Financial incentives significantly reduced BSI total scale scores, as well as, Depression and Anxiety subscale scores in all women in the aforementioned contingent condition. For Dep- women, Somatization and Anxiety subscale scores were decreased. Among Dep+ women, financial incentives significantly reduced BSI total scale scores and 7 of 9 subscale scores starting in late pregnancy and continuing through 12-weeks postpartum.

These results demonstrate that providing smoking cessation-based financial incentives to pregnant and newly postpartum women reduces psychiatric symptoms. This effect is especially evident among Dep+ women who experience reductions across a wide range of symptoms during the period when they are most at-risk for postpartum depression.

**10.**

**A Laboratory-based Evaluation of Exercise plus Contingency Management for Reducing Cigarette Smoking**

**A. Kurti1 & J. Dallery2**

**1Vermont Center on Behavior and Health, University of Vermont & 2University of Florida**

Both contingency management (CM) and exercise have shown promise as smoking cessation treatments, but their combined effects have not been evaluated. The present study evaluated whether CM (in which motivational incentives are provided for abstinence) plus exercise reduced smoking more than either component alone.

**Method:** In a within-subjects design, 20 smokers were exposed to exercise plus CM, exercise plus CM-control (non-contingent incentives), inactivity plus CM, and inactivity plus CM-control. **Results:** CM increased latencies to smoke and decreased total puffs (*Mdns =* 39.6 min and .8 puffs, respectively) relative to CM-control (*Mdns =* 2.5 min and 12.8 puffs). Exercise decreased craving relative to baseline for craving based on both the pleasurable consequences of smoking (*D* = -10.7 on a 100-point visual analog scale) and anticipated relief from withdrawal (*D* = -5.9), whereas inactivity increased both components of craving (*Ds* = 7.6 and 3.5). Exercise had no effect on smoking or a measure of temporal discounting.

**Conclusions:** Although exercise decreased craving, it did not affect smoking behavior. Exercise plus CM was not more effective than CM alone.

**11.**

**Cigarette Purchase Task as Predictor of Response to Contingent Vouchers for Smoking Abstinence among Smokers with Substance Use Disorders**

**C. Murphy, J. MacKillop, R. Martin, J. Tidey, S. Colby, D. Rohsenow.**

**Rationale:** We investigated whether baseline demand for cigarettes versus money predicted response to contingent monetary rewards for abstinence. The Cigarette Purchase Task 1 (CPT) assesses sensitivity to price versus desire for cigarette consumption among general smokers, thus the monetary value of smoking based on the following indices: “elasticity of demand” (slope of the demand curve), “maximum expenditure across intervals of price” (Omax), “breakpoint of price” (price at which consumption is reduced to zero), and “intensity of demand” (number of cigarettes smoked at minimal or no cost).

**Methods:** In our study comparing contingent vouchers (CV; giving monetary vouchers for abstinent readings for 14 days) to noncontingent vouchers (NCV), the CPT was asked at baseline to predict number of abstinence days while receiving monetary rewards for smoking cessation.

**Results:** Demand indices were associated with concurrent measures of smoking and nicotine dependence. High demand for cigarettes at baseline predicted fewer abstinent CO readings only for individuals who were not incentivized to quit smoking.

**Conclusions:** While cigarette demand measures an individual's value of tobacco as a reinforcer, abstinence-contingent vouchers introduce an alternate, competing source of reinforcement that may increase the likelihood of smoking abstinence and cessation.

**12.**

**Revisiting the Role of Nicotine in Smoking**

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Nicotine withdrawal is widely believed to play a pivotal role in motivating smoking behavior, but research has commonly confounded the pharmacological (i.e. reduced blood levels) and behavioral (i.e. interruption of self-administration rituals) components of withdrawal. The present study sought to isolate the impact of pharmacological withdrawal on smoking motivation, as well as smoker’s ability to differentiate cigarettes based on their nicotine content. Participants (*N* = 37) attended a baseline session that included an assessment of nicotine dependence. Afterwards, they completed two laboratory sessions following overnight smoking deprivation. At each session, participants smoked three nicotinized (.6 mg yield) or de-nicotinized (.05 mg yield) cigarettes. Upon arrival and immediately following each cigarette, participants reported their craving, withdrawal and mood. Participants also rated their subjective response to each cigarette across several dimensions. Results revealed robust changes in craving, withdrawal and mood across cigarettes, with the largest changes following the first cigarette. The differential effect attributable to nicotine was generally weak or absent. Despite this, smokers consistently rated the nicotine cigarettes more positively. Nicotine dependence moderated the effects of smoking across most motivational indices, but not the differential impact of nicotine. Thus, while smokers were able to detect differences between cigarettes, this did not impact smoking motivation. These findings may help explain the growing popularity of electronic nicotine delivery systems relative to other forms of nicotine replacement. At a time when major research and public health efforts are targeting nicotine, it is crucial that the behavioral components of smoking continue to receive consideration.

**13.**

**Heaviness of Cigarette Smoking Among Treatment-Seeking Cannabis Users**

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**Background:** Cigarette smoking is ubiquitous among substance-using populations. Despite its pervasive nature and negative associated health consequences, the epidemiology of cigarette smoking among drug users remains relatively poorly understood. Little is known about cigarette smoking characteristics, such as what differentiates light and heavy smokers among substance-using populations, particularly among treatment-seeking cannabis users.

**Methods:** Data came from the screening visit of a 12-week outpatient cannabis treatment program in Baltimore, Maryland. Descriptive statistics and logistic regression analyses were used to describe the associations between sociodemographic and drug use characteristics with heavy smoking (i.e., 10+ cigarettes per day (CPD)).

**Results:** Of 182 participants, 65% of were current smokers. Smokers reported smoking an average of 4.2 (SD=5.4) CPD, and smoking for an average of 12.7 (SD=9.8) years. Approximately 32% were heavy smokers. In adjusted analyses, the average number of alcoholic drinks per week over the past 4 weeks (aOR=1.08, 95% CI=1.00-1.16) and daily cannabis use (aOR=4.96, 95% CI=1.03-23.93) were significantly associated with heaviness of cigarette smoking.

**Discussion:** Despite heavy and regular cannabis use, as well as an average lifetime smoking history of almost 13 years, smokers in this sample reported smoking few CPD on average. Characteristics (i.e., substance use characteristics) typically found to be correlates of smoking status and intensity among the general population and other groups were found to be significantly associated with heaviness of smoking in the present analyses. Findings help to further characterize the epidemiology of cigarette smoking among a vulnerable group. Future research is needed to investigate the low intensity of smoking among treatment-seeking cannabis users, and whether these findings generalize to samples of persons seeking treatment for other substances, as well as non-treatment-seeking cannabis users.

**14.**

**Smoking Topography of Menthol and Non-Menthol Cigarettes in People**

**With and Without Schizophrenia**

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The cooling and analgesic properties of menthol are thought to enable smokers to take larger or more frequent cigarette puffs, increasing toxin exposure. However, studies have found inconsistent effects of menthol on topography. Smokers with schizophrenia (SS) have more intense puffing characteristics than non-psychiatric controls (CS), and one study found that menthol may contribute to these effects. The aim of this project was to compare menthol and non-menthol topography in SS and CS. It was hypothesized that SS would smoke more intensely than CS and that menthol smokers would smoke more intensely than non-menthol smokers. Using desktop CRESS systems, topography was collected over 5-hr periods of usual-brand smoking in 32 SS and 33 CS. Effects of group and menthol status on topography variables were analyzed using 2 x 2 ANOVAs. Menthol preference did not differ by group (SS: 46%; CS: 64%). SS smoked more puffs and had greater cumulative puff volumes (i.e., total puffs x average puff volume), shorter puff durations and shorter inter-puff intervals than CS (*p’*s < .05). Menthol smokers took smaller puffs and had lower cumulative puff volumes and puff flow rates than non-menthol smokers (*p’*s < .05). CO boost from the 5-hr sessions did not significantly differ by group or menthol status. Covarying race did not affect the pattern of results. In this cross-sectional comparison, there was no indication that menthol is associated with more intense puff topography among SS or CS. Mechanisms by which menthol preference may confer additional health risk from cigarettes remain unclear. **Funding:** Supported by P50DA036114, U54DA031659, and R01DA14002.

**15.**

**The Effects of Nicotine and Minor Tobacco Alkaloids on Food Intake in Rats: A Pilot Study**

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Nicotine is thought to play a primary role in smoking’s effects on body weight. However, the inability of NRT to prevent weight gain suggests that other constituents may be important. In light of a potential FDA-imposed nicotine reduction policy, it is important to investigate whether non-nicotine constituents may prevent weight gain and facilitate continued smoking. The purpose of this pilot study was to investigate changes in food intake following administration of nicotine and minor tobacco alkaloids. Male Holtzman rats (3-4/group) were trained to lever press for food pellets during daily 2h sessions in operant chambers. Following 2 weeks of training and stable food intake, the effects of saline and nicotine (0.25 - 1.00 mg/kg), nornicotine (0.50 - 6.00 mg/kg), cotinine (1.00 -100.00 mg/kg), anatabine (0.25 - 3.00 mg/kg), or anabasine (0.50 - 4.00 mg/kg) were assessed. Doses were administered in ascending order 15 min before test sessions. All drugs, except cotinine, produced a dose-dependent reduction in food intake. High doses of anatabine and anabasine produced a greater reduction in food intake than nicotine. These data are the first to suggest that minor tobacco alkaloids have appetite suppressant effects and represent novel candidates for anti-obesity drugs. They also suggest a potential need to regulate minor tobacco alkaloids.

**16.**

**Influence of Smoking and BMI on Birth Weight and Preterm Birth**

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**Objective**: Maternal smoking and obesity are independent risk factors for growth restriction/preterm birth and macrosomia, respectively, although little is known about the interaction of these factors. The goal of this study is to examine how maternal obesity may moderate the impact of smoking status on infant birthweight (BW) and preterm birth (PTB).

**Study Design:** This is a secondary analysis of data from several prospective randomized trials at the same institution evaluating the use of incentives for smoking cessation and relapse prevention during pregnancy. 384 women with a singleton pregnancy, <25 weeks gestation, who self-reported smoking were included. Data are expressed as mean ± SD or %. ANOVA and logistic regression were used for statistical analysis with significance p <0.05.

**Results:** 7% of women were underweight, 50% normal weight, 17% overweight, and 26% obese. 53% were smokers (SM) and 47% non-smokers (NS). Overall there was not a significant interaction of smoking and BMI on BW and PTB. Only normal weight SM had a decreased GA at delivery (p=0.0005). Normal/underweight SM had a 5.2x increased risk of PTB compared to NS (95% CI 1.5-18.6); smoking was not associated with increased PTB in the overweight/obese groups. Mean BW was lower in the normal weight and obese SM compared to NS (p=0.0001 and 0.0004, respectively) but not statistically significant in other BMI groups. Only normal weight SM were more likely than NS to have low BW neonates (OR 5.0, 95% CI 1.4-18). Compared to NS, normal weight and obese SM were less likely to have a macrosomic fetus (OR 0.2, 95% CI 0.04-0.9 and 0.3, 95% CI 0.1-0.95).

**Conclusion:** Although there were some effects of smoking and BMI on PTB and BW, we did not detect a significant interaction of smoking and BMI. However, obesity appears to attenuate the adverse impact of smoking on rates of preterm delivery but does not affect the influence of maternal smoking on birthweight.

**17. Increasing the Value of an Alternative Monetary Reinforcer Reduces Cigarette Choice in Adolescents**

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**Aims:** Smoking can be conceptualized as an operant behavior maintained by the reinforcing aspects of cigarettes. Changing the magnitude and availability of alternative reinforcers should shift behavior away from smoking. Adults’ smoking behavior is sensitive to the magnitude and availability of alternative reinforcers; however, the extent to which the same is true for teens has not yet been shown in the laboratory. Compared to adults, adolescents tend to smoke fewer cigarettes per day, smoke more intermittently and have shorter smoking histories; therefore, results obtained with adult smokers may not always generalize to adolescent smokers.

**Methods:** To test the sensitivity of adolescent smoking choice to changes in the magnitude of alternative reinforcement, we gave adolescents (*N* = 85; M = 16.45 years old, SD = 1.415) the opportunity to make 20 choices between 2 puffs of their usual-brand cigarette or money following overnight abstinence. The magnitude of the monetary reinforcer varied across sessions in counterbalanced order ($0.00, $0.10, and $0.50).

**Results:** Results indicated that adolescents’ choices for puffs decreased as a function of increasing monetary reinforcer magnitude, while money choices increased. A repeated-measures analysis of variance confirmed that mean choices for puffs were significantly different across monetary amount (*F*(2,107)= 40.91, *p* < .0005). Paired t-tests revealed that mean choices for puffs when the alternative money reinforcer value was $0.00 significantly differed from means puffs when the money value was $0.10 (*t*(85)=3.189, *p*=.002) as well when it was $0.50 (*t*(85)=8.427, *p*< .0005). Mean choices for puffs also differed significantly when the value was $0.10 versus when it was $0.50 (*t*(85)=6.090, *p*< .0005).

**Conclusions:** These results extend previous laboratory work on the relationship between alternative reinforcers and cigarette choice to adolescents, and demonstrate that adolescent smoking behavior is sensitive to changes in the magnitude of concurrently available monetary reinforcers. These results have implications for behavioral treatments such as contingency management.

**Support:** Research supported by NIDA grants T32 DA016184 and R01 DA16737

**18. Very Low Nicotine Content Cigarettes: A Comprehensive Review**

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**Elizabeth Ruggieri, B.A.1,2, Morgan Tromblee, B.A.1,2, & Stephen T. Higgins, Ph.D.1,2,3**

**University of Vermont**

The Family Smoking Prevention and Tobacco Control Act (FSPTCA) of 2009 gave the US Food and Drug Administration (FDA) the authority to regulate tobacco. This includes the ability to assess and potentially implement a proposal by Benowitz and Henningfield (1994) to reduce the nicotine yield of cigarettes to very low (and potentially sub-addictive) levels. This proposal has the potential to result in substantial population-wide decreases in the prevalence of cigarette smoking via dual processes of reducing nicotine dependence in new smokers and facilitating the ability of established smokers to quit. However, prior to implementation of this nicotine-reduction plan, critical information on a variety of questions is needed. To this end, the present review brings together in a single review all available articles describing original studies experimentally manipulating nicotine content involving VLNC cigarettes in human study participants. A rigorous search process was conducted to identify all extant articles. The search was limited to English-language, empirical research studies (not reviews or commentaries) published in peer-reviewed journals during the 25-year period from 1989 to 2014. An article met inclusion criteria if (A) denicotinized cigarettes (as compared to “light” cigarettes) were administered to humans (not animals) and (B) some effect was measured that enabled comparisons to be made between denicotinized cigarettes and regular nicotine content cigarettes. As discussed above, cigarettes were considered denicotinized if a non-filter method of nicotine extraction or reduction was utilized (e.g., supercritical CO2 extraction; genetically modified tobacco). These parameters resulted in 85 articles that form the basis of the review. Conclusions about the reinforcing, craving, withdrawal and sensory effects of VLNC cigarettes are made where possible, and new directions are suggested for special and disadvantaged populations that are underrepresented in the literature.

**19. Characterizing Nicotine Withdrawal among Opioid-Maintained Smokers**

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**Vermont Center on Behavior and Health, University of Vermont**

**Aim:** Withdrawal is a central component of nicotine dependence and its severity may influence risk of relapse. While withdrawal typically peaks within the first two days following a quit attempt and gradually diminishes thereafter, less is known about its pattern in vulnerable groups of smokers with disproportionate rates of smoking. One such group is opioid-dependent individuals, in whom smoking rates are high and treatment response notoriously poor. We have developed an intervention which produces initial abstinence among opioid-maintained smokers (Dunn et al., 2008, 2010; Sigmon et al., in prep). Here we characterize nicotine withdrawal in these participants and contrast it with withdrawal seen previously in a general population of smokers (Hughes, 1992).

**Methods:** Fifty-three opioid-maintained patients completed a 2-week smoking intervention and were biochemically-verified to be abstinent. Withdrawal was assessed daily using the Minnesota Nicotine Withdrawal Subscale (Hughes & Hatsukami, 1998).

**Results:** At intake, participants smoked on average 18 cigs/day, had cotinine levels of 1208 ng/ml and moderate nicotine dependence. Nicotinewithdrawal was mild at intake (*M=*1.86 out of a possible range of 0-4), comparable to scores seen in non-substance abusing smokers. Withdrawal then steadily decreased over the 14-day study, which stands in contrast to the peak typically seen at Day 2 in prior studies. Specifically, at Day 2 participants’ withdrawal had declined to 73% of baseline levels (*M*=1.36), compared to 142% of baseline (*M*=2.33) in a general population of smokers. By Day 14, participants withdrawal reached 47% of baseline (*M=*.87), compared to 104% (*M=*1.71) in the general population.

**Conclusion:** The pattern of nicotine withdrawal in opioid-dependent patients may depart from that typically seen among the general population of smokers. How this pattern may influence patients’ success with quitting smoking remains unclear. The mechanism underlying this difference, such as a unique pharmacological interaction whereby opioids may attenuate nicotine withdrawal, also warrants further study.

**Funding:** Supported in part by NIDA R01DA019550 (Sigmon) and NIH/FDA P50DA036114 (Higgins).

**20. Correspondence between Self-Reported and Biochemical Measures of Smoking in Opioid-Dependent Pregnant Women**

**C. A. Arger, S. T. Higgins and S. H. Heil**

**Vermont Center on Behavior and Health, University of Vermont**

Smoking exacerbates adverse outcomes among opioid-dependent pregnant women (e.g., a more severe neonatal abstinence syndrome in exposed neonates). Vermont birth certificate data for opioid-dependent pregnant women indicates a significant decrease in their self-reported smoking rate over the course of pregnancy, from a mean of 17.9 cigarettes per day prior to pregnancy to 13.8, 10.9, and 9.7 in the first, second and third trimesters, respectively. The present study examined self-reported smoking rate and biochemical measures of smoking in 18 opioid-dependent pregnant women to test whether self-reported decreases in smoking were paralleled by decreases in biochemical measures. All women were participating in clinical trials for smoking cessation, but were still smoking. Self-reported cigarettes per day prior to pregnancy was collected at the intake assessment. Self-reported cigarettes per day, breath CO, and urine cotinine were collected at the intake assessment, at a second assessment 1 month later (early pregnancy assessment), and again at the end of pregnancy (≥ 28 weeks EGA; late pregnancy assessment). Like birth certificate data, self-reported smoking rate decreased substantially over the course of pregnancy, from a mean of 22.6 cigarettes per day prior to pregnancy to 15.5, 7.5, and 9.0 cigarettes per day at intake, early pregnancy, and late pregnancy assessments, respectively. However, parallel changes were not evident in biochemical measures of smoking. Mean CO was 13.3, 10.0, and 12.3 ppm and mean urine cotinine was 1422.8, 1387.8, and 1294.1 ng/ml at the intake, early pregnancy, and late pregnancy assessments, respectively. Potential explanations for discrepancies between self-report and biochemical measures include misrepresentation of smoking or reductions in cigarettes per day offset by changes in smoking topography. Further research is needed to understand changes (or lack thereof) in smoking among opioid-dependent pregnant women.

**21. Electronic Cigarettes on Twitter: Sentiment Analysis of Organic Tweets**

**and their response to Political and Social Media Marketing Campaigns**

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**M. Couch, and C. Danforth**

**University of Vermont**

Electronic Nicotine Delivery Systems, or e-­‐cigarettes, have become a popular alternative to traditional tobacco products. The vaporization technology present in e-­‐cigarettes allows consumers to simulate tobacco smoking without igniting the carcinogens found in tobacco. The health risks, marketing regulations, and the potential of these devices as a form of nicotine replacement therapy are hotly debated both politically and clinically.

Twitter, a mainstream social media outlet, provides a means to survey the popularity and sentiment of consumer opinions regarding e-­‐cigarettes. Using Big-­‐Data mining techniques, ~700,000 tweets containing mentions of e-­‐cigarettes were collected from a 10% sample of Twitter spanning from January 2012 to July 2014.

All tweets mentioning e-­‐cigarettes were categorized as Commercial, Infomercial, or Organic. Tweets in the commercial category (~70%) contained at-­‐least 3 marketing key-­‐words (e.g. ‘free-­‐trial’, ‘buy’, ‘coupon’, ‘starter-­‐kit’,… ) , a key-­‐word along with a URL, or are from SPAM accounts. The Infomercial category (~15%) contains all tweets with URLs that omit these key-­‐words. The Organic category (~15%) contains the remaining tweets.

The emotionally charged words that contribute to the positivity of various subsets of tweets from each category are quantitatively measured using hedonometrics. Outliers in both the positivity and frequency time-­‐series distributions correspond to political debates regarding the regulation of e-­‐cigarettes. Time-­‐series analysis techniques are implemented to determine the effect promotional tweets have on organic sentiments. Due to the high youth presence on twitter as well as the clinical uncertainty regarding the risks associated with e-­‐cigarettes, understanding the effect of promotionally marketing vaporization products across social media is relevant to public health agendas.

**22.** **Co-Occurring Obesity and Smoking are Associated with Socioeconomic Disadvantage and Adverse Health Indicators and Outcomes in Women of Reproductive Age**

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**& S. T. Higgins1, 2, 3**

**University of Vermont**

**Introduction**: Obesity and smoking are independently associated with socioeconomic disadvantage and a wide range of common adverse health effects in women, but relatively little is known about co-occurring obesity and smoking.  The purpose of this study was to begin investigating relationships between co-occurring obesity and smoking and socioeconomic status, health biomarkers, and health outcomes among women of reproductive age.

**Methods**:  Data from non-pregnant women between ages 25-49 years were obtained from the National Health and Nutrition Examination Surveys collected between 2007-2010.  Linear and logistic regressions with survey sampling weighted adjustments were used to examine associations between obesity and smoking alone and in combination with educational attainment and health biomarkers and outcomes.

**Results**: Prevalence of co-occurring obesity and smoking increased as a linear, inverse function of educational attainment.  Compared to those with neither condition, obese smokers had significantly poorer cardiovascular and glycemic biomarker profiles, and higher rates of menstrual irregularity, hysterectomy, oophorectomy, impaired physical functioning, and depression.  There was also a pattern of elevated risk among obese smokers compared to those with obesity or smoking alone, including significant differences in high density lipoprotein (HDL) cholesterol levels, impairments in physical mobility, and depression scores.

**Conclusions**: Co-occurring obesity and smoking is associated with socioeconomic disadvantage and a broad range of adverse health indicators and outcomes in women of reproductive age.  Interventions specifically targeting co-occurring obesity and smoking in this at-risk population may be needed in efforts to reduce health disparities.

**23.**

**Natural History of Attempts to Stop Smoking**

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**University of Vermont, Burlington, VT**

This study provides a replication of our prior work describing a fine-grain description of the incidence and pattern of intentions to quit, quit attempts, abstinence, and reduction in order to address several clinical questions about self-quitting. 152 smokers who planned to quit in the next 3 months called nightly for 12 weeks to an Interactive Voice Response system to report on cigarettes/day, quit attempts, intentions to smoke or not in the next day, etc. No treatment was provided. Most smokers (60%) made multiple transitions among smoking, reduction and abstinence. Intention to “not smoke” or “to quit” often did not result in a quit attempt but were still strong predictors of a quit attempt and eventual abstinence. Most quit attempts (79%) lasted less than one day; about one-fifth (18%) of participants were abstinent at 12 weeks. The majority of quit attempts (72%) were not preceded by an intention to quit. Such quit attempts were shorter than quit attempts preceded by an intention to quit (< 1 vs. 25 days). Most smokers (67%) used a treatment and use of treatment was non-significantly associated with greater abstinence (14 vs. 3 days). Making a quit attempt and failing early on predicted an increased probability of a later quit attempt compared to not making a quit attempt early on (86% vs. 67%). Smokers often (17%) failed to report brief quit attempts on an end-of-study survey. We conclude cessation is a more chronic, complex, dynamic process than many theories or treatments assume.

**24.**

**Development of a Measure of the Enjoyment of and Wanting for Rewarding Events**

**J. R. Hughes, A. J. Budney, P. W. Callas, J. Etter, J. R. Fingar, S. C. Sigmon**

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Decreased interest in non-drug reinforcers is thought to be a cause or a consequence of drug abuse. We developed the Rewarding Events Inventory (REI) to be a more comprehensive and up-to-date survey than existing reward inventories, yet can be administered on a repeated basis. Initial qualitative work identified 476 possible rewarding events and reduced these to 99 events based on clarity, overlap, ceiling/floor effects, and frequency. We asked 182 participants to rate their enjoyment of and wanting for the events on three occasions, and frequency of the events on two occasions. We used these results to reduce the number of events to 54 for an Enjoyment Scale and 53 for a Wanting Scale. Factor analysis indicated several factors that were similar for the Enjoyment and Wanting Scales. Both scales had high internal consistency (Cronbach’s alphas > 0.92) and test-retest reliability (Intraclass Correlation Coefficients > 0.83). Construct validity was tested by the correlation between ratings of enjoying vs. wanting a reward (r > 0.86), enjoying vs. frequency (r > 0.36), and wanting vs. frequency of the reward (r > 0.33). Further work is needed to assess a) scores in never, current and former drug dependent individuals, b) concordance with self-report and behavioral measures of anhedonia, c) ability to measure, predict, or mediate changes due to behavioral and pharmacological treatments and d) utility in treatments that focus on increasing non-drug reinforcers. The REI is a comprehensive, yet brief measure of wanting for and enjoyment of rewards that may be helpful in behavioral and psychiatric studies and in implementing behavioral treatments.

**25. A Pilot Study of Zolpidem Pharmacotherapy in the Treatment of Cannabis Use Disorders**

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**A. Hampson & M. Stitzer**

**Behavioral Pharmacology Research Unit, Johns Hopkins School of Medicine**

**Background:** Treatment admissions for cannabis use disorders (CUDs) have increased over the past 20 years. Most who enter treatment fail to quit and there are no approved medications for treating CUDs. Sleep disturbance is a hallmark feature of cannabis withdrawal and is reported as a barrier to cessation. The present pilot study was conducted to evaluate extended-release zolpidem as a treatment for CUDs and examine the feasibility of conducting ambulatory sleep monitoring in an outpatient clinical trial.

**Methods:** Eighteen participants enrolled in the 12-week study, which included twice-weekly clinic visits, 12 sessions of computer-delivered psychosocial counseling (MET/CBT), case-management by an addictions counselor, and randomization to receive 12.5mg zolpidem (N=11) or placebo (N=7) for nightly self-administration. Outcome measures included urine toxicology, polysomnography (PSG), and self-reported substance use, sleep, and adverse events.

**Results:** Almost half (5/11) of participants randomized to receive zolpidem achieved a period of cannabis abstinence (verified by negative urine) during the study period; 4 were still abstinent at the end of treatment. No participant randomized to placebo achieved objectively verified abstinence. PSG assessments indicated significant sleep disturbance among study participants, however, issues related to participant compliance, equipment reliability, and lack of abstinence in the placebo group precluded our ability to evaluate the effect of zolpidem on sleep or examine relations between sleep quality and abstinence.

**Conclusion:** The results of this pilot study suggest that zolpidem may be a useful adjunct medication for the treatment of CUDs. Obtaining objective measures of sleep from individuals receiving outpatient treatment for CUD is difficult and requires tailored reinforcement strategies to obtain adequate levels of compliance. Further evaluation in a larger controlled trial is under way.

**26. Comparing Lifetime Use and Discontinuation of Contraception between Opioid-Maintained and National Samples**

**D. J. Hand, G. J. Badger, & S. H. Heil**

**Vermont Center on Behavior and Health, University of Vermont**

Rates of contraceptive use by opioid-abusing women are low, ranging between 26% and 56%. Not surprisingly, approximately 80% of pregnancies in opioid-abusing women are unintended and could have been avoided by effective use of contraceptives. Effective contraception can be achieved by correct use of fertility awareness methods (e.g., the rhythm method), barrier methods (e.g., condoms), and hormonal contraceptives (e.g., the pill). Hormonal contraceptives are the most consistently effective contraceptive methods, but require more effort to acquire and initiate and can produce more side effects than other methods. The extant literature suggests that opioid-abusing women tend to use barrier methods or no contraceptives at all, but it remains unclear whether opioid-abusing women are inexperienced with other methods or have experienced dissatisfaction that led to discontinuation of other methods. To better understand opioid-abusing women’s experiences with contraceptives, we collected histories of contraceptive use and reasons for discontinuation from 38 opioid-maintained (OM) women and compared the results to data from the National Survey of Family Growth. Nearly all of the OM sample (95%) reported using hormonal contraceptives in their lifetime, compared to the US national average of approximately 75%. OM women reported discontinuing hormonal contraceptives due to dissatisfaction at twice the rate of the NSFG sample, and most frequently reported discontinuation due to difficulty using methods consistently or their side effects. It appears that OM women’s experiences may make them prime candidates for a subset of hormonal contraceptives called long-acting, reversible contraceptives, which require little effort to maintain effectiveness and can have fewer side effects than other hormonal contraceptives.

27.

**A Pilot Evaluation of Move it Move it! A Before School Incentive-Based Physical Activity Program at the Integrated Arts Academy in Burlington, VT**

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**Objective:** To describe the implementation and preliminary results from a mixed-methods pilot evaluation of a before school incentive based physical activity program.

**Background:** Launched in 2012, Move it Move it! is a voluntary morning running and walking program at the Integrated Academy (IAA) designed to build community, increase fitness and better prepare students for learning. Move it Move it! encourages students and families to run/walk laps in the recess yard. Student miles are tracked and incentives are awarded at several benchmarks: 1 mile a pencil, 5 miles a sports bracelet, 10 miles a water bottle, 25 miles a T-shirt, 50 miles a pedometer and ball, 75 miles a field trip, and 100 miles a metal and name on a community developed banner housed in the gym. Students are celebrated each Friday at the all school town meeting when they have achieved the specific milestones, celebrating and dancing along with their fellow peers and classmates.

**Methods:** A mixed-methods pilot evaluation of Move it Move it! was conducted in the Spring of 2014 to assess the impact of a before school physical activity program on three domains of child health and development: academic, social, and physical. Self-reported surveys were administered to all consented students in grades K-5 (N=250). Semi-structured key informant interviews were conducted with school personnel.

**Conclusion:** Preliminary results of the pilot evaluation will be shared. Discussion will highlight the effectiveness of an incentive-based physical activity program in improving indicators of child health and academic success.

**28.**

**Comparing Monetary Incentives and Deposit Contracts to Increase**

**Walking in Healthy Adults**

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Most adults fail to meet physical activity guidelines (USDHHS, 2014). Interventions providing monetary incentives for increasing physical activity are often effective, though expensive. One way to reduce costs is to require monetary “deposit contracts” of participants. We compared the efficacy of a $50 incentive program on walking when either $0 (N=9) or $25 (N=10) had been deposited by the participant. Nineteen healthy adults who were deficient walkers (<10,000 steps/day on average), wore a Fitbit© accelerometer during all waking hours for 5-6 weeks. For a 1-2 week baseline, participants reported stepcounts but received no incentives. During a 3-week intervention, $1.50 per day could be earned for meeting individualized stepcount criteria, with bonuses ($2.65) awarded for meeting criteria on three consecutive days. In the final week, a return to baseline condition included no incentives. A RMANOVA revealed significantly higher stepcounts during the incentive condition. Monetary deposit amount did not affect stepcounts or sensitivity to the incentives.

**29.**

**The Effect of Statin Use on Cardiac Rehabilitation Exercise Training**

**J. Rengo**

**Fletcher Allen Cardiac Rehabilitation program**

**Introduction:** A recent publication in JACC by Mikus et al. reported that simvastatin attenuated aerobic training in statin- naïve, overweight subjects at risk for metabolic syndrome following a 12-week exercise program similar to that used in cardiac rehabilitation. This is concerning to Cardiac Rehabilitation (CR) populations given the prevalence of statin treatment amongst patients and that baseline aerobic capacity and improvements following CR are correlated with reductions in all-cause and cardiovascular mortality.

**Purpose:** A diminished training response may limit some long-term beneficial effects of CR. We sought to determine whether statins attenuate the exercise training response, measured directly by VO2peak (mLO2·kg-1·min-1), in CR patients with coronary heart disease (CHD).

**Design:** Retrospective analysis from January 1996 to July 2013.

**Methods:** Aerobic training was assessed in 1,201 CHD patients performing entry and exit ETT’s with expired gas analysis. The cohort was divided according to statin status upon entry to CR with 968 (81%) individuals taking a statin medication throughout the study period and 233 (19%) individuals remaining statin-naïve. Patients performed standard CR exercise consisting of 3 sessions per week for 36 sessions.

**Results:** Peak VO2 increased significantly following exercise training in both the statin and non-statin groups when expressed relative to body mass 3.2±3.7vs3.1±3.7 (mLO2·kg-1·min-1)(p=0.73) or in absolute terms (LO2·min-1)(p=0.84). Changes in handgrip strength and self-reported physical function scores were similar (p=NS).

**Conclusions:** Chronic statin use does not attenuate exercise-induced improvements in VO2peak for CR patients with CHD, thus expected survival benefits should indeed persist.

**30.**

**Systematic Pre-visit Screening for Unhealthy Drinking in Primary Care Using Interactive Voice Response (IVR)**

**G.L. Rose, T.A. Ferraro, J.M. Skelly, G.J. Badger, C.D. MacLean, J.E. Helzer.**

**Vermont Center on Behavior and Health, University of Vermont**

PURPOSE: to systematically pre-screen primary care patients for unhealthy alcohol use using interactive voice response (IVR). METHODS: Patients registered for non-acute visits were contacted prior to their appointment and invited to complete a six-item screening questionnaire about alcohol, smoking, low mood, physical activity, concern about weight, and pain. Patients who screened positive for unhealthy alcohol use later answered questions about their doctor’s visit. RESULTS: We contacted 64% of patients prior to their scheduled visit and 64% consented to the screening (N=8,476; mean age 55; 57% female). 36% met criteria for unhealthy alcohol use, 9% endorsed smoking, 20% reported low mood, 44% reported concern about weight, 6% reported being not at all physically active, and 23% reported having pain. In post-visit interviews, 44% of patients who screened positive indicated they had discussed their drinking with their doctor. Patients who discussed alcohol were heavier drinkers than those who reported they did not discuss it (mean 22.8 days past year heavy drinking vs. 13.4, respectively). CONCLUSIONS: 1) A majority of primary care patients were willing to complete behavioral health screening by IVR before their medical visit. 2) The screen-positive rate using this methodology is comparable to studies using other assessment methods. 3) The frequency of drinking above NIAAA maximum daily limits was low. 4) There was a positive association between pre-visit report of heavy drinking frequency and post-visit report of alcohol-related discussion. Those who received information and advice from their doctors drank more heavily than those who did not have such discussions.

**31. Upper and Lower Extremity Muscle Strength of Breast Cancer Survivors Participating in an Oncology Rehabilitation Program**

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**Vermont Center on Behavior and Health, University of Vermont**

Advancements in breast cancer treatment have improved survival rates. However, cancer therapy is associated with impairments in fitness and function. Despite well-documented increases in muscle strength following resistance training, the strength of breast cancer survivors compared to the general population is unknown. The purpose of our investigation was to compare the upper (UE) and lower extremity (LE) strength of breast cancer survivors participating in oncology rehabilitation to normal values for the general population.

Participants were 141 women with a breast cancer diagnosis who enrolled in Oncology Rehabilitation. Upper (chest press) and lower (leg press) extremity strength was evaluated by one repetition maximum strength testing before and after 12 weeks of resistance training. Participants were categorized into UE and LE strength percentiles using ACSM normative data.

Over 80% of women were categorized as having UE strength at ≤ the 15th percentile (very poor strength) and 79% were categorized as having LE strength ≤ 30th percentile (well below average) at baseline. UE strength increased 19.8 lbs (37%) and LE strength increased 33.4 lbs (30%) after the intervention. The increases in strength shifted individuals toward higher percentile categories but percentiles remained below predicted.

Breast cancer survivors entering oncology rehabilitation have markedly low UE strength. The lower than expected strength noted in the LE is surprising given that oncologic interventions do not directly impact lower extremities. Significant gains in muscle strength can be achieved with a 12 weeks intervention. However, continued weakness may have implications for future impaired function among breast cancer survivors.

**32. Temporally Rapid and Pharmacological State-Dependent Heroin Delay Discounting: Individual Differences**

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**Wayne State University**

***Aims:*** Delay discounting is typically considered a trait variable, but some data suggest it can be state-dependent. Few studies have assessed commodity valuation at short, ecologically-relevant intervals. This study investigated whether individual differences modulated heroin behavioral-economic valuation at short, ecologically-relevant time intervals under two heroin-specific, hypothetical pharmacologic conditions.

***Methods:*** Intensive, non-treatment seeking heroin users (*N*=185; 18-55 years old, *M*=42.7; 50.6% African American; 77.8% male) completed a temporal discounting task under two imagined pharmacologic conditions: heroin satiation and withdrawal (order counterbalanced across subjects). Delays were 3, 6, 12, 24, 48, 72 and 96 hours, consistent with participants’ heroin-use frequency. Drug use characteristics (e.g., route of administration, heroin-related health consequences) were assessed using a comprehensive drug history inventory.

***Results:*** Repeated measures analysis of square-root transformed AUC data revealed a significant state-dependent main effect whereby heroin discounting was significantly steeper during the withdrawal (lower AUC) than satiation condition, *F*(1,176)=290.99, *p*<.05. Exploratory analyses of individual differences were conducted separately for each pharmacological state condition. Non-injecting heroin users (vs. injectors) discounted heroin significantly more during satiation, *F*(1,177)=5.68, *p=*.018 but not withdrawal. Subjects who inject report more heroin-related health consequences *F*(1,170)=7.27, *p=*.008.

***Conclusion:*** Heroin discounting was state-dependent when contrasting hypothetical pharmacological state across ecologically-relevant time-points. Discounting occurred rapidly in withdrawal compared to satiation and was influenced by current route of heroin use.

***Support:*** NIH R01 DA015462, Joe Young Sr./Helene Lycaki Funds (State of Michigan), and Detroit Wayne Mental Health Authority.

**33.**

**Clinic and Family Based Contingency Management for Adolescent Alcohol Abuse: Randomized Trial Results**

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Alcohol is the most frequently used substance among adolescents and is the primary drug reported by nearly 20% of the adolescent treatment population. The present study examined the efficacy of integrating contingency management (CM) with a behavioral outpatient treatment program for adolescent alcohol abuse/dependence. Teens (N=75) that met criteria for alcohol abuse or dependence were randomly assigned to one of two 14-week treatment conditions. Both conditions received individualized Motivational Enhancement and Cognitive Behavioral Therapy (MET/CBT) and weekly drug testing. The experimental CM condition received an abstinence-based incentive program and weekly behavioral parent training sessions. The comparison condition received an attendance-based incentive program. Alcohol use was assessed via a Timeline Follow-Back Interview (TLFB) at each assessment visit. Assessments were conducted at baseline, post-treatment, and 3, 6, and 9 months post-treatment. Post-treatment abstinence was modeled using piecewise logistic generalized estimating equations (GEE). Both conditions demonstrated fewer days of alcohol use during treatment compared to pretreatment. In addition, the CM condition had a significantly (p <0.05) lower percent of days of alcohol use during treatment than the comparison condition. By 9 months post treatment, frequency of use remained lower than pretreatment, but was similar across treatment conditions. Urine drug testing for ethylglucuronide (EtG) was used weekly to detect alcohol use, and these data will be presented as well. Preliminary outcomes suggest that integrating CM with MET/CBT represents an encouraging treatment model for adolescent alcohol abuse, but that maintenance interventions may be necessary to sustain the efficacy of CM.

**34.**

**Motivation to Change as Measured within a Web-Based Brief Alcohol Intervention**

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**Vermont Center on Behavior and Health, University of Vermont**

**Background:** Alcohol consumption is one of the leading contributors to mortality and morbidity in young adults. Mechanisms for changing alcohol use in college students have been investigated with questionnaires measuring pre-treatment motivation to change. The current study evaluated whether personal assessment of importance and confidence in changing drinking as rated during a web-based brief alcohol intervention (WBI) predicted subsequent alcohol use and self-control behaviors related to alcohol consumption in the month following the WBI.

**Methods:** Participants were 547 heavy drinking college undergraduates (70% female, 82% Caucasian) from the U.S. and Canada who completed a WBI. Single-item ratings of importance and confidence in changing drinking were collected during the WBI. Sixty-eight percent of participants completed the one month follow up and multiple imputation was used to cope with the missing data.

**Results:** Pooled estimates from the multiple regression analysis with imputed datasets revealed that importance rating predicted peak estimated blood alcohol content at follow up, when controlling for baseline highest number of drinks consumed in the past month, AUDIT score, Greek affiliation, residence on on/off campus, time in the study year, and confidence rating (p=.0001). Importance rating also predicted use of self-control behaviors related to alcohol consumption in the month following the WBI (p = .05). Confidence rating did not predict alcohol use and self-control behaviors related to alcohol consumption (all p’s > .05).

**Conclusions:** The findings suggest that importance in changing drinking as rated during a WBI is an important factor in college student alcohol use following a WBI.

**35.**

**Contingency Management in the Treatment of SUDs: Trends in the Literature**

**D. R. Davis & S. T. Higgins**

**Vermont Center on Behavior and Health, University of Vermont**

Investigators have been examining Contingency Management (CM) as a treatment for substance use disorders (SUDs) since the 1960s, but interest in this area has grown considerably in the past 20 years. Much of that growth has involved voucher-based CM where vouchers exchangeable for retail items or equivalent monetary reinforcers are earned contingent on behavior change. In this review growth in this area over the past 4.75 years (November 2009 to August 2014) is reviewed. Reports were identified from the search engine PubMed using specific search terms and inclusion criteria. 59 controlled studies were identified, with most (71.1%) focused on reinforcing abstinence from drug use, while others examined abstinence and a subset of studies examined combined abstinence plus other therapeutic goals (13.5%) or other therapeutic goals only (15.2%). 85% (50/59) of the studies supported the efficacy of CM, and that pattern was consistent across the three different types of intervention. Voucher-based CM used in the treatment of SUDs continues to show considerable growth and high levels of empirical support of efficacy.

**36.**

**The Prevalence and Severity of Psychosocial Issues of Pregnant Women**

**Who Use Illicit Substances**

**H. S. Melbostad & S. H. Heil**

**Vermont Center on Behavior and Health, University of Vermont**

Numerous psychosocial issues including stressful life events, smoking, depression, nutrition, and lack of access to health care services are proximally associated with adverse pregnancy and birth outcomes. Women who use substances during their pregnancies may be particularly vulnerable to these risk factors thereby exacerbating the incidence of poor birth outcomes such as low birth weight, preterm delivery, neonatal withdrawal, and perinatal mortality. Although much attention has focused on the impact of in utero drug exposure on birth outcomes, we reviewed the literature to characterize the prevalence of psychosocial issues among pregnant women who use illicit substances as compared to women in the general pregnant population. Results suggest that pregnant women who use illicit substances experience 2- to 20-fold higher rates of unplanned pregnancy, smoking, depressive symptoms, stress, homelessness, exposure to violence, and barriers to care compared to pregnant women who do not use illicit substances. Although similar in nature, the psychosocial issues of pregnant women with substance use disorders appear more severe and pervasive compared to women who do not use illicit substances during their pregnancies. These results suggest that the efficacy of current treatment strategies that address the psychosocial risk factors of pregnant women who use illicit substances should be evaluated and interventions may need to be modified or developed to improve maternal, fetal, and neonatal health.

**37.**

**Surveying Lactation Professionals Regarding Marijuana Use and Breastfeeding**

**C. L. Bergeria& S. H. Heil**

**Vermont Center on Behavior and Health, University of Vermont**

**Background:** Guidelines state that women who use illicit drugs should not breastfeed (ABM, 2009, AAP, 2012). Given the shifting legal landscape surrounding marijuana and the unclear evidence for or against breastfeeding and marijuana use; it is unclear (1) what recommendations lactation professionals are making to clients who use marijuana and breastfeed and (2) what professional statements or protocols are being used to guide clinical practice and recommendation. Finally, the prevalence of this public health issue has not been documented so the scope and relevance of the issue is unknown.

**Method:** Attendees at a regional lactation conference (N=120) in Burlington, VT were offered the opportunity to fill out a 5-item survey addressing the aims noted above.

**Results:** Of the 74 conference attendees who completed the survey, 61 indicated that they had experience working with women who breastfeed and use marijuana. Of those 61 professionals, 41% reported that they recommend continued breastfeeding to a woman who cannot stop using marijuana because the benefits outweigh the harms. Another 44% said their recommendation depends on factors like the severity of a breastfeeding woman’s marijuana use. Only 15% reported recommending that a woman stop breastfeeding if she used marijuana. Survey completers also estimated that 17% of their breastfeeding clients in the past year used marijuana.

**Conclusion:** Our results indicate that professional recommendations to breastfeeding clients who use marijuana vary widely. The estimate of prevalence also suggests that this is a relatively common issue faced by these lactation professionals.

**38.**

**The Neural Basis of Emotion Regulation in Young Children**

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**Vermont Center on Behavior and Health, University of Vermont**

Limited empirical data exist on the neural basis of cognitive reappraisal in children. We examined the effects of cognitive reappraisal on self-reports of affect and brain responses in children (6-10 years-old). We found that while children can use reappraisal to decrease subjective ratings of negative affect, the neural networks supporting reappraisal at this age deviate from findings in adults, with results revealing increased activation in both prefrontal cortex and amygdala. In addition, amygdala activity was positively correlated with ventromedial prefrontal cortex activation during reappraisal. Our findings suggest that the neural networks supporting emotion regulation are still developing during middle childhood.

**39.**

**Heart Rate Variability in Families with a Dysregulated Child**

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**Vermont Center on Behavior and Health, University of Vermont**

**Objective**: We aimed to examine the heart rate variability and sympathetic/parasympathetic balance in school-aged children with and without severe self-regulatory problems –“dysregulation”.

**Method**: To determine whether a dysregulation profile was present in young children, we collected data from the Child Behavior Checklist in two family studies of children with dysregulation. Children who met the profile of high levels of attention problems, anxious-depression, and aggressive behavior were called dysregulated (n= 70). Control children either had no psychopathology (n=40) or had psychopathology at the same level as the dysregulated children, but did not have the dysregulation profile (n=50). Heart rate monitoring during an emotion-induction Go-NoGo task where the second block consists of a frustration component was able to be conducted on 37 children with dysregulation, 38 clinical controls, and 25 nonclinical controls. Power-spectral analysis using fast-Fourier transform to calculate the low frequency/high frequency ratio provided a measure of sympathetic/parasympathetic activity before, during, and after frustration.

**Results**: Dysregulated children were not significantly different from controls at baseline, but showed less relative sympathetic activation with frustration in blocks 2 and 3.

**Conclusions**: Children with dysregulation differ from controls, including controls that have psychopathology but are not dysregulated, on measures of autonomic reactivity. More study of this phenomenon, especially at earlier ages, seems warranted.

**40.**

**Extinction of a Heterogeneous Behavior Chain:**

**Effects of Procurement Extinction on Consumption Responding**

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Behavior often consists of sequences or *chains* of responses that include procurement behavior leading to consumption. For example, a drug user or overeater must first acquire the drug or food before he or she can inject or consume it. In such chains, behavioral units are linked by access to one another and eventually to a reinforcer, such as a drug or food. Efforts to decrease drug abuse or overeating must address each part of the behavioral chain. Three experiments examined the effects of extinguishing procurement responding on consumption behavior in a heterogeneous chain. Rats learned to make a procurement response (e.g., lever press) in the presence of a discriminative stimulus, which led to the presentation of a consumption discriminative stimulus and the opportunity to perform a consumption response (e.g., chain pull). Experiment 1 showed that extinction of procurement alone weakened the consumption response. Experiment 2 replicated that effect, and further demonstrated that the opportunity to make the procurement response, as opposed to simple exposure to the procurement stimulus alone, was required for this effect. Experiment 3 used a within-subject design in which rats learned two distinct heterogeneous chains, and found that extinction of a procurement response weakened the consumption response that had been specifically associated with it. Thus, learning to inhibit the procurement response may result in the mediated extinction of consumption. Importantly, the results suggest that extinction of drug or junk food *procurement* is effective for reducing consumption behavior, which is often either difficult or impossible to treat directly.

**41. Discriminative Role of Alternative Reinforcement in the Inhibition of Operant Behavior**

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Extinguished instrumental responding can recover when the behavior is tested following removal from the physical context of extinction (renewal) and following removal of alternative reinforcement (resurgence). Both renewal and resurgence can be viewed as illustrations of the fact that the context of extinction controls inhibition of the response. In renewal, the context is the physical conditioning chamber, whereas in resurgence, the “context” of extinction is theoretically created by reinforcer presentations during the response elimination (extinction) phase. The latter view gives a discriminative role to reinforcer presentations. Two experiments therefore tested whether reinforcer presentations can indeed control operant extinction. The first experiment studied renewal. It used an ABA renewal design in which all animals learned to lever press for a reinforcer, O1, in Context A. Following acquisition of this behavior, all animals were switched to Context B, where responses no longer produced pellets, but a second reinforcer, O2, was presented noncontingently. Animals were then tested for responding back in A, under both typical extinction conditions and with O2 pellets delivered noncontingently. Consistent with a discriminative role for reinforcer presentations, animals showed renewed responding when tested back in Context A, but this effect was attenuated by the presentation of O2 pellets. A second experiment examined the discriminative role of reinforcers in resurgence. Initially, all animals were taught to perform a response, R1, for a reinforcer, O1. In a second phase, R1 was placed on extinction, while a newly available response, R2, produced a second reinforcer, O2. Following extinction of R1 and acquisition of R2, both responses were placed on extinction and tested with either no reinforcer presentations, noncontingent O2 presentations, or noncontingent O1 presentations. Animals tested with no pellets or O1 pellets showed robust resurgence, but this effect was abolished in the group that received O2 pellets during the test. Together, the results confirm that reinforcer presentations can control the inhibition of instrumental behavior.

**42. Alternative Reinforcement from Substance-Free Activities: Analysis of Risk and Protective Factors in an Alcohol Treatment Sample.**

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**Rationale:** Behavioral economic theories define addiction as a state in which the reinforcing value of drugs exceeds the value of drug-free alternatives, resulting in a strong preference for drugs relative to other activities. Although tolerance can diminish the reinforcing value of drugs, chronic drug use can also diminish the value of alternative reinforcers. Remission is possible if the value of substance-free reinforcers increases. Behavioral economic accounts of addiction are supported by laboratory research on drug self-administration, but have not been widely studied in clinical populations. Previous research has used resource allocation (e.g., time, money) or subjective enjoyment ratings to operationalize the reinforcing value of activities.

**Methods:** This study collected event-level information on enjoyment related to specific substance-using and substance-free activities using a timeline follow-back interview. Participants were 76 adults who met diagnostic criteria for alcohol abuse or dependence. The assessment was completed within two weeks of admission to an inner-city substance abuse treatment program. Participants reported their enjoyment from 7 recent substance-free and 7 substance-using activities using a 5-point scale (0 = unpleasant – 4 = extremely unpleasant). The goals of this study were (1) to provide descriptive data on enjoyment and social participation related to substance use and substance-free activities, and (2) to determine whether these variables were associated with relapse during the 3-months after treatment entry.

**Results:** Participants reported higher mean enjoyment from substance-free activities than from substance-using activities, which might be expected in a population seeking treatment to stop substance use. Mean enjoyment from substance-free activities increased from pre-treatment to 3 months post treatment. Participants who relapsed at 3 months reported greater mean pre-treatment enjoyment from substance-free activities. Relapse was also associated with lower mean enjoyment from substance-free activities at 3-months post-treatment.

**Conclusions:** Participants who reported greater enjoyment from drinking, a proxy for substance-related reinforcement, were more likely to relapse in the 3 months following treatment. Participants who successfully abstained following treatment showed lower pre-treatment levels of substance-related and substance-free reinforcement, but greater levels of post-treatment substance-free reinforcement Substance abuse aftercare programs should attempt to increase participation in enjoyable substance-free activities that are consistent with treatment goals

**43.**

**Resurgence is Attenuated by Increasing Generalization with the Reinforcement Context Provided by a Replacement Behavior**

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**University of Vermont**

Resurgence is the relapse of an extinguished behavior that occurs when an alternative behavior introduced to replace it is also placed on extinction. Resurgence experiments involve three phases. During Phase 1, a response (R1) is trained; in Phase 2, it is then extinguished while a new behavior (R2) is introduced and reinforced. Then, in a third and final phase (the resurgence test), R2 is also placed on extinction, and responding on R1 resurges despite remaining on extinction. Several theories have attempted to explain the resurgence effect. To distinguish between them, the current experiments examined how the temporal distribution of reinforcers delivered over Phase 2 sessions affect resurgence when they are removed during the resurgence test. Experiment 1 demonstrated weaker resurgence when the reinforcement rate for R2 gradually became leaner over Phase 2 (i.e., forward thinning) and in the reverse condition when the reinforcement rate was first lean and then became richer (i.e., reverse thinning). However, only the forward thinning procedure completely eliminated resurgence. In Experiment 2, resurgence was also eliminated when reinforcement for R2 was only available in alternating Phase-2 sessions. In contrast, groups that received either the same reinforcement rate during the final Phase-2 session or the same average reinforcement rate over the phase displayed similarly robust resurgence effects. The results suggest that resurgence may be a special type of renewal effect in which extinguished R1 responding recovers when the context provided by reinforcer presentations is removed. Resurgence can be weakened when R1 is extinguished in a lean pellet context that generalizes better to the extinction context that prevails during a resurgence test.

**44.**

**Measuring Executive Function in Health-Related Behavior Change Trials**

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Executive function contributes significantly to health related quality of life and has been shown to relate to outcomes of behavior change trials including smoking cessation and weight loss. However, executive function encompasses multiple cognitive domains and comprehensive assessment of executive function requires a battery of tests. The Vermont Center on Behavior and Health (VCBH) is an interdisciplinary center dedicated to investigating relationships between personal behavior patterns and health outcomes. One key goal of the VCBH is to contribute new understanding of the neurobiological mechanisms related to health risk behaviors and successful behavior change. To this end, the Behavioral Economics and Intervention Sciences (BEIS) Core of the VCBH supports Project Directors to measure executive function in their studies. This poster describes the VCBH executive function assessment protocol currently being implemented across 4 projects. The protocol collects a standard set of measures assessing multiple domains of executive function. Initial results will be presented including determination of feasibility and preliminary data characterizing executive function in subjects across study populations. Areas for future data analytic projects demonstrating the potential of this unique data set will be highlighted.

**45.**

**Characterizing Knowledge and Risk Behaviors for Opioid Overdose in a High Risk Population**

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Unintentional fatal drug overdose is now the 2nd leading cause of accidental death in the general population. Educational interventions have been developed to increase knowledge regarding opioid overdose risk factors, symptoms, and appropriate responses, and within-subject evaluations of knowledge do report immediate and sustained gains in information and behavioral changes in response to overdose events following brief educational sessions. However, there are no standardized measures available to characterize opioid overdose knowledge or engagement in risk behaviors among patients at high risk for overdose. We have developed a knowledge and risk behavior questionnaire for use with opioid dependent patients at high risk for opioid overdose. Participants (n=153) were recruited from a 3-day residential opioid detoxification center to complete a 1-time, self-report assessment of opioid knowledge and past 30-day engagement in risk behaviors. Results have been summed into knowledge and risk severity scores and reveal areas in which overdose knowledge is strong and areas that require improvement. These results will contribute meaningfully to the literature on opioid overdose by providing the first large-scale characterization of overdose knowledge deficits in opioid dependent patients and by introducing a measure that can be used to assess opioid overdose knowledge and risk behaviors.

**46.**

 **Acute Cocaine Administration Appears to Dose-Dependently Increase Discounting of Delayed Condom-Protected Sex and Cocaine, but not Monetary Rewards.**

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**Introduction:** Acute cocaine use is associated with repeated self-administration of additional cocaine and increases in sexual HIV risk behavior, but little is known about the mechanisms underlying these relationships. Previous studies suggest delay discounting may underlie choices related to drug use and risky sexual behavior, but no published studies have examined the influence of acute cocaine on discounting in humans. Here we summarize the preliminary findings from one of two studies examining relations between cocaine use and discounting.

**Methods:** Cocaine users (n=6) were administered placebo, 125 mg, and 250 mg of cocaine orally, double blind, each on one of three separate session days. Participants completed measures of (1) delay discounting of real (money) and hypothetical (money, cocaine, condom-protected sex) rewards, (2) probability discounting of hypothetical rewards (money, condom-protected sex), (3) sexual interest/desire, and (4) cocaine craving while experiencing drug effects.

**Results:** Cocaine appeared to dose-dependently increase discounting of cocaine and of condom-protected sex, but not of real or hypothetical money, in a manner paralleled by dose-dependent increases in sexual interest/desire and in cocaine craving.

**Conclusion:** The preliminary results of this ongoing study suggest that acute cocaine increases discounting of sexual outcomes and cocaine, but not money. Parallel increases in sexual interest/desire and cocaine craving suggest that these effects may be related to cocaine-induced increases in reinforcer efficacy, which may in turn drive repeated self-administration and increases in sexual HIV risk behavior. The results also suggest that studies examining the effects of acute drug administration on discounting should use clinically-relevant reinforcers.

Supported by R01DA032363 and T32DA07209 from the National Institute on Drug Abuse

**47.**

**Investigating a Genetic Marker of Vulnerability for Stimulant Abuse**

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 Individuals vary extensively in their subjective and behavioral response to psychomotor stimulants, and these differences may be associated with their likelihood of developing problematic use of the drugs. A growing scientific literature suggests that vulnerability for drug abuse is influenced by genetic factors, particularly polymorphisms of the D2 dopamine receptor gene (DRD2). The aim of the present study was to prospectively evaluate whether *d*-amphetamine reinforcement varies as a function of DRD2 A1 allele status. We utilized a discrete-trial choice laboratory procedure and prospective genotyping to investigate individual differences in sensitivity to the subjective and reinforcing effects of *d*-amphetamine in healthy adults. Presence of the DRD2 Al allele was not associated with subjective effects of *d*-AMPH. However, there was a trend toward increased percentage of *d*-AMPH choice among carriers, relative to noncarriers. This association between allele status and stimulant reinforcement was most evident at the lowest (i.e., 5mg/70kg) *d*-AMPH dose, as opposed to the higher doses (i.e., 10mg/70kg; 20mg/70kg). As such, these data provide the first experimental, prospective evidence that stimulant reinforcement may vary as a function of DRD2 allele status, and suggest the potential mechanism of heightened sensitivity to the reinforcing effects of low stimulant doses among DRD2 A1 carriers. In summary, an improved understanding of these marked differences across individuals in the subjective and reinforcing effects of stimulants may help predict the individuals at risk for developing abuse and dependence to psychomotor stimulants.

**48.**

**Improving Attitudes about MAT in the Criminal Justice System through a Web-Based Training**

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The use of medication-assisted treatment (MAT) for opioid addiction is often subject to widespread misunderstanding and misinformation. Though most MAT trainings target treatment providers, criminal justice (CJ) program staff and treatment referrers are in a unique position to oftentimes determine offender placement. This presentation supports the efficacy of an internet-based training on CJ stakeholders’ and decision makers’ attitudes towards MAT.

Supported by the Pennsylvania Department of Health (SAP #4100054873).