Mediators of Mindfulness-Based Stress Reduction (MBSR) in Cancer Patients: Assessing the Timing and Sequence of Change

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Division of Psychosocial Oncology
Helping You Live Well With Cancer
Background
MBSR and Cancer

- MBSR: an 8-week group intervention including mindfulness meditation, yoga, psychoeducation, group support
- Targets cultivation of “mindfulness”
- Offered through the Tom Baker Cancer Centre, Calgary, Alberta since 1996
- Originally based on practice of therapists, blended with MBSR
- Modified over the years based on research protocols
- Now called “Mindfulness-Based Cancer Recovery” (MBCR)
- Open to cancer patients and family members
- Over 2,000 patients have participated
MBSR and Cancer

- MBSR reduces psychological and stress symptoms and enhances positive outcomes in cancer patients (RCTs) (Branstrom 2010; Henderson 2012; Lengacher 2009; Speca 2000; Shapiro 2003)
  - Symptoms of stress
  - Mood disturbance
  - Depression
  - Anxiety
  - Perceived stress
  - Quality of life
  - Physical functioning
  - Sleep, fatigue, energy
  - Spirituality, meaning
  - Positive states of mind

- MBSR is beneficial for cancer patients’ mental health ($d=.48$) (Ledesma 2009)
Mechanisms of MBSR

• Do targeted constructs lead to change?
• Why assess “how” interventions work?
  – Prevents compiling a catalog of instances in which interventions do/do not work
  – Informs program modifications to increase effectiveness/efficiency
  – Supports a more sophisticated understanding of mindfulness
  – Helps with development of theories/models of change and informs future research
Mindfulness as a Mediator

- Mindfulness = practice/process, state or trait
- Two commonly-used measures of trait mindfulness:
  - Mindful Attention-Awareness Scale (MAAS; single score) (Brown 2003)
    Presence/absence of attention to/awareness of what is occurring in the present, in daily activities
    *e.g.*, “I snack without being aware that I’m eating.”
  - Five Facet Mindfulness Questionnaire (FFMQ; 5 subscales) (Baer 2006)
    - Observing: “I notice the smells and aromas of things.”
    - Describing: “My natural tendency is to put my experiences into words.”
    - Acting: “I rush through activities without being really attentive to them.”
    - Nonjudging: “I disapprove of myself when I have irrational ideas.”
    - Nonreactivity: “I watch my feelings without getting lost in them.”
Emotion Regulation (ER) as a Mediator

- ER = processes influencing emotional experience and expression
- Keeps the individual within a “window of tolerance” between hypo- and hyper-arousal, optimizing functioning
ER as a mediator

- **ER difficulties** (Hayes 2004):
  - **Over-engagement** = repetitive and unproductive thought processes such as rumination and worry
  - **Under-engagement** = cognitive, emotional and behavioral avoidance, or “Experiential Avoidance”

- ER training is a component of mindfulness-based therapies for treating psych symptoms/disorders
  - MBCT, DBT, ACT
Proposed Mediation Model: Primary Outcomes

Mindfulness
- MAAS
- FFMQ

Emotion regulation
- Rumination (RRQ)
- Worry (PSWQ)
- Experiential avoidance (AAQ)

Psychological functioning
- Symptoms of Stress (CSOSI)
- Mood Disturbance (POMS)

MBSR (vs. Waitlist Control)
Objectives & Methods
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(1) (a) To replicate previous research showing an effect of MBSR on proposed mediator and outcome variables, and

(b) to address the timing of MBSR-related changes across the two halves of the program.

(2) To assess temporal associations among early change in mediators and later change in outcome variables

(3) To test the mediation model for primary outcomes

(4) To test the mediation model for “positive” outcomes

(5) To examine correlations with adherence
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Data Analysis

• Intervention effects and timing of change:
  – Comparing changes from pre-program to week 4, then week 4 to post-program
  – Hierarchical linear modeling (HLM) and piecewise HLM (ITT sample)

• Temporal associations between early changes in mediators and later change in outcome variables
  – Mediation analysis (Baron & Kenney) with bootstrapping
Results
Flow Chart

Eligible
N = 324

Consented and Completed Time 1 Questionnaire
MBSR group n = 135; Control group n = 76

Attrition = 29%

MBSR (4 weeks)

Consented and Completed Time 2 Questionnaire
n = 96

Time 3 Questionnaire
n = 78

Dropped out of MBSR program: 20% (<5 classes)

Attrition = 19%

MBSR (4 weeks)

Waiting (4 weeks)

Consented and Completed Time 2 Questionnaire
n = 68

Time 3 Questionnaire
n = 62

Attrition = 11%

MBSR (4 weeks)

Waiting (4 weeks)

Completed all 3 Questionnaires
MBSR group n = 77 (43% total questionnaire attrition)
Control group n = 61 (20% total questionnaire attrition)

Study drop-outs:
• More men
• Younger
• Higher stress and mood disturbance
• Lower spirituality

Attrition = 9%

65% accrued
Participants

• Mostly female (80%), caucasian (92%) and coupled (71%)
• Mean age = 53 years ($SD=11.0$)
• Mean education = 15 years ($SD=2.0$)
• Minority (38.4%) were employed > 20 hrs/wk
• Mostly breast cancer (59%)
• Diagnosed a mean of 23.5 months earlier ($SD=43$)
• Majority (70%) had completed cancer treatments
Intervention Effects \((N=211)\)

- Consistent with previous RCTs and a recent meta-analysis in cancer populations, significant effect of MBSR on all variables

- Most effect sizes were medium, and ranged from .23 (Posttraumatic Growth) to .79 (FFMQ-Observe)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group x Time</th>
<th>Estimate(SE)</th>
<th>Effect size</th>
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<tbody>
<tr>
<td>CSOSI Total*</td>
<td>-0.53(0.13)***</td>
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<tr>
<td>POMS Total*</td>
<td>-0.60(0.14)***</td>
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<td>MAAS</td>
<td>3.03(0.65)***</td>
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<td>FFMQ-Observe</td>
<td>2.05(0.32)***</td>
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<tr>
<td>FFMQ-Describe</td>
<td>1.39(0.30)***</td>
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<tr>
<td>FFMQ-Act</td>
<td>1.22(0.32)***</td>
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<tr>
<td>FFMQ-Nonjudge</td>
<td>1.84(0.42)***</td>
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<td>FFMQ-Nonreact</td>
<td>1.41(0.30)***</td>
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<td>RRQ</td>
<td>-3.10(0.62)***</td>
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<td>PSWQ</td>
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<td>FACIT-Sp</td>
<td>3.22(0.58)***</td>
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<td>PTGI</td>
<td>2.61(1.78)*</td>
<td>0.23</td>
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</table>

* Square-root transformed
Timing of MBSR-related Change (N=211)

Mindfulness and ER variables

• Relatively **early effect** of MBSR on:
  – Present-focused nonjudgmental awareness (“PNA”)
    • Observe, Nonjudge and MAAS
    • Observe showed largest early effect (ES = .46) - 1st mindfulness skill?
  – Perseverative thinking (rumination and worry)

• Relatively **late effect** of MBSR on:
  – Labeling thoughts and emotions, acting with awareness, nonreactivity, and experiential avoidance
    • Nonreact showed the largest delayed effect (ES = .51)
Timing of MBSR-related Change (N=211)

Primary outcomes

- Symptoms of stress and mood disturbance changed later
  - In current format, full 8 weeks may be required

Positive outcomes

- Spirituality developed early
- PTG increased only across entire program
Temporal Mediation: Observing

Early changes in **Observing** partially mediated later changes in **Mindful Attention (acting)** and **Describing**

- $a = 0.43^{***}$
- $b = 0.21^*$
- $c = 0.31^{**}$
- $c' = 0.22^*$
- $b = 0.16$, $p = 0.08$
- $c = 0.30^{***}$
- $c' = 0.23^*$
- Bootstrapping PE = 0.21; CIs = 0.05, 0.41
- Bootstrapping PE = 0.40; CIs = 0.04, 0.97
Temporal Mediation: Ruminaton

Early changes in **Rumination** partially mediated later changes in **observing, nonreacting** and **experiential avoidance**
Temporal Meditation: Worry

Early changes in **worry** partially mediated later changes in **mindful attention (acting)** and **stress symptoms**
Summary

- Early changes in emotion regulation variables account for later changes in some mindfulness variables, and also for reductions in stress symptoms
- Opposite of initial mediation model where mindfulness facets were posited to change first, then emotion regulation and symptoms
Proposing an Alternative Model

Mindfulness
- Present-focused nonjudgmental attention/awareness (PNA)

MBSR (vs. Control)

Perseverative thinking
- Rumination
- Worry

Reduced avoidance of identification with thoughts and feelings, increased clarity
- Experiential avoidance
- Nonreactivity
- Describing thoughts and feelings (“clarity”)

Psychological functioning
- Symptoms of Stress
- Mood Disturbance
Conclusions

• Confirmed beneficial impact of MBSR in a cancer setting

• First controlled study examining timing and sequence of MBSR-related change
  – Findings differentiate changes in PNA and perseverative thinking from other changes in mindfulness/emotion regulation

• Temporal associations suggest bi-directional effects
  – Mindfulness = an “upward spiral process”?

• Much more work to be done to understand process
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