Relapse, Addiction, and Mindfulness

The Neuroscientific Implications and Clinical Applications of Mindfulness-Based Relapse Prevention (MBRP)

Introduction

Presenters
Dr. G. Alan Marlatt, University of Washington, Addictive Behaviors Research Center
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Assistant
Haley Douglas, Seattle Pacific University, Lustyk Women’s Health Lab, University of Washington, Addictive Behaviors Research Center

Handouts found at: www.spu.edu/lustyklab on the “Calendar” page

History of MBRP

G. Alan Marlatt, Ph.D.

University of Washington
Addictive Behaviors Research Center

abrc@u.washington.edu
http://depts.washington.edu/abrc
Brickman's Model of Helping & Coping Applied to Addictive Behaviors

<table>
<thead>
<tr>
<th>Model Type</th>
<th>Responsible for Development</th>
<th>Responsible for Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moral Model (War on Drugs)</td>
<td>YES</td>
<td>NO</td>
</tr>
</tbody>
</table>
| Relapse = Crime or Lack of Willpower

<table>
<thead>
<tr>
<th>Compensatory Model (Cognitive-Behavioral)</th>
<th>Responsible for Development</th>
<th>Responsible for Change</th>
</tr>
</thead>
</table>
| Relapse = Mistake, Error, or Temporary Setback

<table>
<thead>
<tr>
<th>Spiritual Model (AA &amp; 12 Steps)</th>
<th>Responsible for Change</th>
<th>Responsible for Development</th>
</tr>
</thead>
</table>
| Relapse = Sin or Loss of Contact with Higher Power

<table>
<thead>
<tr>
<th>Disease Model (Heredity &amp; Physiology)</th>
<th>Responsible for Development</th>
</tr>
</thead>
</table>
| Relapse = Reactivation of the Progressive Disease

Analysis of High-Risk Situations for Relapse
Alcoholics, Smokers, and Heroin Addicts

<table>
<thead>
<tr>
<th>RELAPSE SITUATION (Risk Factor)</th>
<th>Alcoholics (N=70)</th>
<th>Smokers (N=35)</th>
<th>Heroin Addicts (N=32)</th>
<th>TOTAL Sample (N=137)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intrapsychic Determinants</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative Emotional States</td>
<td>38%</td>
<td>43%</td>
<td>28%</td>
<td>37%</td>
</tr>
<tr>
<td>Negative Physical States</td>
<td>3%</td>
<td>-</td>
<td>9%</td>
<td>4%</td>
</tr>
<tr>
<td>Positive Emotional States</td>
<td>-</td>
<td>8%</td>
<td>16%</td>
<td>6%</td>
</tr>
<tr>
<td>Testing Personal Control</td>
<td>9%</td>
<td>-</td>
<td>-</td>
<td>4%</td>
</tr>
<tr>
<td>Urges and Temptations</td>
<td>11%</td>
<td>6%</td>
<td>-</td>
<td>8%</td>
</tr>
<tr>
<td>Total</td>
<td>61%</td>
<td>57%</td>
<td>53%</td>
<td>59%</td>
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<tr>
<td>Interpersonal Determinants</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interpersonal Conflict</td>
<td>18%</td>
<td>12%</td>
<td>13%</td>
<td>15%</td>
</tr>
<tr>
<td>Social Pressure</td>
<td>18%</td>
<td>25%</td>
<td>34%</td>
<td>24%</td>
</tr>
<tr>
<td>Positive Emotional States</td>
<td>3%</td>
<td>6%</td>
<td>-</td>
<td>3%</td>
</tr>
<tr>
<td>Total</td>
<td>39%</td>
<td>43%</td>
<td>47%</td>
<td>42%</td>
</tr>
</tbody>
</table>
A Cognitive Behavioral Model of the Relapse Process

High-Risk Situation

Effective coping response -> Increased self-efficacy -> Decreased probability of relapse

Ineffective coping response -> Decreased self-efficacy -> Increased probability of relapse

Lapse (initial use of the substance) -> Abstinence Violation Effect

Decreased probability of relapse

Increased probability of relapse

Perceived effects of the substance

Abstinence Violation Effect

Positive outcome Expectancies (for initial effects of the substance)

Decreased self-efficacy

A Cognitive Behavioral Model of the Relapse Process

Marlatt & Gordon 1985

Skill-Training with Alcoholics: One-Year Follow-Up Results

Days of Continuous Drinking

<table>
<thead>
<tr>
<th>Skill training (Mean = 5.1)</th>
<th>Combined Controls (Mean = 44.0)</th>
</tr>
</thead>
<tbody>
<tr>
<td>p &lt; .05</td>
<td>SD = 6.9</td>
</tr>
<tr>
<td>SD = 62.2</td>
<td></td>
</tr>
</tbody>
</table>

Skill-Training with Alcoholics: One-Year Follow-Up Results

Number of Drinks Consumed

<table>
<thead>
<tr>
<th>Skill training (Mean = 399.8)</th>
<th>Combined Controls (Mean = 1592.8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>p &lt; .05</td>
<td>SD = 507.8</td>
</tr>
<tr>
<td>SD = 2218.4</td>
<td></td>
</tr>
</tbody>
</table>
Skill-Training with Alcoholics: One-Year Follow-Up Results

**Days Intoxicated**

<table>
<thead>
<tr>
<th></th>
<th>Skill Training</th>
<th>Combined Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD</td>
<td>17.8</td>
<td>17.8</td>
</tr>
<tr>
<td>Mean</td>
<td>11.1</td>
<td>64.0</td>
</tr>
</tbody>
</table>

*p < .05*

**Controlled Drinking**

<table>
<thead>
<tr>
<th></th>
<th>Skill Training</th>
<th>Combined Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD</td>
<td>17.8</td>
<td>2.6</td>
</tr>
<tr>
<td>Mean</td>
<td>4.9</td>
<td>1.2</td>
</tr>
</tbody>
</table>

*P = N.S.*

Aversion Therapy & Relapse Prevention

**Aversion Therapy**

**Relapse Prevention**

Addiction Behavior Research Center
University of Virginia
Empirical Support: Meta-Analytic Review
Irwin, Bowers, Dunn & Wang (1999)

- Reviewed 17 controlled studies to evaluate overall effectiveness of the RP model as a substance abuse treatment
- Statistically identified moderator variables that may reliably impact the outcome of RP treatment
- “Results indicate that RP is highly effective for both alcohol-use and substance-use disorders”

Empirical Support: Meta-Analytic Review
Irwin, Bowers, Dunn & Wang (1999)

- Moderator Variables with Significant Impact on RP Effectiveness:
  - Group format more effective than individual therapy format
  - More effective as “stand alone” than as aftercare
  - Inpatient settings yielded better outcomes than outpatient
  - Stronger treatment effects on self-reported use than on physiological measures
  - While effective across all categories of substance use disorders, stronger treatment effects found for substance abuse than alcohol abuse
Mindfulness

“A way of paying attention:
on purpose,
in the present moment,
non-judgmentally”

(Kabat-Zinn, 2005)
Results: Vipassana vs. TAU
3-Months Post-Release

- N = 173
- Significant reductions in substance use
  - Marijuana
  - Crack cocaine
  - Alcohol
  - Alcohol-related negative consequences
- Significant changes in psychosocial outcomes
  - Decreased psychiatric symptoms
  - Increased internal drinking-related locus of control
  - Increased optimism

Mean Changes from Baseline to 3-month Follow-up: Peak Weekly Alcohol Use

Mean Changes from Baseline to 3-month Follow-up: Alcohol-Related Negative Consequences
Mindfulness and Relapse Prevention: Clinical and Empirical Perspectives

Sarah Bowen, PhD
March, 2010

Practicing Mindfulness

*"If your attention wanders a hundred times, simply bring it back a hundred times."*
Mindfulness and Substance Use

**Paying attention:**
Greater awareness of triggers and responses, interrupting previously automatic behavior (Breslin et al., 2002)

**In the present moment …**
Accepting present experience, rather than using substances to avoid

**Nonjudgmentally:**
Detach from attributions and automatic thoughts that often lead to relapse

Mindfulness-Based Relapse Prevention (MBRP)

NIDA Grant # R21 DA010562; PI Marlatt

MBRP Structure

- Integrates mindfulness practices with Relapse Prevention
- Patterned after MBSR (Kabat-Zinn) and MBCT (Segal et al.)
  - 8 weekly 2 hour sessions; daily home practice
- Components of MBRP
  - Formal mindfulness practice
  - Informal practice
  - Coping strategies

(Witkiewitz, Marlatt & Walker, 2005; Bowen, Chavez & Marlatt, 2008)
Intentions of MBRP

Awareness:
From “automatic pilot” to awareness and choice

Triggers:
Awareness of triggers, interrupting habitual reactions

Acceptance:
Change relationship to discomfort, decrease need to “fix” the present moment

Balance and Lifestyle:
Supporting recovery and maintaining a mindfulness

“Formal” Practices

• Body Scan
• Mindful Movement
• Sitting Meditation
• “Lovingkindness” or “metta”
• Mountain Meditation
• Walking Meditation

Inquiry

- Relationship to Craving, Relapse, Recovery
- Not personal

Adapted from Segal et al., 2002
“Informal” Practices

• Mindfulness of daily activities
• Urge Surfing
• “SOBER” breathing space

“SOBER” Breathing Space

Stop
Observe
Breath
Expand
Respond

Urge Surfing

Riding this wave, rather than succumbing to the urge and being wiped out by it.

Staying with the urge as it grows in intensity, riding it to its peak, using the breath to stay steady as it rises and crests, knowing it will subside.

Trusting that without any action on your part, all the waves of desire, like waves on the ocean, arise and eventually fade away.
Session 1: Automatic Pilot and Relapse
Session 2: Awareness of Triggers and Craving
Session 3: Mindfulness in Daily Life
Session 4: Mindfulness in High-Risk Situations
Session 5: Acceptance and Skillful Action
Session 6: Seeing Thoughts as Thoughts
Session 7: Self-Care and Lifestyle Balance
Session 8: Social Support and Continuing Practice

Facilitating MBRP

- Motivational Interviewing style
- Acceptance, open curiosity, kindness, authenticity
- Personal practice
- Embodiment of these qualities
- Spontaneity and creativity
Several populations and disorders
- stress
- cancer
- psoriasis
- anxiety
- depression
- chronic pain
- psychosis
- trichotillomania
- epilepsy

Several treatments
- Acceptance and Commitment Therapy
- Dialectical Behavior Therapy
- Mindfulness-Based Cognitive Therapy
- Mindfulness-Based Stress Reduction
- Vipassana Meditation

Few studies of mindfulness and substance use

Research in Mindfulness-Based Therapies

Studies of Mindfulness and Substance Use

- 22 Studies
- 3 treatment trials

PsyInfo: All Journals, “mindfulness and . . .”

MBRP Pilot Efficacy Trial

- NIDA funded
- Randomized Controlled Trial
- Two Groups: MBRP, TAU
- Aftercare
- 4-month follow up
MBRP Study Design

Funded by National Institute on Drug Abuse Grant R51 DA0 10562-01A1; PI: G. Alan Marlatt

MBRP Study Design

Completed 
Inpatient or Intensive 
Outpatient

Baseline

MBRP

8 weeks

Post 
Course 
(61%)

TAU

2months 
(57%)

4months 
(73%)

Participants

• Age 40.5 (10.3)
  • 64% male
• 50% Caucasian
• 28% African American
• 15% Multiracial
• 7% Native American
• 72% completed high-school
• 41% unemployed
• 33% public assistance
• 62% less than $4,999 / year
• Homeless/unstably housed

Drug of Choice

Alcohol 46%
Opiates/Heroin 7%
Marijuana 5%
Crack/Cocaine 26%
Meth 14%
Other 2%
Measures

- Mindfulness (FMMQ; Baer et al., 2006)
- Acceptance (AAQ; Hayes et al., 2004)
- Depression and Anxiety (BDI; Beck, Steer & Brown, 1996, BAI; Beck & Steer, 1984)
- Craving (PACS; Flannery, Volpicelli & Pettinati)
- Substance Use (TILFB; Sobell & Sobell, 1992)

Results: Feasibility

- Attendance
  65% of sessions
  \( M = 5.18, SD = 2.41 \)
- Formal Practice
  4.74 days/week \( (SD = 4.0) \)
  29.94 minutes/day \( (SD = 19.5) \)

(Bowen et al., 2009)

Results: Mindfulness & Acceptance

Across 4-month follow-up, significant differences between groups:

- Mindfulness (“acting with awareness”) \( (p = .01) \)
- Acceptance \( (p = .05) \)
Results: Craving

Time x treatment: \( p = .02 \)
Time\(^2\) x treatment: \( p = .02 \)

PACS, Flannery et al., 1999

Results: Substance Use

MBRP = 2.1 days of use
TAU = 5.4 days of use

Time x group interaction: \( p = .02 \)
Time\(^2\) x group interaction: \( p = .01 \)

Results: Mediating Effect of Craving

\[ z = -2.00, p < .05 \]

Coefficients are IRR's; **\( p < .01 \), *** \( p < .001 \); Baron & Kenney, 1986; Sobel, 1982
Summary of Results

- Increased awareness and acceptance
- Reduction in craving
- Decreased rates of substance use
- Craving is partially mediating the effects of treatment of substance use at the 2-month follow-up

Negative Affect

Outcomes
Substance use treatment outcomes
(e.g., Hodgins, Garberly, & Armstrong, 1995)

Re-initiation of use following abstinence
(e.g., Wilkewitz & Villarroel, in press)

Comorbidity

- ~40% of Americans with depressive/anxiety disorders have co-occurring substance use disorders (NCS; Kessler, Nelson, McGonagle, Liu, et al., 1996)
  Depression has particularly strong relation with craving and relapse
  (Gordon et al., 2006; Zilberman et al., 2007; Carvan et al., 2009; Levy, 2008)

Self-medication hypothesis (Khantzian, 1985)
Negative Reinforcement model (Wikler, 1948)
Results: Depression and Craving

Total sample TAU

(Moderated mediation effect of treatment; \( p = 0.04 \))

MBRP

(Withkiewitz & Bowen, in press)

Results: Depression and Craving

Results

• MBRP vs. TAU
  
  • Weaker relation between depressive symptoms following treatment and substance use at follow up
  
  • Thereby weakening the relation between depression and substance use
Implications

- Consistent with intention and hypothesized mechanisms
  - Experience discomfort without “automatically” reacting
  - Decrease craving in the presence of depressive symptoms

- Consistent with findings from other mindfulness/acceptance-based interventions
  (Dahl et al., 2004; Bowen & Marlatt, 2009; Griffith et al., 2004; Hayes et al., 1999; Levitt et al., 2004)

- Examination of relation between depression and craving: Negative affect doesn’t have to lead to relapse
  (Griffith et al., 2004; Bowen & Marlatt, 2009)

- May be helpful in treating dual-diagnosis populations

MBRP in session

- Private treatment agency
- VA Addictions Treatment Center
- People living with HIV/AIDS
- Community groups offered at our site
- RCTs at a county treatment agency
- Others at VAs, Kaiser, Salvation Army, research labs, inpatient units, private practice, internet-based groups

Future Directions / Current Study

- MBRP vs. RP vs TAU
- Longer follow-up (6-12 months)
- Limited variability (83% abstinent)
- Larger sample
- Physio/Neuro measures
- Weekly measures
- Ongoing support
Some Ongoing Questions

• Meditation Practice
• Supporting practice
• Daylong practice
• Length of in-session and daily meditations

• Populations/Risks
• Trauma
• Cognitive challenges
• Abstinence

• MBRP therapists
• History and current practice
• Training

• MBRP and 12-Step treatment
• “Secularizing” Practice

Addiction and the Neurobiology of Mindfulness
M. Kathleen B. Lustyk, PhD

Image Credit

Image Source: Digital Anatomist, Univ. of Washington, Dr. John Sundsten
Link: http://da.biostr.washington.edu/cgi-bin/DA/PageMaster?url=Neuroanatomy+&pathindex=splash%5EPage+2
Stress increases activity in the dorsal striatum of cocaine addicts

Sinha et al., Psychopharmacology (2005)
Relative activation of the medial prefrontal cortex as a function of the amount of cocaine normally taken each week by cocaine abusers.


Decreased gray matter volume relative to that of control subjects in the brains of chronic cocaine abusers.

Inverse Correlations with Subjective Distress - the higher the distress ratings, the lower the activation in the anterior cingulate (ACC).

Rajita Sinha et al. at Yale studied brain function under stress (2004).

Neural Mechanisms in addiction

So what would be helpful?

• Something to reduce stress

• Something to increase PFC inhibition over habit behaviors

• Something to temper negative emotion – perhaps by toning down activity in the amygdala
Mindfulness and the Neurobiology of Stress

The Autonomic Nervous System

PARASYMPATHETIC FUNCTIONS
- Constricts pupil
- Stimulates salivation
- Slows respiration
- Slows heartbeat
- Stimulates gall bladder
- Stimulates digestion
- Contracts bladder

SYMPATHETIC FUNCTIONS
- Dilates pupil
- Inhibits salivation
- Increases respiration
- Accelerates heartbeat
- Inhibits digestion
- Stimulates glucose release
- Stimulates adrenal

PNS Tone: Calming
SNS Tone: Arousing

Hypothalamus releases CRH
Pituitary Releases ACTH
HPAA: Hypothalamic-pituitary-adrenal axis

The Autonomic Nervous System Research on the ANS
Blaine Ditto et al. from McGill University
3 groups participated in 20 minutes of either:

1. Sit & wait
2. Body-scan
3. Progressive Muscle Relaxation

MM is not simply relaxation — although gender differences exist.

**MM and ANS Tone in Addicts**

Judson Brewer, Rajita Sinha, Mark Potenza et al. at Yale studied mindfulness training (MT) effects on reactivity in substance abusers and found decreased sympathetic tone with MT.

![Graph showing MT vs CBT in ANS tone](image)

F = 7.97, p = .02, es = .42


**Research on HPA-Axis: Cortisol and MM**

Can MM decrease Cortisol reactivity to a laboratory stressor?

Yi-Yuan Tang, Michael Posner, et al. studied students at Dalian Univ. of Tech. in China.

2 groups participated in 5-days of either:

- 9+1
- 3
- 5
- 10
- 4
- 8

![Graph showing reduced salivary CORT reactivity](image)

Mindfulness Meditation and the Brain

• Focus on the PFC

Sara Lazar et al. at Harvard studied fMRI during meditation.

Britta Hölzel et al. at the U of Giessen Germany studied brain activity during meditation (breath awareness) and an attention control condition (math).

Effects?

Meditators showed increased activity in the PFC, responsible for executive functions


Groups

Meditators showed stronger activity in the PFC, particularly in the ACC (attention) & mPFC (impulse control) with breath awareness than controls

David Creswell et al. at UCLA investigated fMRI changes during an affect labeling task and correlated those changes with dispositional mindfulness.

Mindful Attention Awareness Scale (MAAS)

Source: Creswell et al. (2007). Neural Correlates of Dispositional Mindfulness During Affect Labeling. Psychosomatic Medicine, 69, 560-565

Norman Farb, Zindel Segal, et al. used fMRI to study two aspects of self-awareness: the narrative “me” and the experiential “I”.

1. Trait-related adjective task in scanner:
   - charming – lively – hopeful – greedy – indecisive
   - Narrative Focus: “me” & my story
   - or
   - Experiential Focus: current moment “I” (mindful practice)

2. Activity pattern associated with detached or objective modes of self-focus.


State (fMRI) vs. Trait (MRI)

2 studies that assess structural changes in the brain in response to MM are:
1. Lazar et al. (2005)
2. Holzel et al. (2007)

Photo by M.K.B.L.
Sara Lazar et al. at Harvard compared the brains of experienced meditators with novices using MRI.

Britta Holzel et al. at the U of Giessen Germany used voxel-based morphometry (MRI) to study mindfulness meditation practitioners (2008).

**MM Traits and Stress**

- Mindfulness traits (FFMQ) are negatively correlated with stress reactivity
  - Heart rate, $r = -0.38$, $p < 0.01$
  - Blood pressure (diastolic), $r = -0.43$, $p < 0.01$

Summary of Brain Findings

Addiction
- Addiction is associated with hypofrontality and loss of PFC gray matter, which may reduce cortical inhibition over craving control.
- Addiction is associated with hyperactivity in the amygdala and other components of the stress system. When stressed, addicts activate their "habit" brain (dorsal striatum) and inactivate their PFC, which may reduce cortical inhibition over habitual drug use.

Mindfulness Meditation
- MM increases PFC activity and gray matter, which may enhance cortical inhibition over craving control.
- MM attenuates stress responses, increases emotion regulation, and increases PFC activity, which may enhance cortical inhibition over habitual drug use.

Professor Herman stopped when he heard that unmistakable thud – another brain had imploded.