Behavioral Therapies for Methamphetamine Use

Will M. Aklin, PhD
National Institute on Drug Abuse
Division of Therapeutics and Medical Consequences
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Goals:

- Produce efficacious behavioral treatments for substance use disorders (SUDs)
- Produce treatments that are implementable and self-sustaining
- Develop optimal behavioral strategies to promote medication and SUD treatment adherence
Methamphetamine Use (MA): What Do We Know?

Effective Therapies for MA
- Behavioral approaches are the therapeutic mainstay, such as cognitive-behavioral and contingency-management interventions

Comorbidity
- Many individuals who use MA have other comorbidities including other addictions and a range of psychiatric conditions (e.g., depression, anxiety)

HIV-Risk, Concomitant Behaviors and Treatment
- Research has found that MA users can change HIV risk behaviors
- High-risk behaviors, such as needle sharing and unsafe sexual practices can be reduced and lower risk of exposure to HIV and other infectious diseases

Recovery
- Prolonged abstinence shows recovery of brain dopamine transporters
Available Behavioral Therapies for MA

Contingency Management (CM)
- Highly efficacious; patients receive incentives or rewards for meeting specific behavioral goals (verified abstinence, attendance)

Cognitive Behavioral Therapy (CBT)
- Well-established treatment for MA use with demonstrated effectiveness; Emphasis on specific behaviors to enhance executive control over behavior

Physical Activity (Exercise-based Treatments)
- Evidence of supervised aerobic and resistance exercise program in sustaining abstinence from MA after discharge from treatment

Treatment Approaches Targeting Cognition
- Building on growing evidence to suggest MA and other stimulant use is associated with cognitive deficits
Contingency Management (CM)
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CM is an effective intervention that provides tangible incentives in exchange for tx engagement and abstinence

- Motivational Incentives for Enhancing Drug Abuse Recovery (MIEDAR), an incentive-based method for promoting cocaine and MA abstinence

CM effectively used to promote drug abstinence—

- Drug class: MA, cocaine, etoh, nicotine, marijuana, opioids, benzodiazepines
- Types of reinforcer, schedules, delay, magnitude, and across populations

CM has shown the lowest drop-out rate (29.4%) and has been used in conjunction with CBT for improved retention

(Roll et al., 2013)
Roll et al., randomized MA users to 16-weeks of TAU or CM (1-, 2-, or 4m)

- Attendance over time increased as CM duration increased
- MA abstinence increased over time as CM duration increased
- Attendance/abstinence trends were stronger among those who completed treatment
- Attendance rates in the CM conditions were higher than TAU

(Roll et al., 2013)
Cognitive Behavioral Therapy (CBT)
Cognitive Behavioral Therapy (CBT)

Efficacy through the teaching of specific coping strategies

- Some models view CBT as a cognitive control therapy—increase one’s capacity to enhance executive control over behavior

Study effect sizes in the low-moderate range

High drop-out rates among MA users (40 to 45%)

Most effective therapy for MA—

- **Matrix Model**, a 16-week of weekly group sessions (3x/week) that combines CBT, family education, individual counseling, social support, drug testing, and encouragement for non-drug-related activities

(Rawson et al., 2008)
CBT (Matrix Model)

Mean number of MA-free urine samples, by treatment length and treatment condition

(Mean # of risky sex behaviors (past month))

- Mean # of risky sex behaviors in past 30 days

- Time

- Baseline
- Tx-end
- 6 months
- 12 months
- 3 yrs

(Rawson et al., 2008)
Physical Activity (Exercise-based Therapies)
Physical Activity (Exercise-based Therapies)

- Rawson et al., compared an 8-week exercise intervention on posttreatment MA use following residential tx
  - 135 MA-dependent adults in residential treatment
  - Random assignment to exercise intervention or health education control

- Differential effects on MA were measured after program discharge, reflecting benefits sustained post-intervention
  - Decrease in MA use among lower severity MA users at 1-, 3-, and 6m posttx

- Exercise may help MA users reduce or discontinue use but also carryover benefits of MA tx over time

(Mooney et al., 2014)
Physical Activity (as Relapse Prevention)

(Rawson et al., 2015)
Treatment Approaches Targeting Cognition
Why Target Cognition for MA Use?

- Studies have examined cognitive deficits associated with stimulant use disorders
  - A meta-analysis comparing MA users (N=487) to controls (N=464) found moderate effect sizes (0.8 > d ≥ 0.5) for learning, executive function, memory, and speed of information processing domains
  - Small effect sizes (0.5 > d ≥ 0.2) for motor skills, attention, working memory, visuo-construction, and language domains

- As one example, attentional bias toward drug-related stimuli is particularly salient among MA users
  - Among patients undergoing MA withdrawal, the magnitude of bias toward MA-related stimuli has predicted retention in tx and relapse potential
  - Training to modify attentional bias has shown effective for other SUDs

(Scott et al., 2007)
Cognition: A Trans-diagnostic Treatment Target?

**Individual Vulnerability Factors**
- Comorbid psychiatric disorders
- Comorbid substance use disorders
  - Genetics
  - Psychosocial factors

**Cognitive Enhancement Treatments**
- Pharmacotherapy
- Cognitive rehabilitation

**Cognitive Behavioral Therapy (CBT)**

**Cognitive Function**
- Executive Control
  - Sustained Attention
  - Response Inhibition
  - Working Memory
- Automatic Processes
  - Attentional bias
  - Approach bias

**Drug Craving and/or Use**

(Carroll et al., 2017)
Working Memory Training Decreases Delay Discounting (DD) Among Stimulant Addicts (Bickel)

- DD is measured by assessing preferences for a sooner, smaller reward or a later, larger reward
  - Drug dependence, HIV-risk, alcohol dependence, gambling, obesity

Sample:
27 adults (20 male, 7 female) being treated for stimulant use at a substance abuse facility

Study Design:
Active training: Working memory tasks with monetary reinforcement for performance –versus–

Control training: Identical working memory tasks and cueing the correct response (yoked to active training)

(Bickel et al., 2011)
Results

Effects of Training:
WM training in stimulant-dependent patients resulted in decrease in discounting of delayed rewards.

Relationship between Memory & Discounting:
Change in DD resulted from reinforced WM training.

Active Training group significantly decreased discounting rate by 50% (Bickel et al., 2011).
WM training in stimulant-dependent patients resulted in decrease in discounting of delayed rewards

Change in DD resulted from reinforced working memory training

**Future Questions:**

Durability of the effects? Does the change in DD persist or dissipate?

If the effects decay over time, can booster WM sessions continue the effect?

(Bickel et al., 2011)
MA use greatly reduces the binding of dopamine to dopamine transporters (highlighted in red and green) in the striatum (region important for memory and movement).

With prolonged abstinence, dopamine transporters in this area showed restoration.

Function in other brain regions did not recover even after 14 months of abstinence, indicating that some MA-induced changes are very long lasting.
Effective Therapies for MA

- Behavioral approaches are the therapeutic mainstay (CM, CBT, PA)
- Most robust effects found with CM on MA outcomes, retention and tx attendance

Comorbidity

- Cognitive deficits and cognitive biases could be potential trans-diagnostic treatment targets for MA use and comorbid disorders

HIV-Risk, Concomitant Behaviors and Treatment

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Recovery

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