Mechanisms Change: Yoga for Trauma and Eating Disorders

Catherine Cook-Cottone, PhD, RYT
What is a mechanism of change?

The process that is responsible for change

The How? and Why?

Yoga Practice

Yoga Outcomes

Distress Tolerance

Self-Regulation

Present Moment Awareness
Wait... What is yoga practice? (all of it? Some of it?)

Image from https://blog.freepeople.com/2012/09/limbs-yogaand/
Gard et al., 2014

Potential Self-regulatory Mechanism Of Yoga for Psychological Health

Table 1 | Components of classical yoga (the eight limbs of Patanjali’s Raja yoga).

<table>
<thead>
<tr>
<th>ETHICS</th>
<th>MEDITATION</th>
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<tr>
<td>Yamas</td>
<td>Pratyahara</td>
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<td>Ahimsa</td>
<td>Sensory withdrawal</td>
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<td>Satya</td>
<td>Relaxation techniques</td>
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<td>Asteya</td>
<td>Inward-mindedness</td>
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<td>Brahmacarya</td>
<td>Minimizing sensory input</td>
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<td>Aparigraha</td>
<td>Dharana</td>
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<td></td>
<td>Concentration</td>
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<td>Single-pointed, focused attention</td>
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<td>Niyamas</td>
<td>Dhyana</td>
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<td>Saucha</td>
<td>Meditation</td>
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<td>Santosha</td>
<td>Unbroken flow of attention</td>
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<td>Tapas</td>
<td>Object-based</td>
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<tr>
<td>Svadhyaya</td>
<td>Open monitoring</td>
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<td>Iswara Pranidhana</td>
<td>Effortless</td>
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<tr>
<th>POSTURES</th>
<th>LEGEND OF MODERN USAGE</th>
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<tr>
<td>Asana</td>
<td>Samadhi</td>
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<tr>
<td>Postures</td>
<td>Integration</td>
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<tr>
<td>Standing poses</td>
<td>Merging of subject &amp; object</td>
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<tr>
<td>Balancing poses</td>
<td>Transcendental consciousness</td>
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<tr>
<td>Forward bends</td>
<td>Self-realization</td>
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<td>Backbends</td>
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<td>Twists</td>
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<td>Inversions</td>
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<td>Restorative poses</td>
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<td>Vinyasa</td>
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<td>Breath-linked movement of poses</td>
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**Breath Regulation**

<table>
<thead>
<tr>
<th>Pranayama</th>
<th>Breath Regulation</th>
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<tbody>
<tr>
<td>Nostril breathing</td>
<td>Slow, deep diaphragmatic</td>
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<td></td>
<td>Epiglottal constriction</td>
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<tr>
<td>Nostril breathing</td>
<td>Altered rate or depth</td>
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<td>Uninostri</td>
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<tr>
<td>Mouth breathing</td>
<td>Through curled/flat tongue or teeth</td>
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<td>Breath with sound</td>
<td>Sighing</td>
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<td></td>
<td>Humming or bee breath</td>
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<tr>
<td>Retentions</td>
<td>Holding breath in or out</td>
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<td>Ratios of in, out &amp; retentions</td>
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These components are described by their modern usage, and grouped into four operational categories that are used to conceptualize how yoga may influence self-regulatory processes.
School-Based Yoga Practices
(postures, breathing, relaxation, meditation)

Mind-Body Awareness
- ↑Mindfulness
- ↑Attention
- ↑Concentration/Cognition
- ↑Self/social Awareness

Self-Regulation
- ↑Emotion Regulation
- ↑Stress Regulation
- ↑Resilience
- ↑Equanimity
- ↑Psychological Self-Efficacy

Physical Fitness
- ↑Flexibility
- ↑Strength
- ↑Balance
- ↑Respiratory Function
- ↑Physical Self-Efficacy

Behaviors, Mental State, Health & Performance
- ↑Mood, ↑Well-Being, ↓Psychological Disorders,
- ↑Positive Behaviors, ↓Negative Behaviors, ↑Physical Health,
- ↑Cognitive/Academic Performance, ↑Relationships, ↑Quality of Life
Main Components of Modern Yoga-Based Practices

- **Movement** (Yoga is a movement based contemplative practice)
  - Postures
  - Movement Sequences
  - Interior Muscle Groups
  - Coordinated movement of moderate intensity
  - Expansion of range of motion
  - Tracking bodily sensations
  - Intent of obtaining a state of eutony (a well-balanced tension, Sthira and Sukha)

- **Breath**

- **Attention**
  - To bodily sensations
  - Focused attention and open monitory
  - Metacognitive awareness
  - Gaze as tool

- Schmalzl et al., 2015
Structural plasticity of the social brain: Differential change after socio-affective and cognitive mental training

Sofie L. Valk, Boris C. Bernhardt, Fynn-Mathis Trautwein, Anne Böckler, Philipp Kanske, Nicolas Guizard, D. Louis Collins, Tania Singer

Although neuroscientific research has revealed experience-dependent brain changes across the life span in sensory, motor, and cognitive domains, plasticity relating to social capacities remains largely unknown. To investigate whether the targeted mental training of different cognitive and social skills can induce specific changes in brain morphology, we collected longitudinal magnetic resonance imaging (MRI) data throughout a 9-month mental training intervention from a large sample of adults between 20 and 55 years of age. By means of various daily mental exercises and weekly instructed group sessions, training protocols specifically addressed three functional domains: (i) mindfulness-based attention and interoception, (ii) socio-affective skills (compassion, dealing with difficult emotions, and prosocial motivation), and (iii) socio-cognitive skills (cognitive perspective-taking on self and others and metacognition). MRI-based cortical thickness analyses, contrasting the different training modules against each other, indicated spatially diverging changes in cortical morphology. Training of present-moment focused attention mostly led to increases in cortical thickness in prefrontal regions, socio-affective training induced plasticity in frontoinsular regions, and socio-cognitive training included change in inferior frontal and lateral temporal cortices. Module-specific structural brain changes correlated with training-induced behavioral improvements in the same individuals in domain-specific measures of attention, compassion, and cognitive perspective-taking, respectively, and overlapped with task-relevant functional networks. Our longitudinal findings indicate structural plasticity in well-known socio-affective and socio-cognitive brain networks in healthy adults based on targeted short daily mental practices. These findings could promote the development of evidence-based mental training interventions in clinical, educational, and corporate settings aimed at cultivating social intelligence, prosocial motivation, and cooperation.
**A Training design**

Retest control cohort I (RCC1), n = 30

Training cohort I (TC1), n = 80

Training cohort II (TC2), n = 81

Training cohort III (TC3), n = 81

**B Training modules**

**PRESENCE**
Attention and interoceptive awareness

**AFFECT**
Care/compassion, prosocial motivation, dealing with difficult emotions

**PERSPECTIVE**
Meta-cognition, perspective-taking on self and others

**C Overall cortical thinning in retest controls over 9-month period**

**D Module-specific training-related cortical thickness increases**
# What are we trying to change?

- Stress
- **Eating Disorders**
- Depression
- Mood
- Substance Use
- Chronic Pain
- Alcoholism
- **Trauma**
- PTSD
- Loneliness
- Obesity
- Diabetes
- Poor Academic Performance
- Social Skills
- Headaches
- Cancer
- Side Effects from Cancer Treatment
- Conduct Disorder
- ADHD
- Emotional Outbursts
- Anxiety
- Drunk Driving
- Family Discord
- Running Injury
- **Back Pain**
- Muscle Fatigue
- Aging
- Community Isolation
- Mental Illness
- **World Peace**
  - ..........................
WAIT! HAMMER NO!

QUIET NAIL.
Mechanisms of Risk, Maintenance, and Growth

Identified Target for Change

Today

Trauma and Eating Disorders

Selected Yoga Practice
What is Trauma?

- Exposure to a traumatic event (i.e., threatened death, serious injury or sexual violation)
  - Direct experience
  - Witness the traumatic event in person
  - Learns of traumatic event
  - Experiences first hand repeated or extreme exposure to aversive details
- Overwhelms a person’s ability to cope
- Can result in feelings of terror, helplessness, and powerlessness (prolonged stress response)
- Interferes with sense of control, connection and meaning

Trauma and the Brain

Slide From: https://iveronicawalsh.wordpress.com/2014/04/11/a-cbt-look-at-fight-or-flight-when-the-tail-wags-the-dog/
Survival Mode

• Competing Demands
  • Survival vs. Learning
  • Difficult to learn, grow, and connect when your resources are dedicated to surviving

Sequence of Intra- and Interpersonal Engagement:

• Survival Mode: Regulate- Relate- Reason
• Typical Mode: Reason- Relate- Regulate
Eating Disorders

• Anorexia Nervosa
• Bulimia Nervosa
• Binge-Eating Disorder

• Other Specified Feeding or Eating Disorder
  • 1. Atypical AN
  • 2. BN low frequency or limited duration
  • 3. BED low frequency or limited duration
  • 4. Purging Disorder
  • 5. Night Eating Syndrome
Disorder and Rates

- **Anorexia Nervosa**
  - Less than 1% of population

- **Bulimia Nervosa**
  - About 1% of total population (some ages 3-5%)

- **Binge eating with a sense of being out of control**
  - 1-5% of the population

- According to a study done by colleagues at the *American Journal of Psychiatry* (2009), crude mortality rates were:
  - 4% for anorexia nervosa
  - 3.9% for bulimia nervosa
  - 5.2% for eating disorder not otherwise specified

Identified Target for Change

Mechanisms of Risk, Maintenance, and Growth

Selected Yoga Practice

Today

Trauma and Eating Disorders
“I am not in front of my body, I am in my body or rather I am my body.” Merleau-Ponty, 1996
Mechanisms: Yoga for Self-Regulation
(Gard et al., 2014)
Mechanisms: Yoga for Self-Regulation
(see Gard et al., 2014)

<table>
<thead>
<tr>
<th>Central executive network</th>
<th>Superior parietal lobe (sPL)</th>
<th>Dorsal frontal cortex</th>
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<td>Dorsal parietal cortex</td>
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<th>Frontoparietal control network</th>
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<td>Frontopolar cortex</td>
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<tr>
<td>Anterior cingulate cortex (ACC)</td>
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<td>Temporo-parietal junction (TPJ)</td>
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<th>Moral cognition network</th>
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<td>Ventromedial prefrontal cortex (vmPFC)</td>
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<td>Precuneus</td>
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<th>Dorsal attention network</th>
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<tr>
<td>Frontal eye fields (FEF)</td>
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<td>Dorsal parietal cortex</td>
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<td>Pulvinar</td>
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<th>Striatopallidalthalamocortical network</th>
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<td>Orbitofrontal cortex (OFC)</td>
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<td>Thalamus</td>
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Top-Down Mechanisms: Yoga for Self-Regulation
(Gard et al., 2014)

• Yoga as Meditation in Motion

• Focus
  • Intentional, attention engagement
  • Breath
  • Gaze
  • Disengagement from distractions
  • Stability in the face of stressors

• Meta-Awareness (i.e., witness consciousness)
  • Sensory, Interoceptive, and proprioceptive experience
  • Psychological distancing, decentered perspective
  • Uncouple sensory experience from the narrative self
  • Impermanence, suffering, not self (Grabovac et al., 2011)
  • Accurately assess present
  • Improve behavioral correction processes when regulating emotional responses to stress
Top-Down Mechanisms: Yoga for Self-Regulation (Gard et al., 2014)

• Rapid Cognitive Recovery from Emotional Perturbation

• Positive Reappraisal (upward spiral)
  • Learning to reframe (e.g., from discomfort to sensation)
  • Move to objective, observational, nonjudgmental stance to one’s experience

• Yoga On and Off the Mat
  • Readiness/willingness to change
  • Practice changing on the mat for off the mat life

• Decision Making
  • Integrating ethics such as ahimsa and santosha (contentment) when working through postures (e.g., Krilau yoga)
  • Meta-awareness and discernment to choice
Bottom-up Mechanisms: Yoga for Self-Regulation (Gard et al., 2014)

- Embodiment
  - Sensory and perceptual faculties sharpened
  - Greater phenomenological intensity

- Early Attention Filtering
  - Primary receptive networks for interoception and sensations are re-conditioned to facilitate engagement with body sensations, reduce bias and be more functionally integrated with viscerosomatic input, executive control, and adaptive motor output.

- Attenuated Emotional Reactivity

- Parasympathetic Responsiveness

- Breath Regulation in Connection to Emotional States
Bottom-up, Top-Down Mechanisms: Yoga for Self-Regulation (Gard et al., 2014)

• From effortful doing to effortless being (Automaticity)
  • Adaptive responses move from explicit and effortful to implicit and effortless

• Increased integration of afferent information
  • decreased reliance on top-down, increased integration of bottom-up
Mechanisms of Change in Yoga for Trauma

• Changes in the Brain and Neurotransmitter Systems (Review by Telles et al., 2012)
  • Increased alpha and decreased theta activity
  • Increased activation of the anterior prefrontal cortex
  • Underactive Serotonergic system (5-HTT)
  • Imbalance in ascending dopaminergic tracts (mesolimbic and mesocortical dopamine systems, which alter control of midbrain defenses)
  • Levels of plasma catecholamines
  • Gamma Aminobutyric Acid (GABA)

• Affect Changes (Review by Telles et al., 2012)
  • Reduced negative affect (Dopamine, 5-HTT)
  • Reduced anxiety (GABA)
  • Higher positive affect (Dopamine, 5-HTT, GABA)
  • Stress reduction (Dopamine, 5-HTT)

Review by Telles et al. (2012)
Mechanisms of Change in Trauma

• Embodiment (Cook-Cottone, et al., 2017)
• Present Moment Awareness (Cook-Cottone et al., 2017)
• Interoceptive, Proprioceptive, and Emotion Awareness (Cook-Cottone et al., 2017)
• Distress Tolerance and Experiential Avoidance (Cook-Cottone, 2017; Dick et al., 2014)
  • Aversive internal stimuli leads to
    • Narrowing of behavioral repertoire (psychological inflexibility)
    • Expressive suppression of inhibiting emotion-expressive behavior when emotionally aroused
• Body as a Resource (Cook-Cottone et al., 2017)
• Emotion Regulation (Cook-Cottone et al., 2017)
• Integrative Decision Making (Cook-Cottone et al., 2017)
  • Body and Mind as Source
  • Based on cognitive, emotional, sensational, interceptive, and prop information
Example iREST

iREST is a secular practice consisting of 15-35 minute sequences, which emphasize:

(1) Awareness of the physical body and breath
   • Present Moment Awareness

(2) Systematic desensitization to neutralize and resolve negative sensation, stress, emotion, belief, cognition, image and memory;
   • Embodiment
   • Distress Tolerance
   • Experiential Avoidance
   • Emotion Regulation

(3) An experience of joy and well-being;
   • Emotion Regulation

(4) The embodiment of equanimity amidst the ever-changing circumstances of life.
   • Embodiment
   • Body as a Resource
   • Integrative Decision Making
Mechanisms of Change in Yoga for Eating Disorders

• Anxiety and Depression
  • Attempts to control anxiety and depression
  • exercise and compensatory behaviors (purging, fasting)
  • Food restriction and binge eating
  • Food Preoccupation (cognitions about food)

• Emotion Regulation
• Present Moment Awareness
• Awareness of Internal States
  • Interoception, Proprioception Awareness, Emotion Identification

• Experiential Avoidance and Distress Tolerance
• Embodiment
  • Self as subject, not object;
  • lived experience of and from the body

• Body as a Resource
  • source for coping and stress reduction

Carei et al., 2010; Cook-Cottone, 2015; Hall et al., 2016; Pacanowski et al., 2017
Does Your Program Deliver Active Ingredients?
Sample Logic Model

Reaction To Traumatic Exposure

(a) Hyper-arousal
(b) Avoidance/Re-experiencing
(c) Alterations in Cognition

Yoga and Mindfulness Practice

(a) Embodied Practice
(b) Engagement in the Present Moment
(c) Re-mapping Cognitions

Risk for Unhealthy Behaviors To Self-Regulate

From: Cook-Cottone, 2017
Invitation (Ongoing Informed Consent)

Choice
- Anything
- A, B
- A, B, C

Interoception (Bringing awareness to, and experiencing sensation in, the body)

Safe and Accepting Relational Space
(Non-directional; Continuously Fostered)

Shared Authentic Experience in the Present Moment

Prioritize- Client Agency/Safe Relationship over Form

Methodological Sequence (Practice of Forms) ➔
(Directionality; Step-by-Step Process)
Agency through Choices and Embodied Experience

Acceptance and Change Dialectic
(Balance between Non-directional Relational Space and Directionality in the Methodological Sequence)

Having a Body ➔ Befriending the Body ➔ Body as a Resource

Cook-Cottone Summarizing Emerson, 2016
Eating Disorder

(a) Disordered relationship with the body (body image disturbance, poor interoceptive awareness)
(b) Difficulties with present moment awareness and distress tolerance (mood, body sensations)
(c) Self-regulation through symptoms
(c) Alterations in Cognition

Yoga and Mindfulness Practice

(a) Embodied Practice
(b) Tools for present moment awareness and distress tolerance
(c) Self-regulation through body and breath (body as a resource)
(c) Re-mapping Cognitions

Body objectified and seen as a source of distress that must be controlled

Positive Embodiment the body is experienced as a resource

From: Cook-Cottone, 2015
Sample Delivery of Self-Regulation Tools
Skills Developed in the Yoga Class

• **Step 1:** **BE HERE**- Cultivate present moment awareness
  • Practice being in the here and now
  • Developing the witness and coach

• **Step 2:** **SEE**- Notice what you are experiencing
  • Inner and outer sensations
  • Emotions
  • Thoughts

• **Step 3:** **FEEL**- Feel what you feel
  • Interceptive awareness: muscle tension, heart beat, breath
  • Emotions
  • Changes in what you feel

• **Step 3:** **PRACTICE**- Practicing awareness-driven self-regulation
  • Stay with the moment
  • Physical tools to down-regulate or calm the nervous system
  • Physical tools to effectively engage the nervous system

• (see Cook-Cottone et al., 2017)
Nature of Delivery of Self-Regulation Tools
Sample of Support Provided by Yoga Teacher

• **INSTRUCTION** - Presence, awareness, and skills

• **SAFETY** - Prioritizes *safe* practice for positive embodiment ("I deserve to be safe")

• **CHOICE** and **AGENCY** - Emphasizes *choice* and *agency* - personal ownership of growth ("I can choose")

• **EMPOWERMENT** - Emphasizes personal *empowerment* ("I can")

• **COLLABORATION** and **SUPPORT** - Encourages *collaborative* and *supportive context* (distinction between help and support)

• See Cook-Cottone et al., 2017
Concluding Questions

• More intentional protocols explicitly addressing the causal chains (as in CBT, Mindfulness, MBSR Mechanisms Research)

• Does mechanism of action change for age group, in risk category for the yoga protocol?

• Can there be specifically designed protocols to address specific mechanism?

• Should we keep aspects of the yoga protocol not directly identified to affect a mechanisms of change?

• Should we be more prescriptive?

• What other mechanisms have we not considered?
  • Embodiment of the Teacher
  • Is yoga a form of bonding- connection with self, the teacher, (like the substance or the disorder). Does yoga affect attachment systems?
Books


References


• Evers, T. Using Positive Behavioral Interventions & Supports (PBIS) to Help Schools Become More Trauma-Sensitive. Wisconsin Department of Public Instruction.


Additional Notes on Yoga and Mindfulness

Return to the root of your being.
Mechanisms of Change for Yoga-Based Practice: Changes in neuro-circuitry

- Physiological Effects of Breath
- Body-Focused Attention
- Interoceptive Awareness
- Mind wandering and metacognition
- Gaze Training

RESULTS
- Regulation of allostatic load
- Integration of bottom-up and top-down processing

See schmalzl, et al., 2015
Mechanisms of Action Mindfulness for Psychological Distress
(Alsubaie et al., 2017; Coffey et al., 2010; Grabovac et al., 2011)

• **Emotional Regulation (Emotions)**
  - the ability to manage negative affect through increased insight and decreased reactivity (Coffey et al., 2010)
  - Awareness of impermanence and concept of not self (Grabovac et al., 2011)
  - Decreased cognitive and emotional reactivity (Alsubaie et al., 2017)
  - MBSR group showed improved functioning in brain regions associated with reduction in social anxiety (see Alsubaie et al., 2017)

• **Rumination (Thoughts)**
  - Through mindful attention to the present moment, focused attention (Alsubaie et al., 2017)
  - Nonattachment (not suffering through attachment and aversion; Grabovac et al., 2011)
  - Through decentering (Alsubaie et al., 2017)

• **Self-Compassion**
  - Associated with decreased rumination and worry (Alsubaie et al., 2017)