



**CAHMI MINDFULNESS & MATERNAL AND CHILD HEALTH  
STARTING PACKET OF MATERIALS**

Last Updated: July, 2012

For more information, to make a request for practice and learning support or to get books, audio Books, CD's, and other resources, please contact [mindfulmedicine@ohsu.edu](mailto:mindfulmedicine@ohsu.edu) or Christina Bethell at [bethellc@ohsu.edu](mailto:bethellc@ohsu.edu)

**Section 1: Getting Started Resources from AMCHP PULSE Newsletter**

**Section 2: Mindfulness Overview Materials**

1. A Short Selection of Mindfulness Poems and Sayings
2. NIH January 2012 *Mindfulness Matters* Newsletter
3. *Coping With Stress/Neurobiology of Stress* Diagram of the Body
4. 5 Factor Mindfulness Self Assessment Questionnaire
5. Mindfulness Meditation Primer

**Section 3: Science and Logic of Mindfulness**

1. *How Does Mindfulness Meditation Work*: Neuroscience of mindfulness (Holzel, et al 2011)
2. *The Practice of Self Management*: The Drucker Difference Book Chapter (Hunter)
3. Mindfulness Meditation Primer for Doctors (Young, Feb 2012)

**Section 4: Mindfulness MicroPractices**

1. MicroPractice Personal Planning Worksheet and Ideas to Consider (Bethell)
2. 21 Mindfulness MicroPractices For Work (Santorelli)
3. MicroPractices for Busy Providers (Kurtin)
4. Wheel of Awareness/Events Calendar Tool and 10 Steps to Peaceful Communication
5. Managing Your Calendar MicroPractice

**Section 5: Mindfulness and Health Care Reform and Other Pediatric Relevant Clinical Care References**

1. *Role of Mindfulness in Health Care Reform* Article (Ruff, et al, 2009)
2. *The Ongoing Quality Improvement Journey: Next Stop, High Reliability* (Chassin & Loeb, 2011)
3. *Mindfulness Training for Parents of Children with Autism* Article (Ferraioli & Harris, 2012)
4. *Selected list of mindfulness and maternal and child health related references*

## Getting Started Resources from AMCHP PULSE Newsletter

### **Selected Books and Book Chapters**

1. Mindfulness: Finding Peace in a Frantic World (2011), by Mark Williams and Danny Penmath
2. A Mindful Nation: How a Simple Practice Can Help Us Reduce Stress, Improve Performance, and Recapture the American Spirit (2012) Congressman Tim Ryan
3. Full Catastrophe Living (1990), by Jon Kabat-Zinn
4. The Mindful Leader: Awakening natural management skills through mindfulness meditation (2008), by Michael Carroll
5. The Whole-Brain Child: 12 Revolutionary Strategies to Nurture Your Child's Developing Mind, Survive Everyday Parenting Struggles, and Help Your Family Thrive (forthcoming, 2012), by Daniel Siegel
6. [Becoming a Resonant Leader: Develop Your Emotional Intelligence, Renew Your Relationships, Sustain Your Effectiveness](#) (2008) by [Annie McKee](#), [Richard E. Boyatzis](#) and Fran Johnston

### **Starting Audio Recordings**

1. Mindfulness for Beginners by Jon Kabat-Zinn
2. Guided Mindfulness Meditations by Jon Kabat-Zinn

### **Web Resources to Begin**

1. Free downloadable mindfulness meditation recordings: Mindfulness-Solution.com/DownloadMeditations.html
2. Monthly newsletter on the science of mindfulness: <http://www.mindfulexperience.org/newsletter.php>
3. Mindful: [www.mindful.org](http://www.mindful.org)
4. Institute for Mindful Leadership: [www.instituteformindfulleadership.org](http://www.instituteformindfulleadership.org)
5. Mind and Life Institute: [www.mindandlife.org](http://www.mindandlife.org)

### **Top Pick Article for the Researcher in You!**

Holzel, et al (2011) How Does Mindfulness Meditation Work? Proposing Mechanisms of Action From a Conceptual and Neural Perspective. Perspectives on Psychological Science 6(6) 537–559



A

## A Short Selection of Mindfulness Poems and Sayings

*"We have what we seek. It is there all the time, and if we give it time, it will make itself known to us." — Thomas Merton*

### A Blessing for Beauty

May the beauty of your life become more visible to you, that you may glimpse your wild divinity.

May the wonders of the earth call you forth from all your small, secret prisons  
and set your feet free in the pastures of possibilities.

May the light of dawn anoint your eyes that you may behold what a miracle a day is.

May the liturgy of twilight shelter all your fears and darkness within the circle of ease.

May the angel of memory surprise you in bleak times with new gifts from the harvest of your vanished days.

May you allow no dark hand to quench the candle of hope in your heart.

May you discover a new generosity towards yourself,  
and encourage yourself to engage your life as a great adventure.

May the outside voices of fear and despair find no echo in you.

May you always trust the urgency and wisdom of your own spirit.

May the shelter and nourishment of all the good you have done, the love you have shown, the suffering you have carried, awaken  
around you to bless your life a thousand times.

And when love finds the path to your door may you open like the earth to the dawn, and trust your every hidden color towards its  
nourishment of light.

May you find enough stillness and silence to savor the kiss of God on your soul  
and delight in the eternity that shaped you, that holds you and calls you.

And may you know that despite confusion, anxiety and emptiness, your name is written in Heaven.

And may you come to see your life as a quiet sacrament of service, which awakens around you a rhythm where doubt gives way to  
the grace of wonder, where what is awkward and strained can find elegance, and where crippled hope can find wings, and torment  
enter at last unto the grace of serenity.

May Divine Beauty bless you.

John O'Donohue, from *Beauty – The Invisible Embrace* (2004, SoundsTrue Boulder, CO 80306)

A billion stars go spinning through the night,  
Blazing high above your head.  
But in you is the presence that  
Will be, when all the stars are dead.

*Ranier Maria Rilke*

By being with yourself, by watching yourself in your daily life with alert interest, with the intention to understand rather than to judge, in full acceptance of whatever may emerge, because it is there, you encourage the deep to come to the surface and enrich your life and consciousness with its captive energies. This is the great work of awareness; it removes obstacles and releases energies by understanding the nature of life and mind. Intelligence is the door to freedom and alert attention is the mother of intelligence. **Nisargadatta Maharaj, 1971**

Stand still.

The trees before you and the bushes beside you are not lost.

Wherever you are is a place called Here,

And you must treat it as a powerful stranger,

Must ask permission to know it and be known.

The forest breathes. Listen. It answers,

I have made this place around you,

If you leave it you may come back again saying Here.

No two trees are the same to Raven.

No two branches the same to Wren.

If what a tree or a bush does is lost on you,

You are surely lost. Stand still. The forest knows

Where you are. You must let it find you.

*David Wagoner*

### **Sweet Darkness**

When your eyes are tired  
the world is tired also.

When your vision has gone  
no part of the world can find you.

Time to go into the dark  
where the night has eyes  
to recognize its own.  
There you can be sure  
you are not beyond love.

The dark will be your womb  
tonight.  
The night will give you a horizon  
further than you can see.

You must learn one thing.  
The world was made to be free in.  
Give up all the other worlds  
except the one to which you belong.

Sometimes it takes darkness and the sweet  
confinement of your aloneness  
to learn  
anything or anyone  
that does not bring you alive  
is too small for you.

***David Whyte***

*The Guest House*

This being human is a guest-house.

Every morning a new arrival.

A joy, a depression, a meanness,  
some momentary awareness comes  
as an unexpected visitor.

Welcome and entertain them all!

Even if they're a crowd of sorrows,  
Who violently sweep your house  
empty of its furniture.

still, treat each guest honorably.

He may be clearing you  
out for some new delight.

The dark thought, the shame, the malice,  
meet them at the door laughing,  
and invite them in.

Be grateful for whoever comes,  
because each has been sent  
as a guide from beyond.

*Rumi, Translated by Coleman Barks with John Moyne*

# NIH News in Health

A monthly newsletter from the National Institutes of Health, part of the U.S. Department of Health and Human Services

A monthly newsletter from the [National Institutes of Health](#), part of the U.S. [Department of Health and Human Services](#)

## Mindfulness Matters

### *Can Living in the Moment Improve Your Health?*



At some point in your life, someone probably told you: “Enjoy every moment. Life is short.” Maybe you’ve smiled and rolled your eyes at this well-intentioned relative or co-worker. But the fact is, there’s something to it. Trying to enjoy each moment may actually be good for your health.

The idea is called mindfulness. This ancient practice is about being completely aware of what’s happening in the present—of all that’s going on inside and all that’s happening around you. It means not living your life on “autopilot.” Instead, you experience life as it unfolds moment to moment, good and bad, and without judgment or preconceived notions.

“Many of us go through our lives without really being present in the moment,” says Dr. Margaret Chesney of the University of California, San Francisco. She’s studying how mindfulness affects health. “What is valuable about mindfulness is that it is accessible and can be helpful to so many people.”

Studies suggest that mindfulness practices may help people manage stress, cope better with serious illness and reduce anxiety and depression. Many people who practice mindfulness report an increased ability to relax, a greater enthusiasm for life and improved self-esteem.

One NIH-supported study found a link between mindfulness meditation and measurable changes in the brain regions involved in memory, learning and emotion. Another NIH-funded researcher reported that mindfulness practices may reduce anxiety and hostility among urban youth and lead to reduced stress, fewer fights and better relationships.

A major benefit of mindfulness is that it encourages you to pay attention to your thoughts, your actions and your body. For example, studies have shown that mindfulness can help people achieve and maintain a healthy weight. “It is so common for people to watch TV and eat snack food out of the box without really attending to how much they are eating,” says Chesney. “With mindful eating, you eat when you’re hungry, focus on each bite, enjoy your food more and stop when you’re full.”

Finding time for mindfulness in our culture, however, can be a challenge. We tend to place great value on how much we can do at once and how fast. Still, being more mindful is within anyone’s reach.

You can practice mindfulness throughout the day, even while answering e-mails, sitting in traffic or waiting in line. All you have to do is become more aware—of your breath, of your feet on the ground, of your fingers typing, of the people and voices around you.

Chesney notes that as people start to learn how to be more mindful, it’s common and normal to realize how much your mind races and focuses on the past and future. You can just notice those thoughts and then return to the present moment. It is these little, regular steps that add up and start to create a more mindful, healthy life.

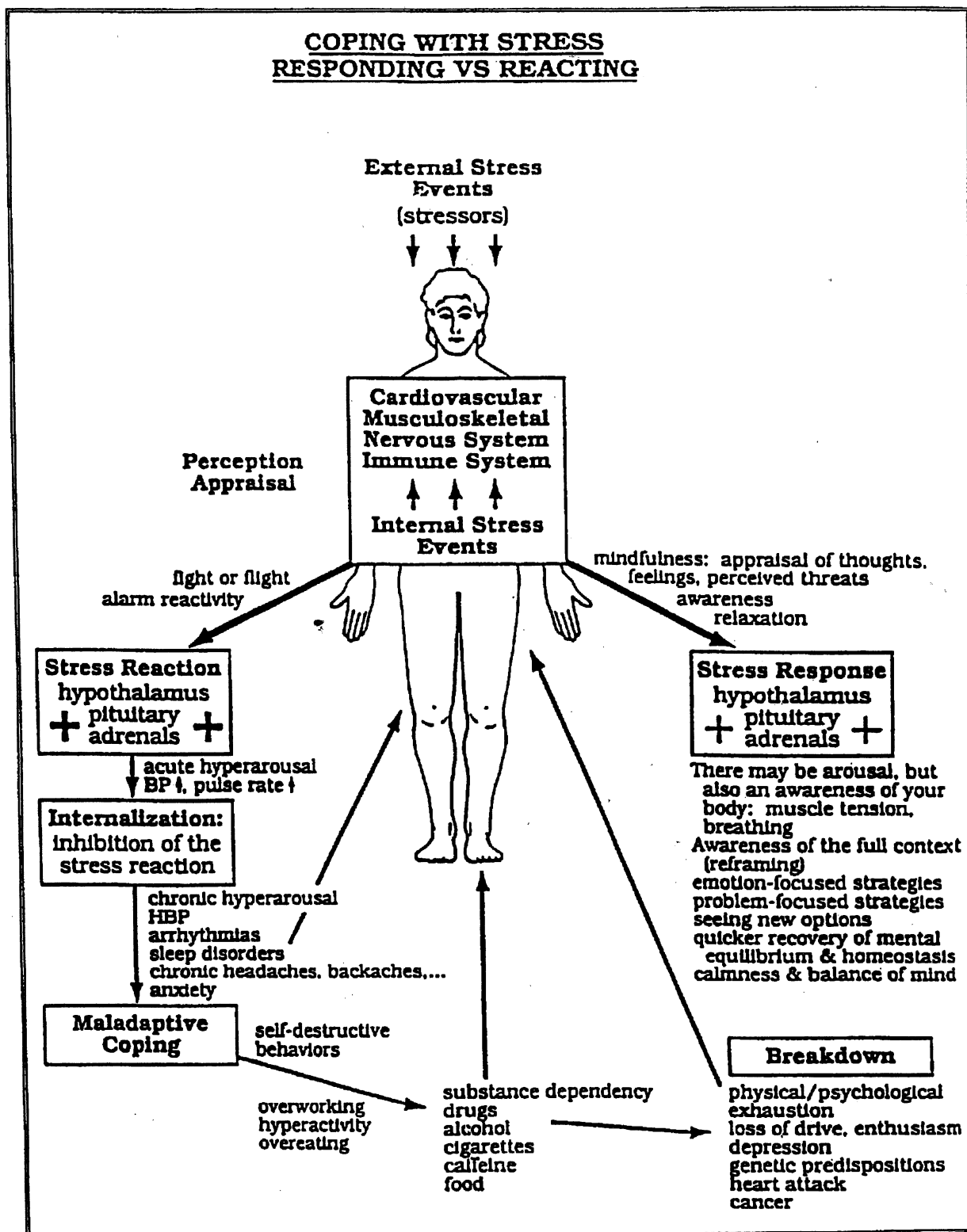
So, before you roll your eyes again, take a moment and consider mindfulness.

#### Being Mindful

The concept of mindfulness is simple, but becoming a more mindful person requires commitment and practice. Here are some tips to help you get started:

- **Take some deep breaths.** Breathe in through your nose to a count of 4, hold for 1 second and then exhale through the mouth to a count of 5. Repeat often.
- **Enjoy a stroll.** As you walk, notice your breath and the sights and sounds around you. As thoughts and worries enter your mind, note them but then return to the present.
- **Practice mindful eating.** Be aware of taste, textures and flavors in each bite, and listen to your body when you are hungry and full.
- **Find mindfulness resources in your local community,** including yoga and meditation classes, mindfulness-based stress reduction programs and books.

## COPING WITH STRESS RESPONDING VS REACTING



Adapted from *Full Catastrophe Living* by Jon Kabat-Zinn, Ph.D



## Five Facet Mindfulness Questionnaire

### **Description:**

This instrument is based on a factor analytic study of five independently developed mindfulness questionnaires. The analysis yielded five factors that appear to represent elements of mindfulness as it is currently conceptualized. The five facets are observing, describing, acting with awareness, non-judging of inner experience, and non-reactivity to inner experience. More information is available in:

Please rate each of the following statements using the scale provided. Write the number in the blank that best describes your own opinion of what is generally true for you.

1	2	3	4	5
never or very rarely true	rarely true	sometimes true	often true	very often or always true

- \_\_\_\_\_ 1. When I'm walking, I deliberately notice the sensations of my body moving.
- \_\_\_\_\_ 2. I'm good at finding words to describe my feelings.
- \_\_\_\_\_ 3. I criticize myself for having irrational or inappropriate emotions.
- \_\_\_\_\_ 4. I perceive my feelings and emotions without having to react to them.
- \_\_\_\_\_ 5. When I do things, my mind wanders off and I'm easily distracted.
- \_\_\_\_\_ 6. When I take a shower or bath, I stay alert to the sensations of water on my body.
- \_\_\_\_\_ 7. I can easily put my beliefs, opinions, and expectations into words.
- \_\_\_\_\_ 8. I don't pay attention to what I'm doing because I'm daydreaming, worrying, or otherwise distracted.
- \_\_\_\_\_ 9. I watch my feelings without getting lost in them.
- \_\_\_\_\_ 10. I tell myself I shouldn't be feeling the way I'm feeling.
- \_\_\_\_\_ 11. I notice how foods and drinks affect my thoughts, bodily sensations, and emotions.
- \_\_\_\_\_ 12. It's hard for me to find the words to describe what I'm thinking.
- \_\_\_\_\_ 13. I am easily distracted.
- \_\_\_\_\_ 14. I believe some of my thoughts are abnormal or bad and I shouldn't think that way.

- \_\_\_\_\_ 15. I pay attention to sensations, such as the wind in my hair or sun on my face.
- \_\_\_\_\_ 16. I have trouble thinking of the right words to express how I feel about things
- \_\_\_\_\_ 17. I make judgments about whether my thoughts are good or bad.
- \_\_\_\_\_ 18. I find it difficult to stay focused on what's happening in the present.
- \_\_\_\_\_ 19. When I have distressing thoughts or images, I "step back" and am aware of the thought or image without getting taken over by it.
- \_\_\_\_\_ 20. I pay attention to sounds, such as clocks ticking, birds chirping, or cars passing.
- \_\_\_\_\_ 21. In difficult situations, I can pause without immediately reacting.
- \_\_\_\_\_ 22. When I have a sensation in my body, it's difficult for me to describe it because I can't find the right words.
- \_\_\_\_\_ 23. It seems I am "running on automatic" without much awareness of what I'm doing.
- \_\_\_\_\_ 24. When I have distressing thoughts or images, I feel calm soon after.
- \_\_\_\_\_ 25. I tell myself that I shouldn't be thinking the way I'm thinking.
- \_\_\_\_\_ 26. I notice the smells and aromas of things.
- \_\_\_\_\_ 27. Even when I'm feeling terribly upset, I can find a way to put it into words.
- \_\_\_\_\_ 28. I rush through activities without being really attentive to them.
- \_\_\_\_\_ 29. When I have distressing thoughts or images I am able just to notice them without reacting.
- \_\_\_\_\_ 30. I think some of my emotions are bad or inappropriate and I shouldn't feel them.
- \_\_\_\_\_ 31. I notice visual elements in art or nature, such as colors, shapes, textures, or patterns of light and shadow.
- \_\_\_\_\_ 32. My natural tendency is to put my experiences into words.
- \_\_\_\_\_ 33. When I have distressing thoughts or images, I just notice them and let them go.
- \_\_\_\_\_ 34. I do jobs or tasks automatically without being aware of what I'm doing.
- \_\_\_\_\_ 35. When I have distressing thoughts or images, I judge myself as good or bad, depending what the thought/image is about.
- \_\_\_\_\_ 36. I pay attention to how my emotions affect my thoughts and behavior.
- \_\_\_\_\_ 37. I can usually describe how I feel at the moment in considerable detail.
- \_\_\_\_\_ 38. I find myself doing things without paying attention.
- \_\_\_\_\_ 39. I disapprove of myself when I have irrational ideas.

## **Scoring Information:**

### Observe items:

1, 6, 11, 15, 20, 26, 31, 36

### Describe items:

2, 7, 12R, 16R, 22R, 27, 32, 37

### Act with Awareness items:

5R, 8R, 13R, 18R, 23R, 28R, 34R, 38R

### Nonjudge items:

3R, 10R, 14R, 17R, 25R, 30R, 35R, 39R

### Nonreact items:

4, 9, 19, 21, 24, 29, 33

## **Reference:**

Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., & Toney, L. (2006). Using self-report assessment methods to explore facets of mindfulness. *Assessment, 13*, 27-45.



**“There is one thing I can state definitely, with confidence: the mind can change through training, through awareness.”**  
 – The Dalai Lama

## Mindfulness Meditation Primer

The idea of being mindful - being present, being more conscious of life as it happens - may seem contradictory to those who are used to sacrificing living for pursuing their goals ... but cultivating mindfulness will help you achieve your goals and enjoy life more. In fact, you're more productive when you're mindful.

But more importantly, being present is undoubtedly the only way to enjoy life to the fullest. By being mindful, you enjoy your food more, you enjoy friends and family more, you enjoy anything you're doing more. Even things you might think are drudgery or boring, such as housework, can be amazing if you are truly present. Try it - wash dishes or sweep or cook, and remain fully present. It takes practice, but it's incredible.

## Steps of Mindfulness Meditation

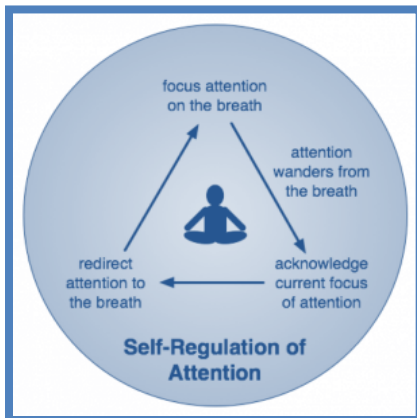


Diagram Source: Dan Siegel

## Benefits

- Maintaining your calm inner awareness, balance and clarity in the midst of any situation
- A gradual shift to a higher level of consciousness... centered in the peace, joy and freedom of your Spirit
- Increased insight and clarity... seeing things truly, as they are.
- Stress reduction

**BUILD T.R.U.S.T.**

**T**RUTH – turn inward to discover your deepest truth, be true to yourself

**R**ELEASE, **R**ELAX, **R**ECEIVE – release fear by relaxing body and mind, then receive direction

**U**SE – use both your inner resources and outer resources

**S**PEAK – speak what you know and your deeper truth

**T**URN INWARD, **T**RY AGAIN – trust the process

1. Sit comfortably, with your eyes closed and your spine reasonably straight.
  2. Direct your attention to your breathing.
  3. When thoughts, emotions, physical feelings or external sounds occur, simply accept them, giving them the space to come and go without judging or getting involved with them.
  4. When you notice that your attention has drifted off and become engaged in thoughts or feelings, simply bring it back to your breathing and continue.
- Remember: it's ok and natural for thoughts to arise, and for your attention to follow them. No matter how many times this happens, just keep bringing your attention back to your breathing.*



**“Smile, breathe & go slowly”**  
 – Thich Nhat Hanh,  
 Zen Buddhist monk

**“To allow oneself to be carried away by a multitude of conflicting concerns, to surrender to too many demands, to commit oneself to too many projects, to want to help everyone in everything is to succumb to violence. The frenzy of the activist neutralizes his or her work for peace.”**  
 – Thomas Merton

## Tips for Mindful Living

**Take a few minutes in the morning to be quiet and still,** sit or lie down and be with yourself. Gaze out the window, listen to the sounds of nature or take a slow, quiet walk.

∞

**Live slowly and savor your life.** Tune into the sights and sounds and awaken your senses.

∞

**Switch off the radio and experience the silence,** see what it's like to have the sound turned off. This gives you an opportunity to fill your awareness with other perceptions, which can be more enriching.

∞

**Do less.** If you do less, you can do those things more slowly, more completely and with more concentration. Figure out what's important and let go of what's not.

∞

**Stop worrying about the future.** Just focus on what you're doing, right now and enjoy the present moment. Decide not to play the radio and be present with yourself – tune in.

∞

**Use moments of waiting as opportunities for mindfulness.** Transform your relationship with traffic lights by using them as moments for meditation.

∞

**When you eat, just eat.** Eat attentively and slowly, savor your food and avoid multitasking while you eat.

∞

**Pause with others.** Take a moment at the beginning of meetings to acknowledge everyone there and take a moment of gratitude before beginning. When in conflict, pause, connect with your breath and set a positive intention.

∞

**Decide to “stop” for 1-3 minutes every hour during your workday** to become aware of your breathing and body sensations. Use this as a time to regroup and recoup.

∞

**See the shades of gray.** Acknowledge the difference between judgment and discernment. See beyond the black and white of your own judgments. This unlocks creativity and innovation.

∞

**At the end of the workday, retrace your activities** of the day, acknowledging and congratulating yourself for what you've accomplished and make a list and set an intention for the next day.

∞

**Reexamine what makes you happy.** What most often makes people happy is the impact they have and the connections they make.

## References and Resources

### Books

*A Mindfulness-Based Stress Reduction Workbook* by Bob Stahl and Elisha Goldstein

*Full Catastrophe Living* by Jon Kabat-Zinn

*Wherever You Go, There You Are: Mindfulness Meditation in Everyday Life* by Jon Kabat-Zinn

*Heal Thy Self: Lessons on Mindfulness in Medicine* by Saki Santorelli

*Mindfulness in Plain English* by Bhante Henepola Gunaratana

*Nonviolent Communication* by Marshall Rosenberg

*Train Your Mind Change Your Brain* by Sharon Begley

*A Pocket Guide to Interpersonal Neurobiology and Mindsight* by Daniel J. Siegel

*The Mindful Workplace* by Michael Chaskalson

### Audio

*Guided Mindfulness Meditations* by Jon Kabat-Zinn

*Mindfulness for Beginners* by Jon Kabat-Zinn

*Here for Now: Mindfulness Meditations* by Elana Rosenbaum

*Guided Meditations for Busy People* by Bodhipaksa

### Web

Mindfulnet.org

Mindful.org

Mind & Life Institute ([www.mindandlife.org](http://www.mindandlife.org))

Mindful Awareness Research Center ([marc.ucla.edu](http://marc.ucla.edu))

Mindfulness Research Guide ([www.mindfulexperience.org](http://www.mindfulexperience.org))

The Mind to Lead ([www.themindtolead.com](http://www.themindtolead.com))

### Journal Articles

Boyatzis, R and McKee, A. (2005). Mindfulness: An essential element of resonant leadership. Harvard Business School Press.

Goleman, D. (2000). Leadership that gets results. Harvard Business Review.

Dane, E. (2010). Paying attention to mindfulness and its effects on task performance in the workplace. *Journal of Management*.

Pipe, T. B. (2008). Illuminating the inner leadership journey by engaging intention and mindfulness as guided by caring theory. *Nursing Administration Quarterly*, 32(2), 117-125.

Peterson, C., & Park, N. (2006). Character strengths in organizations. *Journal of Organizational Behavior*, 27, 1149-1154.

# How Does Mindfulness Meditation Work? Proposing Mechanisms of Action From a Conceptual and Neural Perspective

**Britta K. Hölzel<sup>1,2</sup>, Sara W. Lazar<sup>2</sup>, Tim Gard<sup>1,2</sup>,  
Zev Schuman-Olivier<sup>2</sup>, David R. Vago<sup>3</sup>, and Ulrich Ott<sup>1</sup>**

<sup>1</sup>Bender Institute of Neuroimaging, Justus Liebig-University, Giessen, Germany; <sup>2</sup>Massachusetts General Hospital, Harvard Medical School, Boston, MA; and <sup>3</sup>Brigham and Women's Hospital, Harvard Medical School, Boston, MA

## Abstract

Cultivation of mindfulness, the nonjudgmental awareness of experiences in the present moment, produces beneficial effects on well-being and ameliorates psychiatric and stress-related symptoms. Mindfulness meditation has therefore increasingly been incorporated into psychotherapeutic interventions. Although the number of publications in the field has sharply increased over the last two decades, there is a paucity of theoretical reviews that integrate the existing literature into a comprehensive theoretical framework. In this article, we explore several components through which mindfulness meditation exerts its effects: (a) attention regulation, (b) body awareness, (c) emotion regulation (including reappraisal and exposure, extinction, and reconsolidation), and (d) change in perspective on the self. Recent empirical research, including practitioners' self-reports and experimental data, provides evidence supporting these mechanisms. Functional and structural neuroimaging studies have begun to explore the neuroscientific processes underlying these components. Evidence suggests that mindfulness practice is associated with neuroplastic changes in the anterior cingulate cortex, insula, temporo-parietal junction, fronto-limbic network, and default mode network structures. The authors suggest that the mechanisms described here work synergistically, establishing a process of enhanced self-regulation. Differentiating between these components seems useful to guide future basic research and to specifically target areas of development in the treatment of psychological disorders.

## Keywords

anxiety disorders, attention, cognition, consciousness, neuroscience, positive psychology, stress disorders

Mindfulness meditation has been reported to produce beneficial effects on a number of psychiatric, functional somatic, and stress-related symptoms and has therefore increasingly been incorporated into psychotherapeutic programs (cf., Baer, 2003; Grossman, Niemann, Schmidt, & Walach, 2004). A large body of research documents the efficacy of mindfulness-based interventions in the treatment of a number of clinical disorders, including anxiety (Hofmann, Sawyer, Witt, & Oh, 2010; Roemer, Orsillo, & Salters-Pedneault, 2008), depression (Hofmann et al., 2010; Teasdale et al., 2000), substance abuse (Bowen et al., 2006), eating disorders (Tapper et al., 2009), and chronic pain (Grossman, Tiefenthaler-Gilmer, Raysz, & Kesper, 2007). Furthermore, mindfulness meditation positively influences aspects of physical health, including improved immune function (Carlson, Speca, Faris, & Patel, 2007; Davidson et al., 2003), reduced blood pressure and cortisol levels (Carlson et al., 2007), and increased telomerase activity<sup>1</sup> (Jacobs et al., 2010). Not only has mindfulness successfully been used in the

treatment of disorders and improvement of health; it has also been shown to produce positive effects on psychological well-being in healthy participants (Carmody & Baer, 2008; Chiesa & Serretti, 2009) and to enhance cognitive functioning (Jha, Krompinger, & Baime, 2007; Ortner, Kilner, & Zelazo, 2007; Pagnoni & Cekic, 2007; Slagter et al., 2007). Historically, mindfulness is a concept stemming from ancient Buddhist philosophy (Bhikkhu, 2010), and is practiced to achieve enduring happiness (Ekman, Davidson, Ricard, & Wallace, 2005) and to gain insight into a view of the true nature of existence (Olenzki, 2010).

## Corresponding Author:

Britta K. Hölzel, Bender Institute of Neuroimaging, Justus Liebig-University, Otto-Behaghel-Str. 10 H, 35394 Giessen, Germany  
E-mail: [britta@nmr.mgh.harvard.edu](mailto:britta@nmr.mgh.harvard.edu)

**Table 1.** Previous Theoretical Accounts That Describe Mechanisms of Mindfulness Meditation

Publication	Suggested components
Shapiro, Carlson, Astin, and Freedman (2006)	Attention, intention, attitude
Brown, Ryan, and Creswell (2007)	Insight, exposure, nonattachment, enhanced mind–body functioning, integrated functioning
Baer (2003)	Exposure, cognitive change, self-management, relaxation, acceptance
Five Facet Mindfulness Questionnaire (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006)	Observing, describing, acting with awareness, nonjudging of inner experience, nonreactivity to inner experience

## Definition of Mindfulness

In current research contexts, mindfulness is typically defined as nonjudgmental attention to experiences in the present moment (Kabat-Zinn, 1990). Bishop et al. (2004) suggest a two-component model of mindfulness, where the first component is the regulation of attention in order to maintain it on the immediate experience, and the second component involves approaching one's experiences with an orientation of curiosity, openness, and acceptance, regardless of their valence and desirability. Mindfulness is typically cultivated in formal meditation practices, such as sitting meditation, walking meditation, or mindful movements (Kabat-Zinn, 1990). The practice of mindfulness meditation encompasses focusing attention on the experience of thoughts, emotions, and body sensations, simply observing them as they arise and pass away.

## Need for a Theoretical Framework

It is striking that this seemingly simplistic practice can have such a wide range of applications and effects. Along with the many positive implications of mindfulness arises the question: How does mindfulness work; what are its mechanisms? Although there is currently a large body of literature, covering a wide range of research, including qualitative research, feasibility trials, controlled clinical trials, behavioral studies, and neuroscientific research, there is a relative paucity of theoretical reviews that consolidate the existing literature into a comprehensive theoretical framework.

Existing research on mindfulness includes a few theoretical accounts describing mechanisms of mindfulness meditation (see Table 1). Several of these accounts expound on the central role of attention in meditation practice (Brown & Ryan, 2003; Carmody, 2009; Lutz, Slagter, Dunne, & Davidson, 2008). Others have suggested that several components mediate the beneficial effects of mindfulness practice. For instance, Shapiro, Carlson, Astin, and Freedman (2006) posit that attention, intention, and attitude are the three critical components of mindfulness. Intentionally paying attention with a nonjudgmental attitude leads to a significant change in perspective, a so-called decentering (Fresco et al., 2007) or re-perceiving. Brown, Ryan, and Creswell (2007) also describe several processes underlying the beneficial effects of mindfulness,

including (a) insight, (b) exposure, (c) nonattachment, (d) enhanced mind–body functioning, and (e) integrated functioning. Similarly, in her 2003 review, Ruth Baer summarized several mechanisms that may explain how mindfulness skills can lead to symptom reduction and behavior change, namely (a) exposure, (b) cognitive change, (c) self-management, (d) relaxation, and (e) acceptance. A valuable empirical account for the description of the facets of mindfulness is the Five Facet Mindfulness Questionnaire (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006), which was developed based on an item pool of previously existing mindfulness questionnaires. Factor analyses over these items yielded five facets of mindfulness: observing (attending to or noticing internal and external stimuli, such as sensations, emotions, cognitions, sights, sounds, and smells); describing (noting or mentally labeling these stimuli with words); acting with awareness (attending to one's current actions, as opposed to behaving automatically or absentmindedly); nonjudging of inner experience (refraining from evaluation of one's sensations, cognitions, and emotions); and nonreactivity to inner experience (allowing thoughts and feelings to come and go, without attention getting caught in them).

The field has produced a number of studies utilizing psychological scales or behavioral tasks that provide empirical support for some of the proposed components. Simultaneously, a growing body of neuroimaging literature begins to describe brain activity during the meditative state as well as changes in neural structure and function associated with meditation practice. To our knowledge, no one has previously tried to consolidate the existing empirical literature. Our goal is to consolidate existing findings and address several components that have been empirically supported. Furthermore, whereas the previous models have described the process of mindfulness almost exclusively from a conceptual, psychological perspective, this present review will also integrate a neuroscientific perspective. This review is meant not as a complete description of the research in the field but to stimulate scientific debate.

In this review, we first describe what we believe to be the components of mindfulness meditation. We then discuss how these components are integrated during mindfulness meditation and suggest how they might interact with each other during a given situation. Finally, the relationship of self-compassion with the components is addressed.

**Table 2.** Components Proposed to Describe the Mechanisms Through Which Mindfulness Works

Mechanism	Exemplary instructions	Self-reported and experimental behavioral findings	Associated brain areas
1. Attention regulation	Sustaining attention on the chosen object; whenever distracted, returning attention to the object	Enhanced performance: executive attention (Attention Network Test and Stroop interference), orienting, alerting, diminished attentional blink effect	Anterior cingulate cortex
2. Body awareness	Focus is usually an object of internal experience: sensory experiences of breathing, emotions, or other body sensations	Increased scores on the Observe subscale of the Five Facet Mindfulness Questionnaire; narrative self-reports of enhanced body awareness	Insula, temporo-parietal junction
3.1 Emotion regulation: reappraisal	Approaching ongoing emotional reactions in a different way (nonjudgmentally, with acceptance)	Increases in positive reappraisal (Cognitive Emotion Regulation Questionnaire)	(Dorsal) prefrontal cortex (PFC)
3.2 Emotion regulation: exposure, extinction, and reconsolidation	Exposing oneself to whatever is present in the field of awareness; letting oneself be affected by it; refraining from internal reactivity	Increases in nonreactivity to inner experiences (Five Facet Mindfulness Questionnaire)	Ventro-medial PFC, hippocampus, amygdala
4. Change in perspective on the self	Detachment from identification with a static sense of self	Self-reported changes in self-concept (Tennessee Self-Concept Scale, Temperament and Character Inventory)	Medial PFC, posterior cingulate cortex, insula, temporo-parietal junction

## Components of Mindfulness Meditation

We believe that an array of distinct but interacting mechanisms are at play in producing the benefits of mindfulness meditation practice and propose that the combination of the following components—some of which have been identified in previous accounts—describe much of the mechanism of action through which mindfulness works:

1. Attention regulation
2. Body awareness
3. Emotion regulation, including
  - a. Reappraisal
  - b. Exposure, extinction, and reconsolidation
4. Change in perspective on the self

These components interact closely to constitute a process of enhanced self-regulation (Carver & Scheier, 2011; Vohs & Baumeister, 2004). However, the different components might come into play to varying degrees within any specific moment during mindfulness meditation. In the following sections, we address each of these components individually (see Table 2 for a list of the components and their characteristics).

### 1. Attention regulation

Many meditation traditions emphasize the necessity to cultivate attention regulation early in the practice (e.g., *samadhi* in

the Theravada Buddhist tradition [Hart, 1987]; *samatha* in Tibetan Buddhist traditions [Lutz, Dunne, & Davidson, 2007]; or *dharana* in Indian Yoga traditions [Vishnu Devananda, 1999]). They often recommend a focused attention meditation before moving on to other types of meditations later in the learning process, such as those that focus on cultivating positive emotions. In focused attention meditation (HYPERLINK "" \l "bib148" \o "bib148" Lutz, Slagter, et al., 2008), attention is supposed to rest on a single object. Whenever the practitioner notices that the mind has wandered off, she or he returns it to the chosen object. A typical instruction for a focused attention meditation in the mindfulness meditation tradition is the following: “Focus your entire attention on your incoming and outgoing breath. Try to sustain your attention there without distraction. If you get distracted, calmly return your attention to the breath and start again” (Smith & Novak, 2003; p.77). Illustrating the effects of repeated practice of focused attention meditation, meditators report that the regular practice enables them to focus their attention for an extended period of time (Barinaga, 2003), and distractions disturb this focus less frequently during formal meditation practice and in everyday life. In accordance with such self-reports, a number of studies have empirically documented enhanced attentional performance in meditators (e.g., Jha et al., 2007; Slagter et al., 2007; Valentine & Sweet, 1999; van den Hurk, Giommi, Gielen, Speckens, & Barendregt, 2010).

*Behavioral findings on meditation and executive attention.* During focused attention meditation, distracting external events as



well as memories or thoughts about future events represent conflicts to task goals. These are disregarded while the practitioner concentrates on the meditative object (e.g., the breath, body sensations, thoughts, emotions, a mantra, or visualization). Maintaining the focus of attention on a pursued object, while disregarding distractions, is referred to as conflict monitoring, or executive attention, and is one of the three attention networks proposed by Posner and Petersen (1990). One cognitive test that specifically measures executive attention is the executive attention task of the Attention Network Test (Fan, McCandliss, Sommer, Raz, & Posner, 2002). Two studies found that experienced meditators showed better performance on this executive attention task when compared with nonmeditators, as indicated by smaller error scores (Jha et al., 2007; van den Hurk et al., 2010) and lower reaction times (Jha et al., 2007). Additionally, a longitudinal study showed that only five days of meditation practice (Integrative Body–Mind Training) led to improvements on this test (Tang et al., 2007). Findings of the influence of mindfulness practice on executive attention using the classical Stroop task (Stroop, 1935) are mixed. Whereas one study did not find effects of an 8-week Mindfulness-Based Stress Reduction course on Stroop interference (Anderson, Lau, Segal, & Bishop, 2007), others using this test found lower Stroop interference in experienced meditators compared with controls (Chan & Woolacott, 2007; Moore & Malinowski, 2009) and a reduction in Stroop interference following a brief meditation intervention (Wenk-Sormaz, 2005).

**Neural mechanism of executive attention.** Neuroimaging research has established that the anterior cingulate cortex (ACC) enables executive attention (van Veen & Carter, 2002) by detecting the presence of conflicts emerging from incompatible streams of information processing. During meditation, when distracting external events or memories conflict with task goals, ACC activation may contribute to the maintenance of attention by alerting the systems implementing top-down regulation to resolve this conflict (van Veen & Carter, 2002). Together with the fronto-insular cortex, the ACC constitutes a network that is involved in switching between activations of different brain networks, thereby facilitating cognitive control (Sridharan, Levitin, & Menon, 2008). Neurons in these brain regions have specific properties that enable a rapid relay of control signals to multiple areas of the brain (Allman, Watson, Tetreault, & Hakeem, 2005) to initiate responses during cognitively demanding tasks (Sridharan et al., 2008).

**Neuroscientific findings on meditation practice.** Several neuroscientific studies have reported the ACC to be implicated in meditation (Cahn & Polich, 2006). Using functional MRI (fMRI), Hölzel et al. (2007) pursued the question of which brain region would be distinctly activated when meditators performed focused attention meditation. Compared with age-, gender-, and education-matched controls, experienced meditators showed greater activation in the rostral ACC (Hölzel et al., 2007), suggesting an effect of meditation practice on ACC activity. A similar effect (greater rostral ACC activation in meditators compared with controls) was

identified when individuals engaged in a mindfulness practice while awaiting unpleasant electric stimulation (Gard et al., 2010). Five days of Integrative Body–Mind Training may lead to greater activation of the rostral ACC during the resting state (Tang et al., 2009). Although ACC activation might initially be enhanced when acquiring greater attentional control, it might later decrease with higher levels of expertise, when the focus of attention is so steady that monitoring distractions becomes superfluous (Brefczynski-Lewis, Lutz, Schaefer, Levinson, & Davidson, 2007). In addition to these functional findings, structural MRI data also indicate that meditation practice might exert an influence on the ACC. Cortical thickness in the dorsal ACC was greater in experienced meditators compared with control subjects in an analysis of brain gray matter (Grant, Courtemanche, Duerden, Duncan, & Rainville, 2010), and 11 hr of Integrative Body–Mind Training led to an increase in white matter integrity in the ACC (Tang et al., 2010). In line with the assumption that ACC function is strengthened through concentrative meditation, electroencephalogram data document increased frontal midline theta rhythm during meditation (Aftanas & Golcheikine, 2002; Kubota et al., 2001). Frontal midline theta is associated with attention demanding tasks and presumably reflects ACC (and medial prefrontal cortex) activity (Asada, Fukuda, Tsunoda, Yamaguchi, & Tonoike, 1999).

**Clinical relevance.** The strengthening of attention regulation and accompanying ACC performance through mindfulness practice is especially promising for the treatment of disorders that suffer from deficiencies in these functions, such as attention-deficit/hyperactivity disorder (ADHD; e.g., Passarotti, Sweeney, & Pavuluri, 2010) or bipolar disorder (Fountoulakis, Giannakopoulos, Kovari, & Bouras, 2008). Although there is currently insufficient evidence to support the effectiveness of any type of meditation for ADHD (Krisanaprakornkit, Ngamjarus, Witoonchart, & Piyavhatkul, 2010), initial feasibility studies have shown promising effects on improvements in attention (Zylowska et al., 2008). Bipolar disorder is also associated with impairments in sustained attention and executive function, as has been established by a large number of empirical investigations (Ancin et al., 2010; Clark, Iversen, & Goodwin, 2002; Kolar, Reddy, John, Kandavel, & Jain, 2006; Kravariti et al., 2009; Maalouf et al., 2010). Neuroanatomical models of bipolar disorder propose a key role of the ACC, and a meta-analysis has confirmed volume changes in the ACC as well as state-dependent alterations in resting state activity in this region (Fountoulakis et al., 2008). Furthermore, ACC activation decreases during cognitive tasks in bipolar patients (Gruber, Rogowska, & Yurgelun-Todd, 2004). Mindfulness meditation practice might therefore be beneficial to ameliorate these deficits in cognitive functioning and accompanying ACC function by strengthening these skills in bipolar patients (Stange et al., in press). In line with this hypothesis, a few pilot studies have shown beneficial effects on symptoms in patients with bipolar disorder (Deckersbach et al., in press; Miklowitz et al., 2009; Williams et al.,

2008). However, further research is needed to assess the effectiveness of mindfulness-based treatments on attention regulation in these disorders.

*Effects of meditation practice on further components of attention.* Aside from the documented improvements in executive attention through mindfulness, effects have also been reported on other attention capacities. Within the framework of the network components described by Posner and Petersen (1990), enhanced performance in “orienting” (directing and limiting attention to a subset of possible inputs) has been found following an 8-week mindfulness-based stress reduction course (Jha et al., 2007) and in experienced meditators, as compared with controls (van den Hurk et al., 2010). An improvement in “alerting” (achieving and maintaining a vigilant state of preparedness) was found in experienced meditators following a 1-month mindfulness retreat (Jha et al., 2007), as well as a 3-month samatha retreat (MacLean et al., 2010). At a neurobiological level, these findings may relate to functional changes in the dorsal and ventral attention systems (Corbetta & Shulman, 2002; Fox, Corbetta, Snyder, Vincent, & Raichle, 2006). These data suggest that early stages of mindfulness practice (represented by a short mindfulness course) may lead to improvement in the function of the dorsal attention system involved in orienting, and more intensive open monitoring meditation on a 1-month retreat may additionally result in improvements in the function of the ventral attention system involved in alerting.

Other types of attention tests have shown that 3 months of intensive mindfulness meditation lead to a smaller attentional blink effect (a lapse in attention following a stimulus within a rapid stream of presented stimuli) and modified distribution of brain resources (Slagter et al., 2007; also see van Leeuwen, Willer, & Melloni, 2009). Varying meditation practices will differentially affect these specific attentional components (see Lutz, Slagter, et al., 2008, for a review of focused attention versus open monitoring meditation). Future research is necessary to assess the impact of different types of meditation practice on these other attentional components.

Attention regulation—in particular conflict monitoring—seems to be an important mechanism that is often developed early in mindfulness practice. A sufficient degree of attention regulation is necessary in order to stay engaged in meditation, as opposed to drifting off into day dreaming. Thus, successful attention regulation might be a building block for practitioners to also benefit from the other mechanisms of mindfulness practice, which will be described below. This connection between attention regulation and other mechanisms should be tested in future research.

## 2. Body awareness

Body awareness can be understood as the ability to notice subtle bodily sensations (Mehling et al., 2009). In mindfulness practice, the focus of attention is usually an object of internal experience: sensory experiences of breathing, sensory experiences related to emotions, or other body sensations. According

to Theravadan interpretations of Buddhist teachings, awareness of the body was taught as the first frame of reference (foundation of mindfulness). In Thanissaro Bhikkhu’s translation of the Satipatthana Sutta (Bhikkhu, 2010), the Buddha guides the monks with the following meditation instructions:

In this way he [the monk] remains focused internally on the body in and of itself, or externally on the body in and of itself, or both internally and externally on the body in and of itself. Or he remains focused on the phenomenon of origination with regard to the body, on the phenomenon of passing away with regard to the body, or on the phenomenon of origination and passing away with regard to the body. Or his mindfulness that “There is a body” is maintained to the extent of knowledge and remembrance. And he remains independent, unsustained by (not clinging to) anything in the world. This is how a monk remains focused on the body in and of itself.

*Self-report findings.* Practitioners often self-report that the practice of attending to body sensations results in an enhanced awareness of bodily states and greater perceptual clarity of subtle interoception. In qualitative interviews, 10 experienced mindfulness meditators were asked what changes they experienced in their lives since they had begun meditating. Seven of the 10 meditators spontaneously reported that they noticed a more differentiated experience of body sensations, and four of them reported greater emotional awareness (Hölzel, Ott, Hempel, & Stark, 2006). Participants in a mindfulness-based stress reduction course further illustrate self-reported changes in body awareness, as measured by the Five Facet Mindfulness Questionnaire. Body awareness is represented in items of the Observe subscale of the questionnaire, which covers the awareness of body sensations (e.g., Item 1: “When I’m walking, I deliberately notice the sensations of my body moving”), hearing, smelling, seeing, interoceptions, thoughts, and emotions (e.g., Item 11: “I notice how foods and drinks affect my thoughts, bodily sensations, and emotions”). Participation in the mindfulness-based stress reduction course resulted in large increases in scores on this scale (Carmody & Baer, 2008).

*Behavioral findings.* Although meditation practitioners report improved capability for body awareness, to our knowledge there has been no empirical evidence to verify these claims. In fact, studies that tested this claim by assessing performance on a heartbeat detection task, a standard measure of resting interoceptive awareness, found no evidence that meditators had superior performance compared with nonmeditators (Khalsa et al., 2008; Nielsen & Kaszniak, 2006). However, awareness of heartbeat sensations is not emphasized during mindfulness practice and thus may not be the best index of the awareness cultivated by the practice of meditation. Further studies are needed that test other types of body awareness, such as tactile acuity, which has been shown to be superior in experienced Tai Chi practitioners compared with matched controls (Kerr et al., 2008).

*Neuroscientific findings: Functional neuroimaging.* A number of findings from the mindfulness neuroscience literature point to changes in the function and structure of brain regions related

to body awareness. The insula is commonly activated during tasks of interoceptive awareness (Craig, 2003), and its local gray matter volume correlates with interoceptive accuracy and visceral awareness (Critchley, Wiens, Rotshtein, Ohman, & Dolan, 2004). Insula activation has been found to be increased in individuals after a mindfulness-based stress reduction course (compared with individuals who had not practiced mindfulness) when they focused on their momentary experience (i.e., employed an experiential focus; Farb et al., 2007). This study also found increased activation of the secondary somatosensory area, which is relevant for the processing of exteroceptive sensory events. In another study, a group of participants that had undergone mindfulness training showed greater activation of the right insula when being presented with sad movie clips (Farb et al., 2010). Further neuroscientific evidence along the same lines comes from studies on mindfulness in the context of pain. When presented with unpleasant stimuli during a mindful state, mindfulness meditators show stronger brain activation in the (posterior) insula and secondary somatosensory cortex (Gard et al., 2010). Similarly, mindfulness meditators more robustly activated the left anterior, posterior, and mid-insula as well as the thalamus (Grant, Courtemanche, & Rainville, 2010). The enhanced sensory processing has been suggested to represent increased bottom-up processing of the stimulus, that is, awareness of the actual sensation of the stimulus as it is.

**Neuroscientific findings: Structural neuroimaging.** Two cross-sectional studies comparing the gray matter morphometry of the brains of experienced meditators and controls showed that meditators had greater cortical thickness (Lazar et al., 2005) and greater gray matter concentration (Hölzel et al., 2008) in the right anterior insula. Although 8 weeks of mindfulness practice did not reveal changes in gray matter concentration in the insula (Hölzel et al., 2011), the same study did reveal that 8 weeks of practice led to increases in gray matter concentration in the temporo-parietal junction. It has been suggested that the temporo-parietal junction is a crucial structure for mediating the first-person perspective of bodily states (Blanke et al., 2005), or embodiment (Arzy, Thut, Mohr, Michel, & Blanke, 2006), and that impaired processing at the temporo-parietal junction may lead to the pathological experience of the self, such as out-of-body experiences (Blanke & Arzy, 2005). Morphological changes in the temporo-parietal junction might be associated with an increased awareness of the experience of oneself within the body. Such changes seem to correspond with translations of meditation instructions ascribed to the historical Buddha (Bhikkhu, 2010): “His mindfulness that ‘There is a body’ is maintained to the extent of knowledge and remembrance.”

**Body awareness and emotion regulation.** Body sensations have been ascribed a crucial role in the conscious experience of emotions (feelings), not only historically (James, 1884), but also currently (Bechara & Naqvi, 2004; Damasio, 1999, 2003). An increased awareness of the body’s response to an emotional stimulus might thus lead to greater awareness of one’s

own emotional life; in turn, an awareness of one’s emotions is a precondition for being able to regulate those emotions. Helping individuals increase their body awareness can therefore be considered a relevant aspect in the treatment of psychological disorders. For example, a lack of awareness of internal experience—along with problems in emotion regulation—is a crucial problem for individuals with borderline personality disorder, and helping patients increase their internal awareness might be one key element in its treatment (Linehan, Armstrong, Suarez, Allmon, & Heard, 1991; Wupperman, Neumann, & Axelrod, 2008). Furthermore, the increase of body awareness is also relevant in the treatment of eating disorders (Hill, Craighead, & Safer, 2011) as well as substance abuse disorders. In a pilot study of 16 heroin users in early recovery, high levels of the Observe subscale of the Five Facet Mindfulness Questionnaire were associated with decreased heroin use among those at high risk for relapse (Schuman-Olivier, Albanese, Carlini, & Shaffer, 2011), suggesting a role for body awareness in the recovery process.

**Body awareness and empathy.** Internal awareness of one’s own experience has also been suggested to be an important precondition for empathic responses. Accurate observations of the self are required for the appropriate understanding of others (Decety & Jackson, 2004). Self-report studies provide empirical support for the existence of this relationship. A higher level of mindful observation, as assessed with the Observe scale of the Kentucky Inventory of Mindfulness Skills (Baer, Smith, & Allen, 2004), has been found to be associated with more engagement in empathy (Dekeyser, Raes, Leijssen, Leysen, & Dewulf, 2008), as assessed with the Interpersonal Reactivity Index (Davis, 1980). Neuroscientific research shows that a subset of brain regions (namely, the insula and temporo-parietal junction) is impacted both in awareness of one’s own body sensations and in social cognition and empathic responses (Singer et al., 2004). Enhanced function of these structures following mindfulness training might therefore also correspond to improved empathic responses and compassion attributed to meditation training (Shapiro, Schwartz, & Bonner, 1998). Supporting this assumption, research has found that Tibetan monks with over 10,000 hr of meditation experience showed greater activation of both regions during compassion meditation (a meditation that aims at cultivating feelings of empathy toward the suffering of other beings and the wish to alleviate their suffering) while they were presented with auditory stimuli of people suffering (Lutz, Brefczynski-Lewis, Johnstone, & Davidson, 2008).

To summarize, body sensations are a common object of attention during mindfulness meditation, and practitioners report improved body awareness. Although there have been no objective behavioral data supporting the increased awareness, neuroscientific data on mindfulness practice point to the modification of brain regions involved in first-person conscious experience of body awareness. The enhancement of body awareness might have relevance for affect regulation and empathic processes and thus may be particularly relevant in the mindfulness-based treatment of patients with such deficits.

Ongoing attempts to advance the development of instruments for the valid assessment of body awareness (Mehling et al., 2009) will help to further illuminate this connection.

### 3. Emotion regulation

In this section, we first describe the general findings regarding the effects of mindfulness on emotion regulation. Then we focus on two different emotion regulation strategies that seem to be involved in mindfulness, namely, reappraisal and extinction.

**Role of emotion regulation in meditation practice.** A growing body of literature suggests that mindfulness practice results in improvements in emotion regulation. Emotion regulation refers to the alteration of ongoing emotional responses through the action of regulatory processes (Ochsner & Gross, 2005). In Theravadan translations of Buddhist teachings, the alteration of emotional responses is addressed in the Satipatthana Sutta in terms of the overcoming of sorrow and distress as part of meditation practice:

This is the direct path for the purification of beings, for the overcoming of sorrow and lamentation, for the disappearance of pain and distress, for the attainment of the right method, and for the realization of Unbinding. . . . He [the monk] remains focused on feelings . . . mind . . . mental qualities in and of themselves—ardent, alert, and mindful—putting aside greed and distress with reference to the world. (Bhikkhu, 2010)

**Behavioral and peripheral physiological finding.** Studies from the field of mindfulness research have addressed improvements in emotion regulation through a variety of approaches, including experimental, self-report, peripheral physiological, and neuroimaging data. Healthy novices enrolled in a 7-week mindfulness training program showed a reduction in emotional interference (assessed as the delay in reaction time after being presented with affective versus neutral pictures) compared with those who followed a relaxation meditation protocol and those in a wait-list control group (Ortner et al., 2007). Both the mindfulness and relaxation meditation groups also displayed significant reductions in physiological reactivity during the task. Furthermore, in a group of long-term practitioners, participants with more mindfulness meditation experience showed less emotional interference than did less experienced practitioners. Studies using self-report data from healthy individuals have shown that mindfulness meditation decreased negative mood states (Jha, Stanley, Kiyonaga, Wong, & Gelfand, 2010), improved positive mood states, and reduced distractive and ruminative thoughts and behaviors (Jain et al., 2007). A questionnaire study investigating the immediate effects of brief (15-min) stress management interventions found that mindful breathing may help to reduce reactivity to repetitive thoughts (Feldman, Greeson, & Seniville, 2010).

Physiological studies also support the proposition that meditation training leads to decreased emotional reactivity and facilitates a return to emotional baseline after reactivity. For example, experienced mindfulness meditators have shown a faster decrease in skin conductance in response to aversive stimuli (Goleman & Schwartz, 1976), as well as less enhancement of the startle response by aversive stimuli (Zeidler, 2007). An electroencephalogram study found that mindfulness-based stress reduction training led to increases in left-sided anterior brain activation after the course compared with a wait-list control group (Davidson et al., 2003). This pattern of lateralization has previously been associated with the experience of positive emotions (Davidson, 1992). Similarly, stronger relative left prefrontal activation was also recently found as a state effect in previously depressed individuals following a short practice of mindful breathing and loving kindness meditation (Barnhofer, Chittka, Nightingale, Visser, & Crane, 2010). These findings support the proposition that mindfulness practice has an effect on the physiological aspects of positive emotions and thus positively influences emotional processing.

**Neural mechanisms of emotion regulation.** During emotion regulation, prefrontal control systems modulate emotion-generative systems, such as the amygdala, which is responsible for the detection of affectively arousing stimuli (Ochsner & Gross, 2005). More specifically, these prefrontal structures include dorsal regions of the lateral prefrontal cortex (PFC) that have been implicated in selective attention and working memory; ventral parts of the PFC implicated in response inhibition; the ACC, which is involved in monitoring control processes; and the dorso-medial PFC implicated in monitoring one's affective state (Modinos, Ormel, & Aleman, 2010; Ochsner & Gross, 2008). A typical pattern detected when individuals deliberately regulate affective responses is increased activation within the PFC and decreased activation in the amygdala (Beauregard, Levesque, & Bourgouin, 2001; Harenski & Hamann, 2006; Schaefer et al., 2002), suggesting that PFC projections to the amygdala exert an inhibitory top-down influence (Banks, Eddy, Angstadt, Nathan, & Phan, 2007; Davidson, Jackson, & Kalin, 2000).<sup>2</sup>

**Psychological disorders and emotion regulation.** A variety of psychological disorders are associated with reduced emotion regulation capacity (Cicchetti, Ackerman, & Izard, 1995; Davidson, 2000; Gross, 1998; Hayes, Wilson, Gifford, Follette, & Strosahl, 1996; Mennin, Heimberg, Turk, & Fresco, 2002). Disorders characterized by a deficit in emotion regulation are frequently associated with dysfunction in the frontal-limbic network, that is, reduced prefrontal activation and exaggerated amygdala activation (e.g., depression, H. C. Abercrombie et al., 1998; borderline personality disorder, Silbersweig et al., 2007; bipolar disorder, Pavuluri, O'Connor, Harral, & Sweeney, 2007; social phobia, Phan, Fitzgerald, Nathan, & Tancer, 2006; obsessive-compulsive disorder,

Breiter & Rauch, 1996; posttraumatic stress disorder, Shin et al., 2005; impulsive aggression, Coccaro, McCloskey, Fitzgerald, & Phan, 2007; addiction, Bechara, 2005; generalized anxiety, Monk et al., 2008; and trait anxiety, Etkin et al., 2004).

**Neuroscientific findings on mindfulness and emotion regulation.** In contrast to psychiatric disorders that are characterized by suboptimal or deficient emotion regulatory responses and corresponding abnormalities in brain activation patterns, a few neuroimaging studies have found increased prefrontal activation and improved prefrontal control over amygdala responses in association with mindfulness. The earliest evidence for the neurophysiological basis of differences in emotion regulation according to dispositional levels of mindfulness was found in a study that investigated the effect of dispositional (trait) mindfulness on brain activation while healthy participants labeled the affect of emotional facial expressions (Creswell, Way, Eisenberger, & Lieberman, 2007). Higher dispositional mindfulness, as measured by the Mindful Attention Awareness Scale, predicted (a) increased activation at multiple sites of the prefrontal cortex (including the ventromedial PFC, medial PFC, and ventrolateral PFC), (b) reduced amygdala activity, and (c) a stronger inhibitory association between amygdala activity and regions of the PFC.

Although the above mentioned study investigated dispositional mindfulness in individuals without any mindfulness training, other studies have reported evidence that mindfulness meditation involves activation of brain regions relevant for emotion regulation, and thus activation of these regions might be modified through mindfulness practice. During mindfulness meditation, experienced mindfulness meditators show greater activation in the dorso-medial PFC and rostral ACC compared with nonmeditators (Hölzel et al., 2007). After participants completed an 8-week mindfulness-based stress reduction course, Farb et al. (2007) found increased activity in participants' ventrolateral PFC, which the authors interpreted as augmented inhibitory control. Following participation in a mindfulness-based stress reduction course, social anxiety patients presented with negative self-beliefs showed a quicker decrease of activation in the amygdala as compared with measures taken before course completion (Goldin & Gross, 2010).

The observed improvements in emotion regulation associated with mindfulness practice likely underlie many of the positive effects of mindfulness practice on mental health. Indeed, improved emotion regulation underlies the beneficial effects of mindfulness practice on stress reduction (Garland, Gaylord, & Fredrickson, 2011) and on reductions of depressive symptoms (Shahar, Britton, Sbarra, Figueredo, & Bootzin, 2010).

**Different strategies of emotion regulation.** Although it seems well established that mindfulness has positive effects on emotion regulation, the exact processes underlying these improvements seem less clear. Emotion regulation is an umbrella term for a wide array of strategies for altering emotional responses. Here, we will consider some emotion

regulation strategies that might be influenced by mindfulness practice.

There are several proposed classifications for different kinds of emotion regulation (Ochsner & Gross, 2005; Parkinson & Totterdell, 1999). Ochsner and Gross (2005) have suggested a distinction between behavioral regulation (e.g., suppressing expressive behavior) and cognitive regulation. Cognitive regulation can rely on attentional control (e.g., selective inattention to emotional stimuli, performing distracting secondary tasks) or on cognitive change. Cognitive change strategies include the controlled regulation of an ongoing emotional response, such as *reappraisal* (i.e., reinterpreting the meaning of a stimulus to change one's emotional response to it) and *extinction* (stimulus-response reversal). As discussed in Section 1, attentional control plays a crucial role in mindfulness meditation. Whereas typical contemporary descriptions regard attentional control in emotion regulation as adaptive when attention is directed away from emotionally distressing material, mindfulness usually involves bringing attention to the stimulus. Keeping attention on an emotional reaction leads to a situation of exposure with a subsequent extinction process. Extinction plays a crucial role in producing the beneficial effects of mindfulness meditation and will be discussed in detail below. The following section explores the role of reappraisal.

**Reappraisal.** Reappraisal has been suggested to be one of the ways in which emotion gets regulated during mindfulness. Garland et al. (2011) described mindful emotion regulation as "positive reappraisal," or the adaptive process through which stressful events are reconstrued as beneficial, meaningful, or benign (e.g., thinking that one will learn something from a difficult situation). A very recent self-report study showed that mindfulness practice leads to increases in positive reappraisal and that these increases mediate an improvement in stress levels (Garland et al., 2011).

**Neuroscientific findings.** Cognitive reappraisal of aversive stimuli has been found to coincide with activity in the dorso-lateral PFC, orbitofrontal PFC, and ACC (Eippert et al., 2007; Ochsner, Bunge, Gross, & Gabrieli, 2002; Ochsner et al., 2004), and dorsal PFC activity has been found to go along with reappraisal success (Modinos et al., 2010; Wager, Davidson, Hughes, Lindquist, & Ochsner, 2008). Thus, whereas extinction processes may depend more upon ventral frontal systems (such as the ventromedial PFC) that are directly connected with the subcortical systems (see *Exposure, extinction, and reconsolidation* for details), reappraisal may depend more on dorsal frontal systems (Ochsner & Gross, 2008).

To investigate the neural correlates of dispositional mindfulness in the context of reappraisal, Modinos et al. (2010) assessed fMRI study participants' individual differences in dispositional mindfulness with the Kentucky Inventory of Mindfulness Skills and asked the participants to either attend to or reappraise negative pictures. Findings showed that levels

of dispositional mindfulness were positively correlated with activations in the left and right dorsomedial PFC during the reappraisal condition. Therefore, trait mindfulness seems to be positively associated not only with reappraisal success but also with increased activation in brain regions that support this kind of emotion regulation.

### **Does mindfulness involve reappraisal or nonappraisal?**

Although the above findings suggest increased “reappraisal” related to mindfulness (Garland et al., 2011), there also seems to be some inconsistency in the literature. Other work has identified decreased cognitive control associated with mindfulness meditation, interpreted as nonappraisal. As mentioned earlier in the section on body awareness, experienced meditators, when presented with unpleasant or painful stimuli during a mindful state (Gard et al., 2010) or a baseline state (Grant, Courtemanche, & Rainville, 2011) showed enhanced sensory processing, that is, increased bottom-up processing of the stimulus. At the same time, decreased prefrontal activation was observed in meditators in both studies when they were presented with the painful stimuli. These findings were explained with a decrease in top-down control, representing a lack of reappraisal.

This discrepancy brings to light a question: Does emotion regulation during mindfulness involve cognitive control (and corresponding prefrontal engagement), or is it characterized instead by its absence? Whereas the acceptance of one’s emotional response is characterized by the absence of active cognitive control over the emotional reaction, bringing mindful awareness to emotional responses might initially require some cognitive control, in order to overcome habitual ways of internally reacting to one’s emotions. Although currently speculative, it seems possible that the degree of meditation expertise of the individual might be relevant when considering the question of whether mindfulness involves cognitive control or its absence. Whereas beginners might require more active cognitive regulation in order to approach ongoing emotional reactions in a different way and might therefore show greater prefrontal activation, expert meditators might not employ this prefrontal control. Rather, they might use different strategies; they may have automated an accepting stance toward their experience so they no longer require cognitive control efforts, and they could have different baseline blood flow as a consequence of plastic processes. A similar interpretation has previously been suggested by Brefczynski-Lewis et al. (2007) in regard to attentional control.

To summarize, several studies have demonstrated improvements in emotion regulation associated with mindfulness. Psychological disorders characterized by problems in emotion regulation, such as mood disorders, anxiety disorders, or borderline personality disorder, can benefit from the enhancement of emotion regulation capacities. Different emotion regulation strategies might show improvements following mindfulness practice. Some studies have conceptualized the improved emotion regulation associated with mindfulness practice as

“positive reappraisal,” and correspondingly, studies find enhanced brain activity in multiple prefrontal regions involved in cognitive change strategies. However, other studies have conceptualized the changes as “nonappraisal” and have identified decreased brain activity in prefrontal regions. Further research is needed to test the hypothesis that the amount of required prefrontal control decreases with increased expertise. In the following section, we will turn toward exposure, extinction, and reconsolidation as a further mechanism of action of mindfulness meditation.

**Exposure, extinction, and reconsolidation.** During mindfulness, practitioners expose themselves to whatever is present in the field of awareness, including external stimuli as well as body sensations and emotional experiences. They let themselves be affected by the experience, refraining from engaging in internal reactivity toward it, and instead bringing acceptance to bodily and affective responses (Hart, 1987). Practitioners are instructed to meet unpleasant emotions (such as fear, sadness, anger, and aversion) by turning towards them, rather than turning away (Santorelli, 2000). Those people who are new to meditation often initially find this process counterintuitive, but many practitioners discover that the unpleasant emotions pass away and a sense of safety or well-being can be experienced in their place.

Parallels between the process described here and exposure therapy are evident. Exposure therapy is a highly effective behavioral therapy technique for reducing fear and anxiety responses (Chambless & Ollendick, 2001). Its core element is to expose patients to fear-provoking stimuli and prevent their usual response in order for them to extinguish the fear response and to instead acquire a sense of safety in the presence of the formerly feared stimuli (Öst, 1997). Clinical studies on exposure therapy show that access to safety behaviors can interfere with the beneficial effects of an exposure situation (Lovibond, Mitchell, Minard, Brady, & Menzies, 2009; Salkovskis, Clark, Hackmann, Wells, & Gelder, 1999; Wells et al., 1995). Safety behaviors include not only overt behavior (such as avoiding eye contact in social phobia) but also cognitive avoidance. Mindfulness meditation includes refraining from engaging in cognitive avoidance or other safety behaviors by using enhanced attention regulation skills, thereby maximizing the exposure to the experienced emotion.

Additionally, meditation is often associated with high levels of relaxation in the form of increased parasympathetic tone and decreased sympathetic activity (Benson, 2000). Peripheral physiological changes have been observed with some consistency (but see Shapiro, 1982), including decreased heart rate (Zeidan, Johnson, Gordon, & Goolkasian, 2010), decreased blood pressure (de la Fuente, Franco, & Salvator, 2010), decreased cortisol levels (Carlson et al., 2007), decreased breathing rate (Lazar et al., 2005), lowered oxygen and carbon dioxide consumption (Young & Taylor, 1998), decreased skin conductance response (Austin, 2006), and decreased muscle tension (Benson, 2000). Since extinction mechanisms are

thought to be supported by the experience of a state of relaxation while the individual encounters the feared stimuli (Wolpe, 1958), the relaxation component of meditation might serve to maximize the effects of the extinction process.

In the Five Facet Mindfulness Questionnaire, the capacity to expose oneself to internal experience without reactivity is captured in the Non-Reactivity to Inner Experience Scale. Example items are “In difficult situations, I can pause without immediately reacting” (Item 21), or “When I have distressing thoughts or images I am able just to notice them without reacting” (Item 29). With completion of a mindfulness-based stress reduction course, scores on this scale increase with large effect sizes (Carmody & Baer, 2008), corroborating the theory that mindfulness practice leads to the self-perception of decreased reactivity. This likely is a mechanism for facilitating exposure.

**Fear conditioning, extinction, and reconsolidation.** The process of fear extinction has been studied extensively in the context of conditioned fear. Fear conditioning is a learning process in which a neutral conditioned stimulus (e.g., a tone) is paired with an aversive unconditioned stimulus (e.g., a shock). After a few pairings, the presentation of the conditioned stimulus comes to also elicit various fear responses (e.g., freezing in animals; sympathetic arousal in humans). Repeated presentations of the conditioned stimulus in the absence of the unconditioned stimulus result in the extinction of the conditioned responses. Extinction does not erase the initial association between conditioned and unconditioned stimuli but is thought to form a new memory trace (Quirk, 2002; Rescorla, 2001) or reconsolidate the old memory with new contextual associations (Inda, Muravieva, & Alberini, 2011; Nader & Einarsson, 2010; Rossato, Bevilaqua, Izquierdo, Medina, & Cammarota, 2010). After extinction training, extinction memory is thought to compete with conditioned memory for control of fear expression (Myers & Davis, 2007). Recent research has shown that successful extinction memory reliably differentiates healthy from pathological conditions (Holt et al., 2009; Milad et al., 2008). Extinction learning and its retention may thus be a critical process in the transformation of maladaptive states. It allows individuals to learn not to have a fear response to neutral stimuli, when there is no adaptive function for the fear response. Rather, individuals can flexibly elicit other more adaptive emotional and behavioral responses.

**Neural mechanisms of fear extinction and extinction retention.** Recent fMRI research on fear conditioning has identified a network of brain regions that are crucial for the extinction of conditioned fear responses and its retention. As outlined below, this network seems to strengthen through mindfulness practice. The ventromedial prefrontal cortex (vmPFC) has been shown to be important for the successful recall of the extinction (Milad & Quirk, 2002; Morgan, Romanski, & LeDoux, 1993; Quirk, Russo, Barron, & Lebron, 2000), with the magnitude of vmPFC activation (Milad et al., 2007) and the cortical thickness of the vmPFC (Milad et al.,

2005) positively correlated with extinction recall. In addition, hippocampal activation has also been found to be involved in fear extinction recall. Functional connectivity analysis reveals that the vmPFC and hippocampus work in concert during extinction recall to inhibit fear, suggesting that they comprise a network that mediates the expression of extinction memory in the appropriate context (Milad et al., 2007). Hippocampal activation during extinction recall is likely related to signaling the extinguished context (contextual safety; Corcoran, Desmond, Frey, & Maren, 2005; Corcoran & Maren, 2001). The amygdala has been implicated in both human and animal studies as playing a crucial role during the acquisition and expression of conditioned fear (Davis & Whalen, 2001; LeDoux, 2000; Pare, Quirk, & LeDoux, 2004; Phelps & LeDoux, 2005), including the detection of stressful and threatening stimuli and the initiation of adaptive coping responses (Hasler et al., 2007). When individuals regulate their emotions, the amygdala is thought to be down-regulated by the vmPFC and hippocampus (Banks et al., 2007; Davidson et al., 2000; Milad, Rauch, Pitman, & Quirk, 2006), both of which have extensive connections with the amygdala. This inhibition of the amygdala serves to suppress fear (Milad et al., 2006; Rauch, Shin, & Phelps, 2006), thereby allowing control over behavioral reactions to emotions (Price, 2005). Deficits in fear extinction are thought to be related to a number of psychiatric disorders, and neuroimaging studies have shown that the aforementioned structures are dysfunctional in several psychiatric disorders, such as posttraumatic stress disorder (Milad et al., 2009), schizophrenia (Holt et al., 2009), and depression (Anand et al., 2005).

**Effects of meditation practice on the neural network underlying extinction.** There is recent evidence from anatomical MRI studies that the aforementioned brain regions show structural changes following mindfulness meditation training. Cross-sectional studies comparing mindfulness meditators and nonmeditators found that meditators showed greater gray matter concentration in the hippocampus (Hölzel et al., 2008; Luders, Toga, Lepore, & Gaser, 2009). Furthermore, Hölzel et al. (2011) recently observed that structural changes in the hippocampus were detectable within a period of only 8 weeks in participants that underwent mindfulness-based stress reduction, and Hölzel et al. (2008) found that cumulative hours of meditation training were positively correlated with gray matter concentration in the vmPFC in experienced meditators. In a longitudinal study enrolling participants in an 8-week mindfulness-based stress reduction course, Hölzel et al. (2010) found an impact of the stress-reducing effects of mindfulness meditation on the amygdala; the greater the decrease in participants' scores on perceived stress over the 8 weeks, the greater a decrease they showed in gray matter concentration in the right amygdala. Modified gray matter concentration in these regions that is dependent on meditation training might potentially be related to the improved ability to regulate emotional responses. Furthermore, fMRI

studies show that meditation involves activation of the hippocampus and medial PFC (Lazar et al., 2000; Lou et al., 1999; Newberg et al., 2001), suggesting that regular meditation practice enhances the function of these brain regions. Additionally, for those with social anxiety disorder, amygdala activation is reduced following 8 weeks of mindfulness practice (Goldin & Gross, 2010). There thus appear to be striking similarities in the brain regions being influenced by mindfulness meditation and those involved in mediating fear extinction. These findings suggest that mindfulness meditation could directly influence one's capacity to extinguish conditioned fear by enhancing the structural and functional integrity of the brain network involved in safety signaling. The neuroscientific considerations described here support the previously held view that extinction might contribute to some of the beneficial effects of mindfulness practice (Baer, 2003; Brown et al., 2007).

**The impact of extinction processes within meditation practice.** The role of extinction processes in the improvements following mindfulness-based treatments is most obvious in the treatment of anxiety disorders, which have reliably been found to benefit from mindfulness practice (Kabat-Zinn et al., 1992; Kimbrough, Magyar, Langenberg, Chesney, & Berman, 2010; Roemer et al., 2008). Nonreactivity and the successive extinction mechanism presumably also play a crucial role in the stress-reducing effects of mindfulness and might mediate decreased perceived stress scores (Carmody & Baer, 2008; Chang et al., 2004). They might also be highly relevant for the benefits of mindfulness in the treatment of substance abuse (Brewer et al., 2009). Beyond that, exposure is pursued toward whatever emotions present themselves, including sadness, anger, and aversion, as well as pleasant emotions, such as happiness. We therefore suggest that extinction is effective during all of these emotional experiences, leading to an overwriting of previously learned stimulus-response associations. Buddhist teachings claim that the non-clinging to unpleasant and pleasant experiences leads to liberation (Olendzki, 2010). Framed in Western psychological terminology, one could say that nonreactivity leads to unlearning of previous connections (extinction and reconsolidation) and thereby to liberation from being bound to habitual emotional reactions.

#### 4. Change in perspective on the self

The essence of Buddhist psychology lies in the teaching that there is no such thing as a permanent, unchanging self (Olendzki, 2010). Rather, the perception of a self is a product of an ongoing mental process. This perception reoccurs very rapidly in the stream of mental events, leading to the impression that the self is a constant and unchanging entity. The self is experienced as being the one who inhabits the body, being the one who is thinking the thoughts, being the one experiencing emotions, and being the agent of actions; having free will

(Olendzki, 2010). When internal awareness becomes enhanced through meditation, meditators report that they can observe mental processes with increasing clarity (cf. MacLean et al., 2010) and increasing temporal resolution. Within this enhanced clarity, the process of a repeatedly arising sense of self becomes observable to the meditator through development of meta-awareness. Meta-awareness is a form of subjective experience and executive monitoring, in which one takes a nonconceptual perspective as a distributed form of attention toward the contents of conscious experience and the processes involved. Meta-awareness is not entangled in the contents of awareness (Deikman, 1982; Raffone & Pantani, 2010; Varela, Thompson, & Rosch, 1991) and facilitates a detachment from identification with the static sense of self. Rather than as a static entity or structure, the sense of self can be experienced as an event (Olendzki, 2006). It has been postulated that paying close attention to the transitory nature of this sense of self leads to the "deconstruction of the self" (Epstein, 1988). The Dalai Lama describes the resulting understanding that practitioners reach: "This seemingly solid, concrete, independent, self-instituting I under its own power that appears actually does not exist at all" (Gyatso, 1984, p.70). In place of the identification with the static self, there emerges a tendency to identify with the phenomenon of "experiencing" itself.<sup>3</sup>

From a Buddhist perspective, identification with the static sense of self is the cause of psychological distress, and dis-identification results in less afflictive experience and the freedom to experience a more genuine way of being (Olendzki, 2010). As the psychologist Jack Engler (2004) puts it:

When it is realized that no self is to be found in the elements of our experience, it begins the process of liberation. Understanding that our sense of "I" is not as solid, permanent, or substantial as we habitually hold it to be ultimately uproots clinging, attachment, and hostility. Understanding this burns up the fuel that runs our repetitive habits. Those who have understood this report a sense of spacious lightness and freedom. They exhibit deep concern and tenderness for others.

According to Buddhist philosophy, a change in perspective on the self is thus the key in the process to enduring forms of happiness.

Whereas more advanced meditation practices are required to experience this drastic disidentification from the static sense of self, a de-identification from some parts of mental content is often experienced even in the earliest stages of meditation practice. In mindfulness practice, all experiences are observed as they arise and pass. By closely observing the contents of consciousness, practitioners come to understand that these are in constant change and thus are transient. The mindful, non-judgmental observation fosters a detachment from identification with the contents of consciousness. This process has been termed "reperceiving" or "decentering" (Carmody, Baer, Lykins, & Olendzki, 2009; Fresco et al., 2007; Shapiro et al., 2006) and has been described as the development of the "observer perspective" (Kerr, Josyula, & Littenberg, 2011). We suggest that although this stage is not yet the full



disidentification from a static and unchanging self described above, it is a change in perspective about the sense of self and an alteration in first-person subjective experience.

Philosophical considerations, theoretical accounts, and experiential reports ascribe to the change in the perspective on the self a crucial role for development and maturity in meditation. However, perspective on the self is rather difficult to operationalize, and little empirical research has been published that documents these types of changes following mindfulness meditation. This area of research could benefit from the introduction of clear and consistent definitions of self-related processes as well as terms that until now have been applied inconsistently among various authors and disciplines (e.g., I, me, ego, self, etc.). Although a clarification of the definitions, theories, and conceptualization is far beyond the scope of this article and is not its focus (but see Legrand & Ruby, 2009, and Strawson, 2000), we summarize the few self-report and neuroimaging studies that touch on a change in the perspective on the self through mindfulness practice.

**Self-report findings.** Self-report studies have begun to document the experienced changes in perspective on the self following mindfulness practice. In a qualitative analysis of diaries, Kerr and colleagues focused on the development of an “observing self,” or meta-perspective on experience, and have described how participants experience this shift over the course of an 8-week mindfulness-based stress reduction course (see Kerr et al., 2011, for a description of participants’ self-reports). Questionnaire studies have also documented changes in individuals’ self-concept following mindfulness meditation practice. Participants’ self-reports of internal and external aspects of self-representation (assessed with the Tennessee Self Concept Scale; Roid & Fitts, 1988) showed highly significant changes on almost all of the subscales after completion of a 7-day mindfulness retreat (Emavardhana & Tori, 1997). Changes can be summarized as a more positive self-representation, more self-esteem, and higher acceptance of oneself. A cross-sectional study (Haimerl & Valentine, 2001) that examined the Self-Concept scales of the Temperament and Character Inventory (Cloninger, Svrakic, & Przybeck, 1993) of Buddhist meditators with varying levels of meditation experience found that increased meditation experience was associated with positive development on each of the three scales. More experienced meditators showed self-concept styles that are typically associated with less pathological symptoms. Although these studies do not describe the drastic change in sense of self that highly experienced meditators have reported following deep states of meditation, they suggest that some beneficial changes in the perspective on the self can happen resulting from mindfulness meditation practice.

**Neuroscientific findings: Functional neuroimaging.** Neuroimaging studies of mindfulness meditation have demonstrated that brain structures that support self-referential processing are structurally and functionally impacted by mindfulness meditation. Self-referential processing robustly activates cortical midline structures of the brain (Northoff et al., 2006),

including areas of the medial PFC (Gusnard, Akbudak, Shulman, & Raichle, 2001; Kelley et al., 2002; Sajonz et al., 2010), posterior cingulate cortex /anterior precuneus (Sajonz et al., 2010), and also the inferior parietal lobule (Sajonz et al., 2010). The medial PFC has been shown to support an array of self-related capacities, including memory for self-traits (Kelley et al., 2002; Macrae, Moran, Heatherton, Banfield, & Kelley, 2004) or reflected self-knowledge (Lieberman, Jarcho, & Satpute, 2004). The posterior cingulate cortex and precuneus are engaged when individuals assess the relevance or significance of a stimulus for themselves (Gusnard et al., 2001; Schmitz & Johnson, 2007) and have been suggested to be particularly important for the integration of self-referential stimuli in the emotional and autobiographical context of one’s own person (Northoff & Bermpohl, 2004). All of these structures show high activity during rest, mind wandering, and conditions of stimulus-independent thought (Northoff et al., 2006) and have therefore also been characterized as the “default mode” of the brain or as the default mode network (Buckner, Andrews-Hanna, & Schacter, 2008; Gusnard & Raichle, 2001).

A few MRI studies have begun looking at activity in the default mode network in association with mindfulness practice. Comparing brain activation during mindfulness meditation versus a resting state reveals decreased brain activity in subsystems of the default mode network (Ott, Walter, Gebhardt, Stark, & Vaitl, 2010). The authors interpret this decrease as a diminished involvement in the habitual mode of self-reference during meditation practice. Meditators show greater resting-state functional connectivity within the default mode network than do nonmeditators (Jang et al., 2010). Another study of experienced meditators also reports increased functional connectivity between posterior cingulate cortex and dorsal ACC and dorso-lateral PFC both during rest and during mindfulness meditation among experienced meditators compared with novices, suggesting increased conflict monitoring and cognitive control over the function of default mode network after significant meditation training (Brewer et al., 2011). Although still limited in scope, these studies suggest that default-mode network activity and connectivity might be affected in some way by mindfulness meditation practice.

Probably the most insightful neuroimaging study to address the neural correlates of a change in perspective on the self is by Farb et al. (2007), which investigated brain activity during two forms of self-reference in participants who completed a mindfulness-based stress reduction training; these participants were compared with another group of individuals who had not yet undergone training; the forms of self-reference included a narrative focus (evaluative monitoring of enduring traits) and an experiential focus (momentary first-person experience). Individuals with the mindfulness training showed larger reductions in the medial PFC during the experiential (compared with the narrative) focus, along with increased engagement of the right lateral PFC, the right insula, secondary somatosensory cortex, and inferior parietal lobule. Functional connectivity analyses

revealed an uncoupling of the right insula and medial PFC, and there was increased connectivity of the right insula with dorso-lateral PFC regions in the experiential focus after the mindfulness training. The authors interpret these findings as representing a shift in self-referential processing, namely, as a shift “toward more lateral prefrontal regions supporting a more self-detached and objective analysis of interoceptive (insula) and exteroceptive (somatosensory cortex) sensory events, rather than their affective or subjective self-referential value [which is represented by medial PFC activation]” (Farb et al., 2007, p. 319). Furthermore, given the higher activity of regions supporting body and internal awareness, these data also suggest that increased body awareness might be closely related to changes in the perspective on the self, consistent with Buddhist philosophy. Greater internal awareness might replace the previous, narrative form of self-reference.

**Neuroscientific findings: Structural neuroimaging.** In the recent longitudinal structural study mentioned above (Hölzel et al., 2011), the posterior cingulate cortex, the temporo-parietal junction, and the hippocampus showed increased gray matter concentration following mindfulness-based stress reduction. Given the relevance of these brain structures for the experience of the self, it seems possible that the structural changes might be associated with changes in the perspective on the self. It is interesting to note that the hippocampus, temporo-parietal junction, posterior cingulate cortex, and parts of the medial prefrontal cortex form a brain network (Vincent et al., 2006) that supports diverse forms of projecting the self onto another perspective (Buckner & Carroll, 2007), including remembering the past, thinking about the future (Schacter, Addis, & Buckner, 2007), and conceiving the viewpoint of others, also referred to as a theory of mind (Saxe & Kanwisher, 2003). These abilities have been suggested to share a common set of processes, by which autobiographical information is used adaptively to enable the perception of alternative perspectives (Buckner & Carroll, 2007). Structural changes in this brain network (involved in the projection of the self onto another perspective) may be associated with the perceptual shift in the internal representation of the self following mindfulness practice.

The change in the perspective on the self is precisely described in the Buddhist literature but has yet to be rigorously tested in empirical research. The findings reviewed here exemplify early steps in the process of changing the perspective on the self but are still far from addressing the experiences described by highly trained meditation practitioners. Research studies that are currently under way will help elucidate this process further and will give us more insight into the underlying neuroscientific mechanisms.

## Integration

The above described components (see Table 2 for a summarizing overview) are presumably highly interrelated. In fact, they might interact so closely with one another that a distinction

between each component might seem artificial. We want to illustrate the interaction of the components with an example:

During mindfulness meditation, the meditator’s goal is to maintain attention to current internal and external experiences with a nonjudgmental stance, manifesting acceptance, curiosity, and openness. When an emotional reaction gets triggered by thoughts, sensations, memories, or external stimuli (e.g., a memory of a frightening event), the executive attention system (Section 1) detects the conflict to the task goal of maintaining a mindful state. Heightened body awareness (Section 2) helps to detect physiological aspects of the feelings present (e.g., body tension, rapid heartbeat, short shallow breath), and the provided information about the internal reaction to the stimulus is a prerequisite for accurate identification of the triggered emotional response (i.e., fear). Emotion regulation processes (Section 3) then become engaged, in order to relate to the experience differently rather than with a habitual reaction (i.e., simply noticing the fear as opposed to engaging in avoidance mechanisms). The first two mechanisms (sustained attention [1] to body awareness [2]) lead to a situation of exposure, and the third mechanism (regulating for nonreactivity) facilitates response prevention, leading to extinction and reconsolidation (3). Rather than being stuck in the habitual reactions to the external and internal environment, the meditator can experience the transitory nature of all related perceptions, emotions, or cognitions in each moment of experience. The awareness of the transitory nature of the self and one’s momentary experience leads to a change in the perspective on the self (4), where self-referential processing (i.e., the narrative of the relevance of the stimulus for oneself) becomes diminished, while first-person experiencing becomes enhanced. The entire process represents enhanced self-regulation, which—according to Karoly (1993)—is defined as a process that enables individuals to guide their goal-directed activities by modulation of thought, affect, behavior, or attention via deliberate or automated use of specific mechanisms.

As illustrated by the example, the described components mutually facilitate each other. Attention regulation is especially important and, as the basis of all meditation techniques, appears to be a prerequisite for the other mechanisms to take place. Focused attention on internal events is necessary in order for practitioners to gain an increased awareness of bodily sensations with the resultant ability to recognize the emergence of emotions. The ability to keep attention focused on conditioned stimuli is also a prerequisite for the successful extinction of conditioned responses. Enhanced body awareness might be very closely related to the changes in the perspective on the self and might replace a narrative form of self-reference. The change in perspective on the self may result in reappraisal of situations in specific ways, which might provide motivation for further development of attention regulation and body awareness. As the components mutually facilitate each other, the occurring process could be understood as an upward spiral process (cf. Garland et al., 2011).

## Self-Compassion

The concept of self-compassion is closely related to mindfulness. According to the definition proposed by Neff (2003a), self-compassion entails three components: self-kindness (being kind and understanding toward oneself in instances of perceived inadequacy or suffering rather than being harshly self-critical), common humanity (perceiving one's experiences as part of the larger human experience rather than seeing them as separating and isolating), and "mindfulness" (in this context defined as "holding one's painful thoughts and feelings in balanced awareness rather than over-identifying with them" (Neff, 2003a, p. 223). According to Neff's definition (2003a), mindfulness thus constitutes one of the three components of self-compassion.

### ***The relationship between self-compassion and mindfulness***

In their current conceptualization and operationalization within contemporary research contexts (Baer et al., 2006; Neff, 2003a), mindfulness and self-compassion are highly correlated. The total score of the Five Facet Mindfulness Questionnaire and the total score of the Self-Compassion Scale have been found to be correlated ( $r = .69$ ) in a sample of non-meditators (Hollis-Walker & Colosimo, 2011). Assumptions have been put forth about the nature of their relationship, and it has been suggested that mindfulness is required in order for self-compassion to develop because the former enables one to clearly see mental and emotional phenomena as they arise (Neff, 2003b). In line with this assumption, changes in mindfulness have been found to predict changes in self-compassion (Birnie, Speca, & Carlson, 2010). It has also been suggested that self-compassion partially mediates the relationship between mindfulness and well-being (Hollis-Walker & Colosimo, 2011). Furthermore, the cultivation of self-compassion has been suggested to explain much of the success of mindfulness-based interventions. Kuyken et al. (2010) found that the positive effects of a mindfulness-based cognitive therapy intervention on depressive symptoms were mediated by the enhancement of self-compassion across treatment. In patients with anxious distress, scores on the Self-Compassion Scale have been found to correlate more strongly with symptom severity and quality of life than scores on the Mindful Attention Awareness Scale (Van Dam, Sheppard, Forsyth, & Earleywine, 2011). However, given the strong interrelatedness of both constructs, it might be difficult to tease their effects and relationship apart.

### ***The cultivation of self-compassion in meditation practice***

Meditation is typically practiced with an intention—implicit or explicit—to cultivate self-compassion as well as compassion toward other beings. Different types of meditation

practices vary in the degree to which they foster its increase. Some types of practices are pursued with the primary goal of cultivating (self-) compassion (Germer, 2009; Salzberg, 1995), while others strongly emphasize self-compassion within the context of traditional mindfulness meditation (Brach, 2003). In mindfulness-based stress reduction, even though it is not the declared primary goal of the program, self-compassion is implicitly and explicitly interwoven into meditation instructions, exemplified by reminders included in focused attention meditation: "whenever you notice that the mind has wandered off, bring it back with gentleness and kindness." The gentle yoga stretches are practiced with an emphasis on "exploring what feels good for oneself and one's body in this moment." Whenever participants encounter physical pain or emotional suffering, they are encouraged to "take care of themselves." In line with these practices, self-report studies show that self-compassion scores increase over an 8-week mindfulness-based stress reduction course (Birnie et al., 2010; Shapiro, Astin, Bishop, & Cordova, 2005; Shapiro, Brown, & Biegel, 2007; but also see P. D. Abercrombie, Zamora, & Korn, 2007).

### ***Self-compassion within the theoretical framework proposed here***

Within the framework of mechanisms proposed in this study, self-compassion is presumably most related to emotion regulation as well as to the change in perspective on the self. The generation of feelings of kindness toward oneself in instances of perceived inadequacy or suffering (self-kindness) is an act of emotion regulation. When cultivating self-compassion, seeing one's difficult experiences as part of the larger human experience rather than seeing them as separating and isolating (common humanity) might initially require reappraisal. This reframing might ultimately result in a change in the perspective on the self, where one relates to oneself in a less identified manner. However, there is currently only a very small empirical basis for the explanation of the mechanisms of self-compassion, and it is possible that unique aspects of self-compassion are not addressed within the suggested components.

We are unaware of any published data on the neural correlates of self-compassion in the context of mindfulness training or on the neural basis of self-compassion (but see Lutz, Brefczynski-Lewis, et al., 2008, for altruistic compassion). However, with the availability of the Self-Compassion Scale (Neff, 2003a), there has been a drastic increase in the investigation of self-compassion in the context of mindfulness-based interventions in the last few years, and a considerable body of literature documents the improvement of self-compassion with mindfulness meditation practice. The question about the exact nature of the relationship between both constructs and their interconnection from an empirical and neuroscientific perspective will have to be revisited once more research is available.

## Further Considerations

We have suggested here that mindfulness meditation practice comprises a process of enhanced self-regulation that can be differentiated into distinct but interrelated components, namely, attention regulation, body awareness, emotion regulation (reappraisal and extinction), and the change in perspective on the self. Previous work has often focused on one of these components, neglecting the others and attempting to describe the beneficial effects of mindfulness-based interventions solely through one of the mechanisms (Brown & Ryan, 2003; Carmody, 2009). Other work has suggested an array of distinct components, but these components were not related to one another (Baer, 2003; Brown et al., 2007). Our work in establishing relations between identified components of mindfulness meditation practice is a step toward a more complex framework. Such a framework describing a comprehensive process and simultaneously considering the role of subcomponents will help advance the field in several ways. First, when conducting basic mindfulness meditation research, differentiating between distinct components will facilitate a more detailed understanding of the process and stimulate multifaceted research questions. Second, a detailed understanding of the different components and their relevance for clinical disorders will be conducive for the flexible and more targeted application of mindfulness training in psychiatric treatment and will in turn facilitate the establishment of targeted and cost-effective programs specifically utilizing components that are most relevant for a specific disorder. Third, a better understanding of the state and trait effects of mindfulness practice will also be conducive to a better understanding of the functioning and cultivation of a healthy mind, thereby contributing to the newly emerging field of positive psychology.

Presumably, the distinct components differ in their relevance for types of mindfulness-based meditation practices, levels of meditation expertise, specific psychological disorders, personality types, and specific situations. In the following section, we will suggest connections between the described components and these variables. The suggested connections mostly lack empirical support thus far and are mainly meant to stimulate further research questions.

Various types of mindfulness practice may place different emphasis on the described components. For example, during the practice of breath awareness or the body scan (Hart, 1987), the components of attention regulation and body awareness might be most involved. Observing one's emotions in emotionally challenging situations (Kabat-Zinn, 1990) may involve body awareness and extinction. Open awareness practice might mostly involve the change in perspective on self, whereas loving kindness and compassion meditation (Salzberg, 1995) might rely on emotion regulation and the change in perspective on the self. Investigating which components are involved in mindfulness meditation and which are potentially strengthened by these different types of practice can help individuals in selecting which they would like to specifically cultivate.

In the progression of meditation expertise, the different mechanisms might play different roles. For example, it is possible that an improvement in attention regulation evolves first and helps facilitate other processes. Conversely, the change in perspective on the self might develop rather late, following the establishment of increased body awareness and improved emotion regulation. Beyond the mechanisms formulated here, it is possible that increased experience in mindfulness practice facilitates the flexible access to the different components. Possibly the greatest effect of mindfulness practice for adaptive functioning in daily life might be found in this behavioral flexibility.

Future clinical psychological research should establish what roles the different components play for different psychological disorders. Disorders that manifest as the dysfunction of a certain component could especially benefit from the cultivation of that particular component. For example, strengthening attention regulation might be most beneficial for patients suffering from attention deficit disorders, while borderline personality disorder patients, people in addiction recovery, or patients with alexithymia might benefit much from increased internal awareness. Likewise, patients with mood disorders, anxiety disorders, borderline personality disorder, or aggression might benefit from improved emotion regulation. Change in self-perspective might be beneficial for patients with mood disorders and might also enhance general sense of well-being as well as overall quality of life in healthy populations. Rather than solely testing the usefulness of mindfulness-based interventions for symptom reduction for these disorders in general, future research should focus more on establishing the mechanisms underlying these beneficial effects.

Different mechanisms might be relevant for different personality types. Individuals likely differ in the extent to which they are attracted to the practice of each of these components, and they might differ in the extent to which they can benefit from each of the described mechanisms. For example, it has been found that a self-compassion intervention for smoking reduction was particularly beneficial for individuals high in self-criticism and low in readiness to change (Kelly, Zuroff, Foa, & Gilbert, 2010). In the same way, individual differences should be taken into account in meditation research. Future studies should try to identify traitlike predictors as well as biological markers for (a) attraction to specific kinds of practice and (b) benefits from particular aspects of such practices.

Aside from differing in relevance between different disorders, personality types, levels of expertise, and types of practices, these mechanisms will have distinct relevance for different contextual situations. Depending on the kind of situation to which a practitioner is being exposed, one of the mechanisms might move into the foreground, while others become less relevant.

Mindfulness as a state, trait, and clinical intervention has been extensively researched over the last two decades; however, knowledge of the underlying mechanisms of mindfulness is still in its infancy. Future work should identify additional

components of mindfulness and establish to what extent the components described in this article are truly distinct mechanisms or how they can be integrated into fewer components. We believe that it will be necessary both to further differentiate each component and to further integrate them into a comprehensive model. This future empirical work is critical in order to optimally apply mindfulness in the clinical domain and to advance techniques that aim at cultivating a healthy mind and increased well-being.

### Acknowledgments

The authors would like to thank Elizabeth Kathleen Avis, Narayan Brach, Patricia Pop, and Erik Tobiason for their helpful comments on this article.

### Declaration of Conflicting Interests

The authors declared that they had no conflicts of interest with respect to their authorship or the publication of this article.

### Funding

Britta K. Hölzel was supported by a Marie Curie International Outgoing Fellowship within the Seventh European Community Framework Programme.

### Notes

1. Telomeres are protective DNA sequences at the ends of chromosomes that ensure genomic stability during cellular replication. Telomerase is the cellular enzyme responsible for telomere length and maintenance. Telomerase activity has been found to be a predictor of long-term cellular viability that decreases with chronic psychological distress (Epel et al., 2004).
2. For the sake of completeness, it should be noted that some studies have not found this pattern of higher PFC and lower amygdala activation while participants were decreasing negative affect (Urry et al., 2006).
3. Of note, this decreased identification with the self is fundamentally different from pathological versions of depersonalization. For a detailed discussion of this distinction, see Engler (1995).

### References

- Abercrombie, H.C., Schaefer, S.M., Larson, C.L., Oakes, T.R., Lindgren, K.A., Holden, J.E., . . . Davidson, R.J. (1998). Metabolic rate in the right amygdala predicts negative affect in depressed patients. *NeuroReport*, *9*, 3301–3307.
- Abercrombie, P.D., Zamora, A., & Korn, A.P. (2007). Lessons learned: Providing a mindfulness-based stress reduction program for low-income multiethnic women with abnormal pap smears. *Holistic Nursing Practice*, *21*, 26–34.
- Aftanas, L.I., & Golocheikine, S.A. (2002). Non-linear dynamic complexity of the human EEG during meditation. *Neuroscience Letters*, *330*, 143–146.
- Allman, J.M., Watson, K.K., Tetreault, N.A., & Hakeem, A.Y. (2005). Intuition and autism: A possible role for Von Economo neurons. *Trends in Cognitive Sciences*, *9*, 367–373.
- Anand, A., Li, Y., Wang, Y., Wu, J., Gao, S., Bukhari, L., . . . Lowe, M.J. (2005). Activity and connectivity of brain mood regulating circuit in depression: A functional magnetic resonance study. *Biological Psychiatry*, *57*, 1079–1088.
- Ancin, I., Santos, J.L., Tijeira, C., Sanchez-Morla, E.M., Bescós, M.J., Argudo, I., . . . Cabranes-Díaz, J.A. (2010). Sustained attention as a potential endophenotype for bipolar disorder. *Acta Psychiatrica Scandinavica*, *122*, 235–245.
- Anderson, N.D., Lau, M.A., Segal, Z.V., & Bishop, S.R. (2007). Mindfulness-based stress reduction and attentional control. *Clinical Psychology & Psychotherapy*, *14*, 449–463.
- Arzy, S., Thut, G., Mohr, C., Michel, C.M., & Blanke, O. (2006). Neural basis of embodiment: Distinct contributions of temporo-parietal junction and extrastriate body area. *Journal of Neuroscience*, *26*, 8074–8081.
- Asada, H., Fukuda, Y., Tsunoda, S., Yamaguchi, M., & Tonoike, M. (1999). Frontal midline theta rhythms reflect alternative activation of prefrontal cortex and anterior cingulate cortex in humans. *Neuroscience Letters*, *274*, 29–32.
- Austin, J.H. (2006). *Zen-brain reflections*. Cambridge, MA: MIT Press.
- Baer, R.A. (2003). Mindfulness training as a clinical intervention: A conceptual and empirical review. *Clinical Psychology: Science and Practice*, *10*, 125–143.
- Baer, R.A., Smith, G.T., & Allen, K.B. (2004). Assessment of mindfulness by self-report. *Assessment*, *11*, 191–206.
- Baer, R.A., Smith, G.T., Hopkins, J., Krietemeyer, J., & Toney, L. (2006). Using self-report assessment methods to explore facets of mindfulness. *Assessment*, *13*, 27–45.
- Banks, S.J., Eddy, K.T., Angstadt, M., Nathan, P.J., & Phan, K.L. (2007). Amygdala-frontal connectivity during emotion-regulation. *Social Cognitive and Affective Neuroscience*, *2*, 303–312.
- Barinaga, M. (2003). Buddhism and neuroscience. Studying the well-trained mind. *Science*, *302*, 44–46.
- Barnhofer, T., Chittka, T., Nightingale, H., Visser, C., & Crane, C. (2010). State effects of two forms of meditation on prefrontal EEG asymmetry in previously depressed individuals. *Mindfulness (N Y)*, *1*, 21–27.
- Beauregard, M., Levesque, J., & Bourgouin, P. (2001). Neural correlates of conscious self-regulation of emotion. *Journal of Neuroscience*, *21*, RC165.
- Bechara, A. (2005). Decision making, impulse control and loss of willpower to resist drugs: A neurocognitive perspective. *Nature Neuroscience*, *8*, 1458–1463.
- Bechara, A., & Naqvi, N. (2004). Listening to your heart: Interoceptive awareness as a gateway to feeling. *Nature Neuroscience*, *7*, 102–103.
- Benson, H. (2000). *The relaxation response*. New York, NY: Harper.
- Bhikkhu, T. (2010). *Satipatthana Sutta: Frames of reference (MN10)*. Retrieved from <http://www.accesstoinsight.org/tipitaka/mn/mn.010.than.html>
- Birmie, K., Specia, M., & Carlson, L.E. (2010). Exploring self-compassion and empathy in the context of mindfulness-based stress reduction (MBSR). *Stress and Health*, *26*, 359–371.

- Bishop, S.R., Lau, M., Shapiro, S., Carlson, L.E., Anderson, N.D., Carmody, J., . . . Devins, G. (2004). Mindfulness: A proposed operational definition. *Clinical Psychology: Science and Practice, 11*, 230–241.
- Blanke, O., & Arzy, S. (2005). The out-of-body experience: Disturbed self-processing at the temporo-parietal junction. *Neuroscientist, 11*, 16–24.
- Blanke, O., Mohr, C., Michel, C.M., Pascual-Leone, A., Brugger, P., Seeck, M., . . . Thut, G. (2005). Linking out-of-body experience and self processing to mental own-body imagery at the temporo-parietal junction. *Journal of Neuroscience, 25*, 550–557.
- Bowen, S., Witkiewitz, K., Dillworth, T.M., Chawla, N., Simpson, T.L., Ostafin, B.D., . . . Marlatt, G.A. (2006). Mindfulness meditation and substance use in an incarcerated population. *Psychology of Addictive Behaviors, 20*, 343–347.
- Brach, T. (2003). *Radical acceptance: Embracing your life with the heart of a Buddha*. New York, NY: Bantam.
- Brefczynski-Lewis, J.A., Lutz, A., Schaefer, H.S., Levinson, D.B., & Davidson, R.J. (2007). Neural correlates of attentional expertise in long-term meditation practitioners. *Proceedings of the National Academy of Sciences of the United States of America, 104*, 11483–11488.
- Breiter, H.C., & Rauch, S.L. (1996). Functional MRI and the study of OCD: From symptom provocation to cognitive-behavioral probes of cortico-striatal systems and the amygdala. *NeuroImage, 4*, S127–S138.
- Brewer, J.A., Kober, H., Worhunsky, P.D., Tang, Y.-Y., Gray, J.R., & Weber, J. (2011). *Mental training reveals differences in default mode network activation and functional connectivity*. Manuscript submitted for publication.
- Brewer, J.A., Sinha, R., Chen, J.A., Michalsen, R.N., Babuscio, T.A., Nich, C., . . . Rounsaville, B.J. (2009). Mindfulness training and stress reactivity in substance abuse: Results from a randomized, controlled stage I pilot study. *Substance Abuse, 30*, 306–317.
- Brown, K.W., & Ryan, R.M. (2003). The benefits of being present: Mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology, 84*, 822–848.
- Brown, K.W., Ryan, R.M., & Creswell, J.D. (2007). Mindfulness: Theoretical foundations and evidence for its salutary effects. *Psychological Inquiry, 18*, 211–237.
- Buckner, R.L., Andrews-Hanna, J.R., & Schacter, D.L. (2008). The brain's default network: Anatomy, function, and relevance to disease. *Annals of the New York Academy of Sciences, 1124*, 1–38.
- Buckner, R.L., & Carroll, D.C. (2007). Self-projection and the brain. *Trends in Cognitive Sciences, 11*, 49–57.
- Cahn, B.R., & Polich, J. (2006). Meditation states and traits: EEG, ERP, and neuroimaging studies. *Psychological Bulletin, 132*, 180–211.
- Carlson, L.E., Speca, M., Faris, P., & Patel, K.D. (2007). One year pre-post intervention follow-up of psychological, immune, endocrine and blood pressure outcomes of mindfulness-based stress reduction (MBSR) in breast and prostate cancer outpatients. *Brain, Behavior, and Immunity, 21*, 1038–1049.
- Carmody, J. (2009). Evolving conceptions of mindfulness in clinical settings. *Journal of Cognitive Psychotherapy, 23*, 270–280.
- Carmody, J., & Baer, R.A. (2008). Relationships between mindfulness practice and levels of mindfulness, medical and psychological symptoms and well-being in a mindfulness-based stress reduction program. *Journal of Behavioral Medicine, 31*, 23–33.
- Carmody, J., Baer, R.A., Lykins, E.L.B., & Olendzki, N. (2009). An empirical study of the mechanisms of mindfulness in a mindfulness-based stress reduction program. *Journal of Clinical Psychology, 65*, 613–626.
- Carver, C.S., & Scheier, M.F. (2011). Self-regulation of action and affect. In K.D. Vohs & R.F. Baumeister (Eds.), *Handbook of self-regulation* (pp. 3–21). New York, NY: Guilford.
- Chambless, D.L., & Ollendick, T.H. (2001). Empirically supported psychological interventions: Controversies and evidence. *Annual Review of Psychology, 52*, 685–716.
- Chan, D., & Woollacott, M. (2007). Effects of level of meditation experience on attentional focus: Is the efficiency of executive or orientation networks improved? *Journal of Alternative and Complementary Medicine, 13*, 651–657.
- Chang, V.Y., Palesh, O., Caldwell, R., Glasgow, N., Abramson, M., Luskin, F., . . . Koopman, C. (2004). The effects of a mindfulness-based stress reduction program on stress, mindfulness self-efficacy, and positive states of mind. *Stress and Health: Journal of the International Society for the Investigation of Stress, 20*, 141–147.
- Chiesa, A., & Serretti, A. (2009). Mindfulness-based stress reduction for stress management in healthy people: A review and meta-analysis. *Journal of Alternative and Complementary Medicine, 15*, 593–600.
- Cicchetti, D., Ackerman, B.P., & Izard, C.E. (1995). Emotions and emotion regulation in developmental psychopathology. *Development and Psychopathology, 7*, 1–10.
- Clark, L., Iversen, S.D., & Goodwin, G.M. (2002). Sustained attention deficit in bipolar disorder. *British Journal of Psychiatry, 180*, 313–319.
- Cloninger, C.R., Svrakic, D.M., & Przybeck, T.R. (1993). A psychological model of temperament and character. *Archives of General Psychiatry, 50*, 975–990.
- Coccaro, E.F., McCloskey, M.S., Fitzgerald, D.A., & Phan, K.L. (2007). Amygdala and orbitofrontal reactivity to social threat in individuals with impulsive aggression. *Biological Psychiatry, 62*, 168–178.
- Corbetta, M., & Shulman, G.L. (2002). Control of goal-directed and stimulus-driven attention in the brain. *Nature Reviews Neuroscience, 3*, 201–215.
- Corcoran, K.A., Desmond, T.J., Frey, K.A., & Maren, S. (2005). Hippocampal inactivation disrupts the acquisition and contextual encoding of fear extinction. *Journal of Neuroscience, 25*, 8978–8987.
- Corcoran, K.A., & Maren, S. (2001). Hippocampal inactivation disrupts contextual retrieval of fear memory after extinction. *Journal of Neuroscience, 21*, 1720–1726.
- Craig, A.D. (2003). Interoception: The sense of the physiological condition of the body. *Current Opinion in Neurobiology, 13*, 500–505.
- Creswell, J.D., Way, B.M., Eisenberger, N.I., & Lieberman, M.D. (2007). Neural correlates of dispositional mindfulness during affect labeling. *Psychosomatic Medicine, 69*, 560–565.

- Critchley, H.D., Wiens, S., Rotshtein, P., Ohman, A., & Dolan, R.J. (2004). Neural systems supporting interoceptive awareness. *Nature Neuroscience*, *7*, 189–195.
- Damasio, A.R. (1999). *The feeling of what happens: Body and emotion in the making of consciousness*. New York, NY: Harcourt Brace.
- Damasio, A.R. (2003). *Looking for Spinoza: Joy, sorrow, and the feeling brain*. New York, NY: Harcourt.
- Davidson, R.J. (1992). Anterior cerebral asymmetry and the nature of emotion. *Brain and Cognition*, *20*, 125–151.
- Davidson, R.J. (2000). Affective style, psychopathology, and resilience: Brain mechanisms and plasticity. *American Psychologist*, *55*, 1196–1214.
- Davidson, R.J., Jackson, D.C., & Kalin, N.H. (2000). Emotion, plasticity, context, and regulation: Perspectives from affective neuroscience. *Psychological Bulletin*, *126*, 890–909.
- Davidson, R.J., Kabat-Zinn, J., Schumacher, J., Rosenkranz, M., Muller, D., Santorelli, S.F., . . . Sheridan, J.F. (2003). Alterations in brain and immune function produced by mindfulness meditation. *Psychosomatic Medicine*, *65*, 564–570.
- Davis, M. (1980). A multidimensional approach to individual differences in empathy. *Catalog of Selected Documents in Psychology*, *10*, 1–17.
- Davis, M., & Whalen, P.J. (2001). The amygdala: Vigilance and emotion. *Molecular Psychiatry*, *6*, 13–34.
- Decety, J., & Jackson, P.L. (2004). The functional architecture of human empathy. *Behavioral and Cognitive Neuroscience Reviews*, *3*, 71–100.
- Deckersbach, T., Hölzel, B.K., Eisner, L.R., Stange, J.P., Peckham, A.D., Lazar, S.W., . . . Nierenberg, A.A. (in press). Mindfulness-based cognitive therapy for non-remitted patients with bipolar disorder. *CNS Neuroscience & Therapeutics*.
- Deikman, A.J. (1982). *The observing self: Mysticism and psychotherapy*. Boston, MA: Beacon Press.
- Dekeyser, M., Raes, F., Leijssen, M., Leysen, S., & Dewulf, D. (2008). Mindfulness skills and interpersonal behaviour. *Personality and Individual Differences*, *44*, 1235–1245.
- de la Fuente, M., Franco, C., & Salvador, M. (2010). Reduction of blood pressure in a group of hypertensive teachers through a program of mindfulness meditation. *Behavioral Psychology / Psicología Conductual*, *18*, 533–552.
- Eippert, F., Veit, R., Weiskopf, N., Erb, M., Birbaumer, N., & Anders, S. (2007). Regulation of emotional responses elicited by threat-related stimuli. *Human Brain Mapping*, *28*, 409–423.
- Ekman, P., Davidson, R.J., Ricard, M., & Wallace, A. (2005). Buddhist and psychological perspectives on emotions and well-being. *Current Directions in Psychological Science*, *14*, 59–63.
- Emavardhana, T., & Tori, C.D. (1997). Changes in self-concept, ego defense mechanisms, and religiosity following seven-day Vipassana meditation retreats. *Journal for the Scientific Study of Religion*, *36*, 194–206.
- Engler, J. (1995). Being somebody and being nobody: A reexamination of the understanding of self in psychoanalysis and Buddhism. In J.D. Safran (Ed.), *Psychoanalysis and Buddhism* (pp. 35–79). Boston, MA: Wisdom Publications.
- Engler, J. (2004). Ego, ego on the wall: What is ego after all? In H.B. Aronson (Ed.), *Buddhist practice on Western ground* (pp. 64–90). Boston, MA: Shambhala.
- Epel, E.S., Blackburn, E.H., Lin, J., Dhabhar, F.S., Adler, N.E., Morrow, J.D., & Cawthon, R.M. (2004). Accelerated telomere shortening in response to life stress. *Proceedings of the National Academy of Sciences, USA*, *101*, 17312–17315.
- Epstein, M. (1988). The deconstruction of the self: Ego and “egolessness” in Buddhist Insight meditation. *The Journal of Transpersonal Psychology*, *20*, 61–69.
- Etkin, A., Klemenhagen, K.C., Dudman, J.T., Rogan, M.T., Hen, R., Kandel, E.R., & Hirsch, J. (2004). Individual differences in trait anxiety predict the response of the basolateral amygdala to unconsciously processed fearful faces. *Neuron*, *44*, 1043–1055.
- Fan, J., McCandliss, B.D., Sommer, T., Raz, A., & Posner, M.I. (2002). Testing the efficiency and independence of attentional networks. *Journal of Cognitive Neuroscience*, *14*, 340–347.
- Farb, N.A.S., Anderson, A.K., Mayberg, H., Bean, J., McKeon, D., & Segal, Z.V. (2010). Minding one’s emotions: Mindfulness training alters the neural expression of sadness. *Emotion*, *10*, 25–33.
- Farb, N.A.S., Segal, Z.V., Mayberg, H., Bean, J., McKeon, D., Fatima, Z., & Anderson, A.K. (2007). Attending to the present: Mindfulness meditation reveals distinct neural modes of self-reference. *Social Cognitive and Affective Neuroscience*, *2*, 313–322.
- Feldman, G., Greeson, J., & Senville, J. (2010). Differential effects of mindful breathing, progressive muscle relaxation, and loving-kindness meditation on decentering and negative reactions to repetitive thoughts. *Behaviour Research and Therapy*, *48*, 1002–1011.
- Fountoulakis, K.N., Giannakopoulos, P., Kovari, E., & Bouras, C. (2008). Assessing the role of cingulate cortex in bipolar disorder: Neuropathological, structural and functional imaging data. *Brain Research Reviews*, *59*, 9–21.
- Fox, M.D., Corbetta, M., Snyder, A.Z., Vincent, J.L., & Raichle, M.E. (2006). Spontaneous neuronal activity distinguishes human dorsal and ventral attention systems. *Proceedings of the National Academy of Sciences of the United States of America*, *103*, 10046–10051.
- Fresco, D.M., Moore, M.T., van Dulmen, M.H., Segal, Z.V., Ma, S.H., Teasdale, J.D., & Williams, J.M. (2007). Initial psychometric properties of the experiences questionnaire: Validation of a self-report measure of decentering. *Behavior Therapy*, *38*, 234–246.
- Gard, T., Hölzel, B.K., Sack, A.T., Hempel, H., Lazar, S.W., Vaitl, D., & Ott, U. (2010). *Pain mitigation through mindfulness is associated with decreased cognitive control and increased sensory processing in the brain*. Manuscript submitted for publication.
- Garland, E.L., Gaylord, S.A., & Fredrickson, B.L. (2011). Positive reappraisal mediates the stress-reductive effects of mindfulness: An upward spiral process. *Mindfulness*, *2*, 59–67
- Germer, C.K. (2009). *The mindful path to self-compassion: Freeing yourself from destructive thoughts and emotions*. New York, NY: Guilford.
- Goldin, P.R., & Gross, J.J. (2010). Effects of mindfulness-based stress reduction (MBSR) on emotion regulation in social anxiety disorder. *Emotion*, *10*, 83–91.

- Goleman, D.J., & Schwartz, G.E. (1976). Meditation as an intervention in stress reactivity. *Journal of Consulting and Clinical Psychology, 44*, 456–466.
- Grant, J.A., Courtemanche, J., Duerden, E.G., Duncan, G.H., & Rainville, P. (2010). Cortical thickness and pain sensitivity in Zen meditators. *Emotion, 10*, 43–53.
- Grant, J.A., Courtemanche, J., & Rainville, P. (2011). A non-elaborative mental stance and decoupling of executive and pain-related cortices predicts low pain sensitivity in Zen meditators. *Pain, 152*, 150–156.
- Gross, J.J. (1998). The emerging field of emotion regulation: An integrative review. *Review of General Psychology, 2*, 271–299.
- Grossman, P., Niemann, L., Schmidt, S., & Walach, H. (2004). Mindfulness-based stress reduction and health benefits. A meta-analysis. *Journal of Psychosomatic Research, 57*, 35–43.
- Grossman, P., Tiefenthaler-Gilmer, U., Raysz, A., & Kesper, U. (2007). Mindfulness training as an intervention for fibromyalgia: Evidence of postintervention and 3-year follow-up benefits in well-being. *Psychotherapy and Psychosomatics, 76*, 226–233.
- Gruber, S.A., Rogowska, J., & Yurgelun-Todd, D.A. (2004). Decreased activation of the anterior cingulate in bipolar patients: An fMRI study. *Journal of Affective Disorders, 82*, 191–201.
- Gusnard, D.A., Akbudak, E., Shulman, G.L., & Raichle, M.E. (2001). Medial prefrontal cortex and self-referential mental activity: Relation to a default mode of brain function. *Proceedings of the National Academy of Sciences of the United States of America, 98*, 4259–4264.
- Gusnard, D.A., & Raichle, M.E. (2001). Searching for a baseline: Functional imaging and the resting human brain. *Nature Reviews Neuroscience, 2*, 685–694.
- Gyatso, T. (1984). *Kindness, clarity, and insight*. Ithaca, NY: Snow Lion.
- Haimlerl, C.J., & Valentine, E.R. (2001). The effect of contemplative practice on intrapersonal, interpersonal, and transpersonal dimensions of the self-concept. *Journal of Transpersonal Psychology, 33*, 37–52.
- Harenski, C.L., & Hamann, S. (2006). Neural correlates of regulating negative emotions related to moral violations. *NeuroImage, 30*, 313–324.
- Hart, W. (1987). *The art of living: Vipassana meditation: As taught by S.N. Goenka*. San Francisco, CA: HarperOne.
- Hasler, G., Fromm, S., Alvarez, R.P., Luckenbaugh, D.A., Drevets, W.C., & Grillon, C. (2007). Cerebral blood flow in immediate and sustained anxiety. *Journal of Neuroscience, 27*, 6313–6319.
- Hayes, S.C., Wilson, K.G., Gifford, E.V., Follette, V.M., & Strosahl, K. (1996). Experiential avoidance and behavioral disorders: A functional dimensional approach to diagnosis and treatment. *Journal of Consulting and Clinical Psychology, 64*, 1152–1168.
- Hill, D.M., Craighead, L.W., & Safer, D.L. (2011). Appetite-focused dialectic behavior therapy for the treatment of binge eating with purging: A preliminary trial. *International Journal of Eating Disorders, 44*, 249–261.
- Hofmann, S.G., Sawyer, A.T., Witt, A.A., & Oh, D. (2010). The effect of mindfulness-based therapy on anxiety and depression: A meta-analytic review. *Journal of Consulting and Clinical Psychology, 78*, 169–183.
- Hollis-Walker, L., & Colosimo, K. (2011). Mindfulness, self-compassion, and happiness in non-meditators: A theoretical and empirical examination. *Personality and Individual Differences, 50*, 222–227.
- Holt, D.J., Lebron-Milad, K., Milad, M.R., Rauch, S.L., Pitman, R.K., Orr, S.P., . . . Goff, D.C. (2009). Extinction memory is impaired in schizophrenia. *Biological Psychiatry, 65*, 455–463.
- Hölzel, B.K., Carmody, J., Evans, K.C., Hoge, E.A., Dusek, J.A., Morgan, L., . . . Lazar, S.W. (2010). Stress reduction correlates with structural changes in the amygdala. *Social Cognitive and Affective Neuroscience, 5*, 11–17.
- Hölzel, B.K., Carmody, J., Vangel, M., Congleton, C., Yerramsetti, S.M., Gard, T., & Lazar, S.W. (2011). Mindfulness practice leads to increases in regional brain gray matter density. *Psychiatry Research, 191*, 36–43.
- Hölzel, B.K., Ott, U., Gard, T., Hempel, H., Weygandt, M., Morgen, K., & Vaitl, D. (2008). Investigation of mindfulness meditation practitioners with voxel-based morphometry. *Social Cognitive and Affective Neuroscience, 3*, 55–61.
- Hölzel, B.K., Ott, U., Hempel, H., Hackl, A., Wolf, K., Stark, R., & Vaitl, D. (2007). Differential engagement of anterior cingulate and adjacent medial frontal cortex in adept meditators and non-meditators. *Neuroscience Letters, 421*, 16–21.
- Hölzel, B.K., Ott, U., Hempel, H., & Stark, R. (2006, May). *Wie wirkt Achtsamkeit? Eine Interviewstudie mit erfahrenen Meditierenden* (How does mindfulness work? An interview study with experienced meditators). Paper presented at the 24th Symposium of the Section for Clinical Psychology and Psychotherapy of the German Society for Psychology, Würzburg, Germany.
- Inda, M.C., Muravieva, E.V., & Alberini, C.M. (2011). Memory retrieval and the passage of time: From reconsolidation and strengthening to extinction. *Journal of Neuroscience, 31*, 1635–1643.
- Jacobs, T.L., Epel, E.S., Lin, J., Blackburn, E.H., Wolkowitz, O.M., Bridwell, D.A., . . . Saron, C.D. (2010). Intensive meditation training, immune cell telomerase activity, and psychological mediators. *Psychoneuroendocrinology, 36*, 664–681.
- Jain, S., Shapiro, S.L., Swanick, S., Roesch, S.C., Mills, P.J., Bell, I., & Schwartz, G.E. (2007). A randomized controlled trial of mindfulness meditation versus relaxation training: Effects on distress, positive states of mind, rumination, and distraction. *Annals of Behavioral Medicine, 33*, 11–21.
- James, W. (1884). What is an emotion? *Mind, 9*, 188–205.
- Jang, J.H., Jung, W.H., Kang, D.H., Byun, M.S., Kwon, S.J., Choi, C.H., & Kwon, J.S. (2010). Increased default mode network connectivity associated with meditation. *Neuroscience Letters, 487*, 358–362.
- Jha, A.P., Krompinger, J., & Baime, M.J. (2007). Mindfulness training modifies subsystems of attention. *Cognitive, Affective, & Behavioral Neuroscience, 7*, 109–119.
- Jha, A.P., Stanley, E.A., Kiyonaga, A., Wong, L., & Gelfand, L. (2010). Examining the protective effects of mindfulness training on working memory capacity and affective experience. *Emotion, 10*, 54–64.
- Kabat-Zinn, J. (1990). *Full catastrophe living*. New York, NY: Delta Publishing.



- Kabat-Zinn, J., Massion, A.O., Kristeller, J., Peterson, L.G., Fletcher, K.E., Pbert, L., . . . Santorelli, S.F. (1992). Effectiveness of a meditation-based stress reduction program in the treatment of anxiety disorders. *American Journal of Psychiatry*, *149*, 936–943.
- Karoly, P. (1993). Mechanisms of self-regulation: A systems view. *Annual Review of Psychology*, *44*, 23–52.
- Kelley, W.M., Macrae, C.N., Wyland, C.L., Caglar, S., Inati, S., & Heatherton, T.F. (2002). Finding the self? An event-related fMRI study. *Journal of Cognitive Neuroscience*, *14*, 785–794.
- Kelly, A.C., Zuroff, D.C., Foa, C.L., & Gilbert, P. (2010). Who benefits from training in self-compassionate self-regulation? A study of smoking reduction. *Journal of Social and Clinical Psychology*, *29*, 727–755.
- Kerr, C.E., Josyula, K., & Littenberg, R. (2011). Developing an observing attitude: An analysis of meditation diaries in an MBSR clinical trial. *Clinical Psychology & Psychotherapy*, *18*, 80–93.
- Kerr, C.E., Shaw, J.R., Wasserman, R.H., Chen, V.W., Kanojia, A., Bayer, T., & Kelley, J.M. (2008). Tactile acuity in experienced Tai Chi practitioners: Evidence for use dependent plasticity as an effect of sensory-attentional training. *Experimental Brain Research*, *188*, 317–322.
- Khalsa, S.S., Rudrauf, D., Damasio, A.R., Davidson, R.J., Lutz, A., & Tranel, D. (2008). Interoceptive awareness in experienced meditators. *Psychophysiology*, *45*, 671–677.
- Kimbrough, E., Magyari, T., Langenberg, P., Chesney, M., & Beriman, B. (2010). Mindfulness intervention for child abuse survivors. *Journal of Clinical Psychology*, *66*, 17–33.
- Kolur, U.S., Reddy, Y.C.J., John, J.P., Kandavel, T., & Jain, S. (2006). Sustained attention and executive functions in euthymic young people with bipolar disorder. *British Journal of Psychiatry*, *189*, 453–458.
- Kravariti, E., Schulze, K., Kane, F., Kalidindi, S., Bramon, E., Walshe, M., . . . Murray, R.M. (2009). Stroop-test interference in bipolar disorder. *British Journal of Psychiatry*, *194*, 285–286.
- Krisanaprakornkit, T., Ngamjarus, C., Witoonchart, C., & Piyavhatkul, N. (2010). Meditation therapies for attention-deficit/hyperactivity disorder (ADHD). *Cochrane Database of Systematic Reviews*, *6*, CD006507.
- Kubota, Y., Sato, W., Toichi, M., Murai, T., Okada, T., Hayashi, A., . . . Sengoku, A. (2001). Frontal midline theta rhythm is correlated with cardiac autonomic activities during the performance of an attention demanding meditation procedure. *Cognitive Brain Research*, *11*, 281–287.
- Kuyken, W., Watkins, E., Holden, E., White, K., Taylor, R. S., Byford, S., . . . Dalgleish, T. (2010). How does mindfulness-based cognitive therapy work? *Behaviour Research and Therapy*, *48*, 1105–1112.
- Lazar, S.W., Bush, G., Gollub, R. L., Fricchione, G.L., Khalsa, G., & Benson, H. (2000). Functional brain mapping of the relaxation response and meditation. *NeuroReport*, *11*, 1581–1585.
- Lazar, S.W., Kerr, C.E., Wasserman, R.H., Gray, J.R., Greve, D.N., Treadway, M.T., . . . Fischl, B. (2005). Meditation experience is associated with increased cortical thickness. *NeuroReport*, *16*, 1893–1897.
- LeDoux, J.E. (2000). Emotion circuits in the brain. *Annual Review of Neuroscience*, *23*, 155–184.
- Legrand, D., & Ruby, P. (2009). What is self-specific? Theoretical investigation and critical review of neuroimaging results. *Psychological Review*, *116*, 252–282.
- Lieberman, M.D., Jarcho, J.M., & Satpute, A.B. (2004). Evidence-based and intuition-based self-knowledge: An fMRI study. *Journal of Personality and Social Psychology*, *87*, 421–435.
- Linehan, M.M., Armstrong, H.E., Suarez, A., Allmon, D., & Heard, H.L. (1991). Cognitive-behavioral treatment of chronically parasuicidal borderline patients. *Archives of General Psychiatry*, *48*, 1060–1064.
- Lou, H.C., Kjaer, T.W., Friberg, L., Wildschiodtz, G., Holm, S., & Nowak, M. (1999). A 15O-H<sub>2</sub>O PET study of meditation and the resting state of normal consciousness. *Human Brain Mapping*, *7*, 98–105.
- Lovibond, P.F., Mitchell, C.J., Minard, E., Brady, A., & Menzies, R.G. (2009). Safety behaviours preserve threat beliefs: Protection from extinction of human fear conditioning by an avoidance response. *Behaviour Research and Therapy*, *47*, 716–720.
- Luders, E., Toga, A.W., Lepore, N., & Gaser, C. (2009). The underlying anatomical correlates of long-term meditation: Larger hippocampal and frontal volumes of gray matter. *NeuroImage*, *45*, 672–678.
- Lutz, A., Brefczynski-Lewis, J., Johnstone, T., & Davidson, R.J. (2008). Regulation of the neural circuitry of emotion by compassion meditation: Effects of meditative expertise. *PLoS ONE*, *3*, e1897.
- Lutz, A., Dunne, J.D., & Davidson, R.J. (2007). Meditation and the neuroscience of consciousness: An introduction. In P.D. Zelazo, M. Moscovitch, & E. Thompson (Eds.), *Cambridge handbook of consciousness* (pp. 499–554). Cambridge, England: Cambridge University Press.
- Lutz, A., Slagter, H.A., Dunne, J.D., & Davidson, R.J. (2008). Attention regulation and monitoring in meditation. *Trends in Cognitive Sciences*, *12*, 163–169.
- Maalouf, F.T., Klein, C., Clark, L., Sahakian, B.J., LaBarbara, E.J., Versace, A., . . . Phillips, M.L. (2010). Impaired sustained attention and executive dysfunction: Bipolar disorder versus depression-specific markers of affective disorders. *Neuropsychologia*, *48*, 1862–1868.
- MacLean, K.A., Ferrer, E., Aichele, S.R., Bridwell, D.A., Zanesco, A.P., Jacobs, T.L., . . . Saron, C.D. (2010). Intensive meditation training improves perceptual discrimination and sustained attention. *Psychological Science*, *21*, 829–839.
- Macrae, C.N., Moran, J.M., Heatherton, T.F., Banfield, J.F., & Kelley, W.M. (2004). Medial prefrontal activity predicts memory for self. *Cerebral Cortex*, *14*, 647–654.
- Mehling, W.E., Gopisetty, V., Daubenmier, J., Price, C.J., Hecht, F.M., & Stewart, A. (2009). Body awareness: Construct and self-report measures. *PLoS ONE*, *4*, e5614.
- Mennin, D.S., Heimberg, R.G., Turk, C.L., & Fresco, D.M. (2002). Applying an emotion regulation framework to integrative approaches to generalized anxiety disorder. *Clinical Psychology: Science and Practice*, *9*, 85–90.
- Miklowitz, D.J., Alatiq, Y., Goodwin, G.M., Geddes, J.R., Fennell, M.J.V., Dimidjian, S., . . . Williams, J.M.G. (2009). A pilot study of mindfulness-based cognitive therapy for bipolar disorder. *International Journal of Cognitive Therapy*, *2*, 373–382.

- Milad, M.R., Orr, S.P., Lasko, N.B., Chang, Y., Rauch, S.L., & Pitman, R.K. (2008). Presence and acquired origin of reduced recall for fear extinction in PTSD: Results of a twin study. *Journal of Psychiatric Research, 42*, 515–520.
- Milad, M.R., Pitman, R.K., Ellis, C.B., Gold, A.L., Shin, L.M., Lasko, N.B., . . . Rauch, S.L. (2009). Neurobiological basis of failure to recall extinction memory in posttraumatic stress disorder. *Biological Psychiatry, 66*, 1075–1082.
- Milad, M.R., Quinn, B.T., Pitman, R.K., Orr, S.P., Fischl, B., & Rauch, S.L. (2005). Thickness of ventromedial prefrontal cortex in humans is correlated with extinction memory. *Proceedings of the National Academy of Sciences, USA, 102*, 10706–10711.
- Milad, M.R., & Quirk, G.J. (2002). Neurons in medial prefrontal cortex signal memory for fear extinction. *Nature, 420*, 70–74.
- Milad, M.R., Rauch, S.L., Pitman, R.K., & Quirk, G.J. (2006). Fear extinction in rats: Implications for human brain imaging and anxiety disorders. *Biological Psychiatry, 73*, 61–71.
- Milad, M.R., Wright, C.I., Orr, S.P., Pitman, R.K., Quirk, G.J., & Rauch, S.L. (2007). Recall of fear extinction in humans activates the ventromedial prefrontal cortex and hippocampus in concert. *Biological Psychiatry, 62*, 446–454.
- Modinos, G., Ormel, J., & Aleman, A. (2010). Individual differences in dispositional mindfulness and brain activity involved in reappraisal of emotion. *Social Cognitive and Affective Neuroscience, 5*, 369–377.
- Monk, C.S., Telzer, E.H., Mogg, K., Bradley, B.P., Mai, X., Louro, H.M., . . . Pine, D.S. (2008). Amygdala and ventrolateral prefrontal cortex activation to masked angry faces in children and adolescents with generalized anxiety disorder. *Archives of General Psychiatry, 65*, 568–576.
- Moore, A., & Malinowski, P. (2009). Meditation, mindfulness and cognitive flexibility. *Consciousness and Cognition, 18*, 176–186.
- Morgan, M.A., Romanski, L.M., & LeDoux, J.E. (1993). Extinction of emotional learning: Contribution of medial prefrontal cortex. *Neuroscience Letters, 163*, 109–113.
- Myers, K.M., & Davis, M. (2007). Mechanisms of fear extinction. *Molecular Psychiatry, 12*, 120–150.
- Nader, K., & Einarsson, E.O. (2010). Memory reconsolidation: An update. *Annals of the New York Academy of Sciences, 1191*, 27–41.
- Neff, K.D. (2003a). The development and validation of a scale to measure self-compassion. *Self and Identity, 2*, 223–250.
- Neff, K.D. (2003b). Self-compassion: An alternative conceptualization of a healthy attitude toward oneself. *Self and Identity, 2*, 85–101.
- Newberg, A., Alavi, A., Baime, M., Pourdehnad, M., Santanna, J., & d'Aquili, E. (2001). The measurement of regional cerebral blood flow during the complex cognitive task of meditation: A preliminary SPECT study. *Psychiatry Research, 106*, 113–122.
- Nielsen, L., & Kaszniak, A.W. (2006). Awareness of subtle emotional feelings: A comparison of long-term meditators and nonmeditators. *Emotion, 6*, 392–405.
- Northoff, G., & Bermpohl, F. (2004). Cortical midline structures and the self. *Trends in Cognitive Sciences, 8*, 102–107.
- Northoff, G., Heinzel, A., de Greck, M., Bermpohl, F., Dobrowolny, H., & Panksepp, J. (2006). Self-referential processing in our brain: A meta-analysis of imaging studies on the self. *NeuroImage, 31*, 440–457.
- Ochsner, K.N., Bunge, S.A., Gross, J.J., & Gabrieli, J.D. (2002). Rethinking feelings: An fMRI study of the cognitive regulation of emotion. *Journal of Cognitive Neuroscience, 14*, 1215–1229.
- Ochsner, K.N., & Gross, J.J. (2005). The cognitive control of emotion. *Trends in Cognitive Sciences, 9*, 242–249.
- Ochsner, K.N., & Gross, J.J. (2008). Cognitive emotion regulation: Insights from social cognitive and affective neuroscience. *Current Directions in Psychological Science, 17*, 153–158.
- Ochsner, K.N., Ray, R.D., Cooper, J.C., Robertson, E.R., Chopra, S., Gabrieli, J.D., & Gross, J.J. (2004). For better or for worse: Neural systems supporting the cognitive down- and up-regulation of negative emotion. *NeuroImage, 23*, 483–499.
- Olendzki, A. (2006). The transformative impact of non-self. In D.K. Nauriyal, M.S. Drummond, Y.B. Lal (Eds.), *Buddhist thought and applied psychological research: Transcending the boundaries* (pp. 250–261). New York, NY: Taylor & Francis Routledge.
- Olendzki, A. (2010). *Unlimiting mind: The radically experiential psychology of Buddhism*. Somerville, MA: Wisdom Publications.
- Ortner, C.N.M., Kilner, S.J., & Zelazo, P.D. (2007). Mindfulness meditation and reduced emotional interference on a cognitive task. *Motivation and Emotion, 31*, 271–283.
- Öst, L.G. (1997). Rapid treatment of specific phobias. In G.C.L. Davey (Ed.), *Phobias: A handbook of theory, research, and treatment* (pp. 227–247). Chichester, UK: John Wiley.
- Ott, U., Walter, B., Gebhardt, H., Stark, R., & Vaitl, D. (2010, June 6–10). *Inhibition of default mode network activity during mindfulness meditation*. Paper presented at the 16th Annual Meeting of the Organization for Human Brain Mapping, Barcelona, Spain.
- Pagnoni, G., & Cekic, M. (2007). Age effects on gray matter volume and attentional performance in Zen meditation. *Neurobiology of Aging, 28*, 1623–1627.
- Pare, D., Quirk, G.J., & LeDoux, J.E. (2004). New vistas on amygdala networks in conditioned fear. *Journal of Neurophysiology, 92*, 1–9.
- Parkinson, B., & Totterdell, P. (1999). Classifying affect-regulation strategies. *Cognition & Emotion, 13*, 277–303.
- Passarotti, A.M., Sweeney, J.A., & Pavuluri, M.N. (2010). Emotion processing influences working memory circuits in pediatric bipolar disorder and attention-deficit/hyperactivity disorder. *Journal of the American Academy of Child & Adolescent Psychiatry, 49*, 1064–1080.
- Pavuluri, M.N., O'Connor, M.M., Harral, E., & Sweeney, J.A. (2007). Affective neural circuitry during facial emotion processing in pediatric bipolar disorder. *Biological Psychiatry, 62*, 158–167.
- Phan, K.L., Fitzgerald, D.A., Nathan, P.J., & Tancer, M.E. (2006). Association between amygdala hyperactivity to harsh faces and severity of social anxiety in generalized social phobia. *Biological Psychiatry, 59*, 424–429.
- Phelps, E.A., & LeDoux, J.E. (2005). Contributions of the amygdala to emotion processing: From animal models to human behavior. *Neuron, 48*, 175–187.
- Posner, M.I., & Petersen, S.E. (1990). The attention system of the human brain. *Annual Review of Neuroscience, 13*, 25–42.
- Price, J.L. (2005). Free will versus survival: Brain systems that underlie intrinsic constraints on behavior. *Journal of Comparative Neurology, 493*, 132–139.

- Quirk, G.J. (2002). Memory for extinction of conditioned fear is long-lasting and persists following spontaneous recovery. *Learning & Memory*, *9*, 402–407.
- Quirk, G.J., Russo, G.K., Barron, J.L., & Lebron, K. (2000). The role of ventromedial prefrontal cortex in the recovery of extinguished fear. *Journal of Neuroscience*, *20*, 6225–6231.
- Raffone, A., & Pantani, M. (2010). A global workspace model for phenomenal and access consciousness. *Consciousness and Cognition*, *19*, 580–596.
- Rauch, S.L., Shin, L.M., & Phelps, E.A. (2006). Neurocircuitry models of posttraumatic stress disorder and extinction: Human neuroimaging research—past, present, and future. *Biological Psychiatry*, *60*, 376–382.
- Rescorla, R.A. (2001). Retraining of extinguished Pavlovian stimuli. *Journal of Experimental Psychology: Animal Behavior Processes*, *27*, 115–124.
- Roemer, L., Orsillo, S.M., & Salters-Pedneault, K. (2008). Efficacy of an acceptance-based behavior therapy for generalized anxiety disorder: Evaluation in a randomized controlled trial. *Journal of Consulting and Clinical Psychology*, *76*, 1083–1089.
- Roid, G.H., & Fitts, W.H. (1988). *Tennessee Self-Concept Scale (revised manual)*. Los Angeles, CA: Western Psychological Services.
- Rossato, J.I., Bevilacqua, L.R., Izquierdo, I., Medina, J.H., & Cammarota, M. (2010). Retrieval induces reconsolidation of fear extinction memory. *Proceedings of the National Academy of Sciences, USA*, *107*, 21801–21805.
- Sajonz, B., Kahnt, T., Margulies, D.S., Park, S.Q., Wittmann, A., Stoy, M., . . . Bermpohl, F. (2010). Delineating self-referential processing from episodic memory retrieval: Common and dissociable networks. *NeuroImage*, *50*, 1606–1617.
- Salkovskis, P.M., Clark, D.M., Hackmann, A., Wells, A., & Gelder, M.G. (1999). An experimental investigation of the role of safety-seeking behaviours in the maintenance of panic disorder with agoraphobia. *Behaviour Research and Therapy*, *37*, 559–574.
- Salzberg, S. (1995). *Lovingkindness: The revolutionary art of happiness*. Boston, MA: Shambhala.
- Santorelli, S. (2000). *Heal thy self: Lessons on mindfulness in medicine*. New York, NY: Three Rivers Press.
- Saxe, R., & Kanwisher, N. (2003). People thinking about thinking people. The role of the temporo-parietal junction in “theory of mind”. *NeuroImage*, *19*, 1835–1842.
- Schacter, D.L., Addis, D.R., & Buckner, R.L. (2007). Remembering the past to imagine the future: The prospective brain. *Nature Reviews Neuroscience*, *8*, 657–661.
- Schaefer, S.M., Jackson, D.C., Davidson, R.J., Aguirre, G.K., Kimberg, D.Y., & Thompson-Schill, S.L. (2002). Modulation of amygdalar activity by the conscious regulation of negative emotion. *Journal of Cognitive Neuroscience*, *14*, 913–921.
- Schmitz, T.W., & Johnson, S.C. (2007). Relevance to self: A brief review and framework of neural systems underlying appraisal. *Neuroscience & Biobehavioral Reviews*, *31*, 585–596.
- Schuman-Olivier, Z., Albanese, M., Carlini, S., & Shaffer, H. (2011). Effects of trait mindfulness during buprenorphine treatment for heroin dependence: A pilot study [Abstract]. *American Journal on Addictions*, *20*, 386.
- Shahar, B., Britton, W.B., Sbarra, D.A., Figueredo, A.J., & Bootzin, R.R. (2010). Mechanisms of change in Mindfulness-based cognitive therapy for depression: Preliminary evidence from a randomized controlled trial. *International Journal of Cognitive Therapy*, *3*, 402–418.
- Shapiro, D.H., Jr. (1982). Overview: Clinical and physiological comparison of meditation with other self-control strategies. *American Journal of Psychiatry*, *139*, 267–274.
- Shapiro, S.L., Astin, J.A., Bishop, S.R., & Cordova, M. (2005). Mindfulness-based stress reduction for health care professionals: Results from a randomized trial. *International Journal of Stress Management*, *12*, 164–176.
- Shapiro, S.L., Brown, K.W., & Biegel, G.M. (2007). Teaching self-care to caregivers: Effects of Mindfulness-Based Stress Reduction on the mental health of therapists in training. *Training and Education in Professional Psychology*, *1*, 105–115.
- Shapiro, S.L., Carlson, L.E., Astin, J.A., & Freedman, B. (2006). Mechanisms of mindfulness. *Journal of Clinical Psychology*, *62*, 373–386.
- Shapiro, S.L., Schwartz, G.E., & Bonner, G. (1998). Effects of mindfulness-based stress reduction on medical and premedical students. *Journal of Behavioral Medicine*, *21*, 581–599.
- Shin, L.M., Wright, C.I., Cannistraro, P.A., Wedig, M.M., McMullin, K., Martis, B., . . . Rauch, S.L. (2005). A functional magnetic resonance imaging study of amygdala and medial prefrontal cortex responses to overtly presented fearful faces in posttraumatic stress disorder. *Archives of General Psychiatry*, *62*, 273–281.
- Silbersweig, D., Clarkin, J.F., Goldstein, M., Kernberg, O.F., Tuescher, O., Levy, K.N., . . . Rauch, S.L. (2007). Failure of fronto-limbic inhibitory function in the context of negative emotion in borderline personality disorder. *American Journal of Psychiatry*, *164*, 1832–1841.
- Singer, T., Seymour, B., O’Doherty, J., Kaube, H., Dolan, R.J., & Frith, C.D. (2004). Empathy for pain involves the affective but not sensory components of pain. *Science*, *303*, 1157–1162.
- Slagter, H.A., Lutz, A., Greischar, L.L., Francis, A.D., Nieuwenhuis, S., Davis, J.M., & Davidson, R.J. (2007). Mental training affects distribution of limited brain resources. *PLoS Biology*, *5*, e138.
- Smith, H., & Novak, P. (2003). *Buddhism: A concise introduction*. New York, NY: Harper Collins.
- Sridharan, D., Levitin, D.J., & Menon, V. (2008). A critical role for the right fronto-insular cortex in switching between central-executive and default-mode networks. *Proceedings of the National Academy of Sciences of the United States of America*, *105*, 12569–12574.
- Stange, J.P., Eisner, L.R., Hölzel, B.K., Peckham, A.D., Dougherty, D.D., Rauch, S.L., . . . Deckersbach, T. (in press). Mindfulness-based cognitive therapy for bipolar disorder: Effects on cognitive functioning. *Journal of Psychiatric Practice*.
- Strawson, G. (2000). The phenomenology and ontology of the self. In D. Zahavi (Ed.), *Exploring the self: Philosophical and psychopathological perspectives on self-experience* (pp. 39–54). Amsterdam, Netherlands: John Benjamins.
- Stroop, J.R. (1935). Studies of interference in serial verbal reaction. *Journal of Experimental Psychology: Human Perception and Performance*, *18*, 643–662.

- Tang, Y.Y., Lu, Q., Geng, X., Stein, E.A., Yang, Y., & Posner, M.I. (2010). Short-term meditation induces white matter changes in the anterior cingulate. *Proceedings of the National Academy of Sciences of the United States of America*, *107*, 15649–15652.
- Tang, Y.Y., Ma, Y., Fan, Y., Feng, H., Wang, J., Feng, S., . . . Fan, M. (2009). Central and autonomic nervous system interaction is altered by short-term meditation. *Proceedings of the National Academy of Sciences of the United States of America*, *106*, 8865–8870.
- Tang, Y.Y., Ma, Y., Wang, J., Fan, Y., Feng, S., Lu, Q., . . . Posner, M.I. (2007). Short-term meditation training improves attention and self-regulation. *Proceedings of the National Academy of Sciences of the United States of America*, *104*, 17152–17156.
- Tapper, K., Shaw, C., Ilsley, J., Hill, A.J., Bond, F.W., & Moore, L. (2009). Exploratory randomised controlled trial of a mindfulness-based weight loss intervention for women. *Appetite*, *52*, 396–404.
- Teasdale, J.D., Williams, J.M., Soulsby, J.M., Segal, Z.V., Ridgeway, V.A., & Lau, M.A. (2000). Prevention of relapse/recurrence in major depression by mindfulness-based cognitive therapy. *Journal of Consulting and Clinical Psychology*, *68*, 615–623.
- Urry, H.L., van Reekum, C.M., Johnstone, T., Kalin, N.H., Thurow, M.E., Schaefer, H.S., . . . Davidson, R.J. (2006). Amygdala and ventromedial prefrontal cortex are inversely coupled during regulation of negative affect and predict the diurnal pattern of cortisol secretion among older adults. *Journal of Neuroscience*, *26*, 4415–4425.
- Valentine, E.R., & Sweet, P.L. (1999). Meditation and attention: A comparison of the effects of concentrative and mindfulness meditation on sustained attention. *Mental Health, Religion & Culture*, *2*, 59–70.
- Van Dam, N.T., Sheppard, S.C., Forsyth, J.P., & Earleywine, M. (2011). Self-compassion is a better predictor than mindfulness of symptom severity and quality of life in mixed anxiety and depression. *Journal of Anxiety Disorders*, *25*, 123–130.
- van den Hurk, P.A., Giommi, F., Gielen, S.C., Speckens, A.E., & Barendregt, H.P. (2010). Greater efficiency in attentional processing related to mindfulness meditation. *Quarterly Journal of Experimental Psychology B (Colchester)*, *63*, 1168–1180.
- van Leeuwen, S., Willer, N.G., & Melloni, L. (2009). Age effects on attentional blink performance in meditation. *Consciousness and Cognition*, *18*, 593–599.
- van Veen, V., & Carter, C.S. (2002). The anterior cingulate as a conflict monitor: FMRI and ERP studies. *Physiology & Behavior*, *77*, 477–482.
- Varela, F.J., Thompson, E., & Rosch, E. (1991). *The embodied mind*. Cambridge, MA: MIT Press.
- Vincent, J.L., Snyder, A.Z., Fox, M.D., Shannon, B.J., Andrews, J.R., Raichle, M.E., & Buckner, R.L. (2006). Coherent spontaneous activity identifies a hippocampal-parietal memory network. *Journal of Neurophysiology*, *96*, 3517–3531.
- Vishnu Devananda, S. (1999). *Meditation and mantras*. Delhi, India: Motilal Banarsidass Publishers.
- Vohs, K.D., & Baumeister, R.F. (2004). Understanding self-regulation. In R.F. Baumeister & K.D. Vohs (Eds.), *Handbook of self-regulation* (pp. 1–12). New York, NY: Guilford.
- Wager, T.D., Davidson, M.L., Hughes, B.L., Lindquist, M.A., & Ochsner, K.N. (2008). Prefrontal-subcortical pathways mediating successful emotion regulation. *Neuron*, *59*, 1037–1050.
- Wells, A., Clark, D.M., Salkovskis, P., Ludgate, J., Hackmann, A., & Gelder, M. (1995). Social phobia: The role of in-situation safety behaviors in maintaining anxiety and negative beliefs. *Behavior Therapy*, *26*, 153–161.
- Wenk-Sormaz, H. (2005). Meditation can reduce habitual responding. *Alternative Therapies in Health & Medicine*, *11*, 42–58.
- Williams, J.M., Alatiq, Y., Crane, C., Barnhofer, T., Fennell, M.J., Duggan, D.S., . . . Goodwin G.M. (2008). Mindfulness-based cognitive therapy (MBCT) in bipolar disorder: Preliminary evaluation of immediate effects on between-episode functioning. *Journal of Affective Disorders*, *107*, 275–279.
- Wolpe, J. (1958). *Psychotherapy by reciprocal inhibition*. Stanford, CA: Stanford University Press.
- Wupperman, P., Neumann, C.S., & Axelrod, S.R. (2008). Do deficits in mindfulness underlie borderline personality features and core difficulties? *Journal of Personality Disorders*, *22*, 466–482.
- Young, J.D., & Taylor, E. (1998). Meditation as a voluntary hypometabolic state of biological estivation. *News in Physiological Sciences*, *13*, 149–153.
- Zeidan, F., Johnson, S.K., Gordon, N.S., & Goolkasian, P. (2010). Effects of brief and sham mindfulness meditation on mood and cardiovascular variables. *Journal of Alternative and Complementary Medicine*, *16*, 867–873.
- Zeidler, W. (2007). *Achtsamkeit und ihr Einfluss auf die Emotionsverarbeitung: Eine experimentelle Untersuchung der Wirkmechanismen* [Mindfulness and its influence on emotion processing: An experimental investigation of mechanisms]. Saarbrücken, Germany: VDM Verlag Dr. Mueller.
- Zybowska, L., Ackerman, D.L., Yang, M.H., Futrell, J.L., Horton, N.L., Hale, T.S., . . . Smalley, S.L. (2008). Mindfulness meditation training in adults and adolescents with ADHD: A feasibility study. *Journal of Attention Disorders*, *11*, 737–746.

# Chapter 11

## Knowledge Worker Productivity and The Practice of Self-Management

By Jeremy Hunter, Ph.D., with J. Scott Scherer

*More and more people in the workforce—and mostly knowledge workers—will have to manage themselves.*

—Peter F. Drucker, *Management Challenges for the 21st Century*

Toward the end of his life, Peter Drucker asserted that making knowledge workers productive was “the biggest of the 21<sup>st</sup> century management challenges.”<sup>1</sup> Other scholars support Drucker’s position. Tom Davenport, a leading thinker on knowledge workers, underscores why this productivity is so important: “If our companies are going to be more profitable, if our strategies are going to be successful, if our society is going to become more advanced—it will be because knowledge workers did their work in a more productive and effective manner.”<sup>2</sup> The task of improving knowledge worker productivity is immense, and so are the consequences of failing to do so. In fact, Drucker warned that improving knowledge worker productivity is the “first *survival requirement*” of developed nations.<sup>3</sup> Failure carries dire consequences for a nation’s economy and society.

Significant efforts have been made in this quest, with varying degrees of success. Most endeavors have focused on the logical

suspects—work process, managerial practice, organizational structure, information technology and workplace ergonomics.<sup>4</sup> Despite these efforts, quantum gains in productivity have not flooded the workplace. In his blog, Davenport wondered why more headway wasn’t being made, even going so far as to ask, “Was Drucker wrong?”<sup>5</sup> Alas, Drucker’s 21<sup>st</sup> century challenge is proving to be a tricky lock to pick.

Perhaps the key lies hidden elsewhere. Thus far, most energy has focused on the worker’s external environment. If, according to Drucker, the primary asset of a knowledge economy lies “between the ears” of its knowledge workers,<sup>6</sup> then maybe the key to enhancing productivity lies *within* the workers themselves.

## Productivity from the Inside Out

An internally based exploration of productivity asks different questions about how to optimize it. An inner approach examines how a knowledge worker manages—or mismanages—her internal experience, and helps her to see how her internal processes have a direct impact on her outward behavior. Some questions to ask are:

- How do knowledge workers use their attention to focus on and engage with work and one another?
- How can rigid, judgmental mindsets be shifted toward the openness, learning, and transformation that are the heart of innovation and problem solving?
- How do negative emotional reactions derail the work process or corrode the morale of a work group?

Losses in productivity can often be traced to momentary events inside a person—events whose outward expression disrupts clear thought and effective social interaction. In short, visible behavior results from invisible processes that occur within a person's inner black box, often with negative consequences:

- A senior executive's emotional volatility makes him a scary person to report to. As a result, bad news does not get delivered, and the right decisions are not made. The organization begins to reel off course. Defusing the inner churn that precedes his eruptions quiets his outbursts and, in turn, changes how his people relate to him.
- A team leader's penchant for judgmental and sarcastic comments erodes team morale and performance. Talent leaves

the organization, along with the knowledge capital the company needs if it is to thrive. Teach the leader not to utter his acerbic thoughts and to be more supportive, and watch team performance improve.

- An up-and-coming manager's multitasking BlackBerry addiction compulsively distracts her attention in meetings. She misses key points, her colleagues feel disrespected, and decision-making takes longer. Her chances for promotion are diminished. If the manager keeps her attention focused, decisions proceed more smoothly and her team feels more respected.

In each example, maladaptive behavior can be traced to an event inside the worker that affects outward performance. But why should management be concerned?

The answer becomes clear upon reflection. Drucker reminded us that “knowledge workers must be considered a *capital asset*.”<sup>7</sup> If an organization is seeking to grow its assets and to maximize their return, and if knowledge workers' productivity is deeply influenced by the workers' inner states, then helping knowledge workers to cultivate optimal internal states becomes the responsibility of management and, in effect, becomes an exercise in *asset management*.

If we know internal states affect behavior, then the productivity challenge shifts to how to manage these states effectively and how to improve them. In *The Practice of Management*, Drucker “illuminated the dark continent of management”<sup>8</sup> and made conscious the inner workings of the organization. Analogously, the practice of *self-management*, as I have coined the phrase, allows the worker to shine a light into his own inner black box to illuminate his internal processing, and then

to transform these processes to enhance his effectiveness.

The practice of self-management builds directly on recent advances in neuroscience, medicine and psychology. The model melds Drucker's classic themes of change and continual transformation with contemporary views on human development, providing a systematic framework of theory and practice to help knowledge workers better manage themselves, their work and their relationships. In the process, workers transform their individual and collective productivity and, in turn, generate more capital for the organization.

## Creating the Practice of Self-Management

I developed the practice of self-management after conducting a research study that involved interviewing prominent, successful professionals dedicated to practicing mindfulness. Mindfulness practices are a method of attention development that enhances self-awareness, self-regulation and self-transformation. I'll say more about what that means later.

In recent years, mindfulness practices have received considerable scholarly attention. Research studies have demonstrated these practices improve numerous measures of well-being, including mental and physical health, self-regulation and the quality of relationships.<sup>9</sup>

Outside of the academy, mindfulness practices produce tangible results in a variety of professional settings. Such methods inform stress management programs used in hospitals in more than 26 countries around the world.<sup>10</sup> Mindfulness

has been incorporated into legal training,<sup>11</sup> and it has been applied successfully in professional sports, notably by coach Phil Jackson in his NBA championships with the Chicago Bulls and Los Angeles Lakers.<sup>12</sup>

The professionals I interviewed in the research study included a Fortune 500 CEO, a well-known architect, a financier, senior corporate managers, medical researchers, a film director and a host of other prominent knowledge workers. Most of the time, I met these people in person. Without fail, they were open, relaxed and attentive. They were not the stereotypical picture of the stressed-out but "successful" professional.

Our conversations revealed a common refrain: "My life is so complex and demanding—if I didn't have these mindfulness practices, I think I'd be dead." Often they meant this literally. They produced medical records showing their previous high blood pressure, heart problems and overweight conditions, or they shared stories of divorces and broken relationships.<sup>13</sup> Each person attributed his or her sustained success and well-being to a regular mindfulness practice. Their sustained internal training had resulted in significant transformation.

During this time, I too was using these practices to confront a personal challenge. Diagnosed with a terminal illness at the age of 20, I was told I had a 90 percent chance of dying within five years. Having outlived that prognosis by decades, I knew the power of these methods intimately.

One day, in a conversation about this research, my colleague Jean Lipman-Blumen pointed out, "We rarely train managers to manage themselves." Her comment crystallized an insight for me: the inner world of the executive remained largely neglected. How ironic this all

seemed to me, since my study had suggested internal self-management was the source of both professional effectiveness and professional failure.

The notion of “managing oneself” was already present in Drucker’s work.<sup>14</sup> I realized mindfulness could be the basis of a systematic discipline in self-management. The impulse to create a scientifically-based method of self-management for an expanding audience of knowledge workers was born. Recent discoveries in neuroscience would help to explain why mindfulness works, providing a biological description for this seemingly mystical process. Understanding the function of the human nervous system would be the first step in transforming it for greater professional and personal effectiveness.

## Self-Management Means Managing Your Nervous System

Self-management begins with the human nervous system, including (and especially) the brain. The brain lies at the center of knowledge work. Knowledge workers use their brains to focus, to decide and to act. Unfortunately, few knowledge workers understand how their brain works. Self-management examines how the brain and the nervous system function, explores their limits and demonstrates how these limits can be effectively managed and transformed. Making knowledge workers more productive means helping them to use their brains better.<sup>15</sup>

From this point onward, I will examine specific internal processes involved in self-management. The starting place for this examination is *attention*. Attention informs how we process experience, and at

the same time, attention powers performance. So, I will explore how attention can be used as a tool in a variety of applications, including how to transform nonperforming mindsets and how to manage emotional reactivity—two elements that can deeply affect professional performance.

## Attention is the Foundation for Self-Management

Attention and our experience of the world are intimately linked: you are what you attend to. Attention powers our ability to perceive the outside world as well as to perceive our own actions, thoughts and emotions. The first step toward self-awareness, self-control, self-transformation and connection with others is to master attention. Attention is fundamental.

Over one hundred years ago, the great American psychologist William James recognized the essential role attention plays in self-management. James cited attention as “the very root of judgment, character and will,” and warned that people could not be masters of themselves if they failed to first control their attention. Furthermore, James declared that an education that enhances attention would be “the education *par excellence*.”<sup>16</sup>

At this point in the conversation, many people furrow their brows and say: “Huh? Attention? If it’s so important, why haven’t I heard of it before?”

Good question. Here’s why. There are two reasons. First, modern education has usually favored the conceptual and abstract over the perceptual, which is one reason attention and its development seem foreign to most of us. Second, although Western psychology after James created theories of



development for cognition and emotion, it failed to create a theory of attention development.

“Not paying attention to attention” is a massive cultural blind spot. The modern West has ignored the importance of preserving and developing attention, to its peril. Japan, for example, has a well-developed cultural heritage of “attention-developing arts,” including the tea ceremony, calligraphy, flower arrangement, martial arts and archery. The fundamental purpose of these methods is to develop focus and awareness, as well as mental and emotional stability. A person is considered to be mature and civilized if she has at least one of these under her belt. Drucker, incidentally, was one of the United States’ foremost collectors of Japanese art, a hobby he used to train his perceptive capacities.

## Drucker and the Vital Need to Train Perception

Peter Drucker recognized the West’s perceptual blindness when he wrote: “Descartes said, ‘I *think* therefore I am.’ We will now have to say also, ‘I *see* therefore I am.’”<sup>17</sup> Drucker realized modern management had overemphasized analysis and underappreciated perception. (In this discussion, Drucker used *perception* as a synonym for *attention*.) He echoed James’ century-old declaration: “[P]erception is at the center. And it can—indeed it must—be trained.”<sup>18</sup>

Why is perception important? The greater facility I have in perceiving, the more and more subtle forms I am able to see. A well-developed perception allows a person to see hidden assumptions as well as new possibilities. In *Innovation and Entrepreneurship*, Drucker reminds us that

“when a change in perception takes place, the facts do not change. Their meaning does.”<sup>19</sup> How we see things influences how we understand them and how we can respond to them.

## Concentrated Attention: Focus Is Power

For the knowledge worker, focused attention is what gets work done. It is the engine of productivity. Complex mental operations cannot happen without a focused mind. Mihaly Csikszentmihalyi’s studies of optimal experience find that focused attention is the basic ingredient for those exhilarating moments of flow when a person performs to his highest limits.<sup>20</sup>

Conversely, distraction decreases cognitive efficiency. Interruptions in the flow of thought break momentum, which then takes time to reestablish. Scattered and distracted attention wastes energy and results in less productive action. Thus, management should design work systems that help knowledge workers focus attention.

In terms of brain structures, attention is associated with the prefrontal cortex (PFC), also known as “the inner CEO.” This brain part is associated with directing and allocating attention. This area can be strengthened through systematic practice, just as a muscle can be strengthened through exercise. A more developed prefrontal cortex is associated with an increased ability to concentrate, connect, learn and make decisions. However, it can also be weakened through another “systematic practice”: multitasking.

## Multitasking Damages Your Productivity, Your Relationships, and Your Brain

Multitasking, or simultaneously splitting one's attention across many tasks, has become an all-too-common résumé boast. Many people erroneously believe doing multiple things at once makes them more efficient. After all, if the PC on my desk can multitask, why can't I? Workers look over their shoulder at their colleagues who are simultaneously talking on the phone, writing a report and eating a sandwich. They wonder to themselves, "Is that what it takes to survive?" The good news is: no.

In fact, research shows multitasking both slows performance and increases errors.<sup>21</sup> Multitasking reduces the available attention and increases the chance that disorganizing emotions, like fear and anxiety, will overwhelm brain function. Chronic multitaskers report feeling "out of control." Over time, regular multitasking can lead to a state of panic. By the end of the day, many chronic multitaskers feel they have accomplished little and are completely spent.

Multitasking also damages relationships. Consider this scenario: when your boss is pecking away at his keyboard as you attempt to discuss your pay raise, do you feel heard and respected? Probably not. Attention is the bridge of relationships, and the quality of a relationship is proportionate to the quality of attention. When attention is split or scattered, the quality of connection diminishes, and with it goes the productivity of a team.

It gets worse. Multitasking has a negative effect on how well people learn. UCLA researchers found that divided

attention impairs complex learning and thus negatively affects decision making, adapting, and a host of other essential knowledge worker skills.<sup>22</sup> In their study, multitaskers demonstrated a superficial understanding of issues. Brain scans showed they had become habituated to using a more primitive part of the brain—a part that is responsible for creating rote, inflexible memories (the basal ganglia). Conclusion: multitaskers use a part of the brain that leaves them less capable of applying the principles they have learned.

Study participants who focused their attention, however, relied on a different brain structure, namely, the hippocampus, a part that creates more flexible memories and allows for a deeper, more robust knowing. The focused students were able to apply a more nuanced understanding when facing problems. Chronic multitasking, therefore, leads to a form of neural "de-evolution." That's not a good recipe for high productivity.

## Breaking the Cycle of Multitasking

Reducing multitasking means increasing effectiveness. Here is an example. After I asked her to limit her multitasking for a week, one finance executive I worked with reported the following:

*When I made a concerted effort not to do it, I was actually very effective. I finished quite a few tasks. I was able to better prioritize and minimize distractions. I was more focused. I didn't get overwhelmed with all the things I had to do and waste time just thinking about them in circles. I kept things in perspective. I stayed in the moment, and things that usually feel*

*insurmountable were actually manageable.*

After making a conscious effort to reduce multitasking, many people say both their productivity and their quality of work increase significantly. They report connecting more meaningfully with their colleagues and loved ones, and becoming better listeners all around. Becoming aware of the high costs of multitasking and gradually stepping away from the habit helps people to preserve attention, concentrate and be more productive. Multitasking is the opposite of concentrating. The good news is there are other ways to improve concentration as well.

## Concentration Meditation: Strengthening the Inner CEO

There are numerous methods for developing focused attention or concentration. Consider a tried-and-true way of developing attention: concentration meditation practice.<sup>23</sup> For many, meditation conjures up images of New Age incense and candles. However, for centuries, meditation served as the “basic training” of the fierce Japanese samurai warrior. Meditation gave the samurai an intense, unwavering focus to face a deadly enemy. Meditation can be useful for corporate warriors, too.

Plenty of scientific evidence proves concentration meditation practice is beneficial. Concentration meditation lowers blood pressure, helps the stressed body to relax, and decreases difficult emotions.<sup>24</sup> Brain research at Harvard Medical School found the prefrontal cortex in mindfulness meditators was significantly thicker than in nonmeditators. As people age, the prefrontal cortex thins out, but the study showed the cortex of older meditators was substantially

thicker than that of their nonmeditating counterparts.<sup>25</sup> A thicker cortex is thought to mean greater strength in attention.

Meditation strengthens the brain’s ability to focus and is the antidote to multitasking.<sup>26</sup>

## Attention, Mindfulness and Systematic Abandonment: Learning to See in Order to Change

Once attention is strengthened through developing concentration, it can be used as a tool for other tasks, such as bringing things into awareness. Mindfulness, introduced earlier, is a way of directing attention to become increasingly more aware of our emotions, beliefs and actions. Awareness leads to the possibility of choice. Choice gives us greater conscious influence over our subsequent actions. As I will demonstrate, directed attention is closely related to Drucker’s advocacy of systematic abandonment.

Drucker prescribed that organizations should regularly and dispassionately examine their habitual processes and even whole businesses to determine whether they are still effective, or even necessary. Nonperforming elements should be *systematically abandoned* to free up resources for new, more productive ventures.

The process of systematic abandonment holds true for the knowledge worker as well. Because much of the brain’s processing happens non-consciously, or outside of awareness, workers unknowingly cling to maladaptive habits. For example, a colleague of mine habitually makes wisecracks in meetings, which often offend people. When I gently mentioned this to

him, I found he had no idea how frequently he did it, even though he wisecracked nearly every day. Attention training expands the scope of what we notice. Again, attention powers awareness. Mindfully directing attention makes conscious the non-conscious, enabling us to “see” (perhaps for the first time) and make more conscious choices about the invisible, ineffective behaviors that need to be “systematically abandoned” to achieve greater productivity.

To understand why systematic abandonment is necessary, let’s explore the neurobiology behind how conscious actions and assumptions become non-conscious habits and beliefs. The neural root of the need for systematic abandonment lies in an old part of the brain called the basal ganglia. In the interest of efficiency and saving cognitive resources, the brain moves a repeated action or belief from the conscious control of the evolutionarily newer and more complex prefrontal cortex to the instinctual and much older basal ganglia.

This transfer to the basal ganglia makes conscious and intentional behavior gradually become non-conscious and automatic—a sort of behavioral default position. The newly formed habit becomes, literally, unthinking and non-adapting. Once a habitual action is triggered, it will play out rigidly, automatically, and often unknowingly. And, yes, frequently *unproductively*.

The basal ganglia’s habitual patterning reflex explains why people often fall into a routine of relying on yesterday’s successes to meet today’s conditions, showing why “old habits die hard.” These mindless habits are wired into the basal ganglia. Training and mindfully directing attention helps the worker to observe and shift out of default habitual thinking patterns and behaviors, creating the possibility for more productive effort.

## Neuroplasticity: Rewiring the Network

If the shift to the basal ganglia is one cause of “mindlessness,” the antidote lies in another well-established neural operation: neuroplasticity.<sup>27</sup> This term refers to the brain’s ability to rewire itself. Though scientists previously thought the brain did not change radically after adulthood, we now know this is untrue. Furthermore, not only is the brain capable of change, but the change can be intentionally self-directed—call it self-directed transformation. By altering their neural pathways, it is possible for people to radically alter how they engage with the world. The automatic operations of the basal ganglia are not permanent and can be undone through practice.

The kicker? Attention is thought to be what holds the neural circuitry in place. You get the brain you practice. If you direct attention to a new behavior by breaking the pattern of the old one, the old behavior will gradually dismantle. Neuroplasticity is the biological basis for personal transformation and greater productivity. This can be achieved through mindfulness practice.

## Mindfulness Means Directing Attention

The process of mindfulness is analogous to Drucker’s systematic abandonment. Mindfulness directs the attention flashlight inward and examines what’s working and what isn’t. By illuminating the inner black box, it creates the possibility of abandoning an unwanted behavior.

## Mindfulness and Adam Smith

Earlier in the chapter, I introduced the idea of mindfulness as a means of self-awareness, self-regulation, and self-transformation. You may be surprised to learn that no less a figure than the founding father of capitalism, Adam Smith, advocated cultivating *mindfulness*. Yes, Adam Smith.

In *The Theory of Moral Sentiments*, Smith counseled, “*We must become the impartial spectators of our own character and conduct.*”<sup>28</sup> The impartial spectator is the part of you that dispassionately observes your behavior. This is mindfulness, pure and simple.

A helpful metaphor: imagine the mind as a raging river. Normally, we’re caught in the river and taken for a wild ride by our thoughts and emotions. To take the perspective of the impartial spectator means to step out of the river and watch its flow from the shore. The shift in perceptual stance is critical, fostering the ability to watch our thoughts from an objective position. You are not your thoughts. Training his attention helps the knowledge worker to make a separation between what he thinks and feels and *how he acts*. To repeat, the impartial spectator creates the possibility of witnessing a thought or emotional reaction erupts inside without it translating into a destructive outward action. This distinction, as we shall see, provides a crucial pivot point for increasing the effectiveness of the knowledge worker.

If someone repeatedly recognizes an internal impulse, but does not act on it or suppress it, the neural connections between, say, a flash of anger and verbally lashing out gradually become disentangled. In time, the impulse to act no longer holds its gripping charge. The result: the knowledge worker’s earlier destructive reactivity is now converted into a considered response.

Productivity increases.

## Employing the Impartial Spectator

Smith’s impartial spectator turns out to be a powerful ally in responding to Drucker’s knowledge worker productivity challenge, so let’s take an in-depth look at how to employ this tool. First, I’ll explore workers’ mindsets, and second, I’ll look at their emotional reactivity.

## Mindsets for the Status Quo and Mindsets for Growth

Internal narratives are the ideas, stories, or explanations that we have about our experience, including the experience of ourselves. Taken as a whole, they form a mindset. Mindsets serve as an unconscious filter that predetermines what we see and how we see it. Think of a mindset as a meta-software program that runs underneath your conscious awareness but “preprograms” your perception and response.

The implications of a mindset for workplace productivity are readily apparent. A manager who automatically thinks about how new ventures could fail (and reflect poorly on him) and a counterpart who explores what the possibilities are for moving into an untapped market are two examples of how mindsets function at work. One mindset shuts down opportunity; the other creates it.

Luckily, the impartial spectator can help you uncover which mindsets are guiding your behavior and shift to a mindset for growth and productivity. But first, let’s take a closer look at these mindsets.

Stanford psychologist Carol Dweck, after 30 years of research, identified two forms of mindset: fixed and growth.<sup>29</sup> (Bear in mind that both forms of mindset can exist within the same person and can be activated depending on the circumstances.)

The fixed mindset is rigid and judgmental. It holds that people either are or are not born with talent. Subsequently, this mindset will go to great lengths to protect an ego identity that disallows admitting mistakes, since “mistakes = failure.” Perfection rules, and unfortunately, learning, risk-taking and adapting stop. In a networked knowledge work environment, improvement efforts are unconsciously blocked, and productivity suffers.

The growth mindset, in contrast, is flexible and generative. It views talent as something that can be grown with effort. Instead of trying to *impress*, this mindset will try to *improve*. The growth mindset is curious, and views mistakes not as a cause for condemnation, but as information—as an opportunity to learn and develop. In the collaborative world of knowledge work, such a mindset fertilizes new thought, encourages risk taking, and creates stronger bonds of connection among team members.

The growth mindset exemplifies Drucker’s notion of continual learning. By being curious and open to the world, this mindset allows people to take on a wider, empathic, and more hopeful view that rationally focuses on possibilities and opportunities. Such a mindset is essential in a knowledge work environment.

Mindfulness practice illuminates how these mindsets operate, enabling the worker to learn how to “switch tracks” from the rigid world of the fixed mindset to the open and receptive way of the growth mindset. Take the example of Jack, a banking executive who, after applying

mindfulness practice, had this self-observation:

*A fixed mindset definitely played a role in my reactivity, which was a problem for me at work. It caused me to make assumptions about a situation from a negative belief that I held about a coworker’s motives, and that belief was not based on any real information but derived purely from my own mindset. Had I been more curious, I could have asked, “What is causing him to respond in that way?” Instead of learning something useful about the situation, I reinforced my existing prejudices about the person and ended up in an argument with no better understanding of the situation.*

The fixed mindset does not learn. Instead, it seeks to support what it already knows. Furthermore, feelings of tension, threat, and fear often accompany the fixed mindset. A stance of defense or attack is by nature stressful and makes productive interaction difficult.

By contrast, a growth mindset approaches a situation with greater calm and openness. Listen to Shirley, an accounting executive, explain how she successfully employed the growth framework:

*In working with a client, I put myself in a more inquiring state of mind by asking questions from a growth and learning point of view instead of assuming this person was acting selfishly and egotistically. First, I sensed a calmer state of mind while I was in an inquiring mode. Consequently, it stemmed the urge to feel frustrated or indignant. In addition, I could see the other person, although at first defensive, could sense I really wanted to*

*understand his point of view. He gradually opened up to me with a more authentic and honest manner. We were able to come to common ground that we didn't know we had.*

By becoming mindful of both orientations, fixed and growth, a person becomes aware of her operative mindset and its ramifications. People are often astonished that a simple change in mindset can produce dramatically positive results. Consciously shifting to a growth orientation opens up unforeseen possibilities and solves problems. The alternative fixed position results in an ego-driven, intractable emotional battle about right and wrong that goes nowhere. Changing the mindset opens opportunities to improve productivity.

Now, let's move to the second application of Smith's impartial spectator—the area of reactive emotions.

## Being Mindful of Reactive Emotions

Reactive emotions happen automatically, without will or effort. They are nearly always motivated by self-defense or self-gratification—anger, fear, anxiety, lust, and desire are some examples. Reactive emotions generally do their jobs well, protecting us, feeding us, and so on. However, from time to time, these emotions hijack us and precipitate actions that lead to unwanted results.

Strong reactive emotions affect productivity because they shut down the brain's ability to be rational, objective, and adaptive. Reactive emotions distort perception, as the person interprets events to confirm, support, and maintain the emotional state. The brain of a knowledge

worker who is in the grip of a reactive emotion cannot accept information that challenges her thinking or emotional state.

The attention of the impartial spectator can be a powerful tool to catch the emotional reaction before it has a chance to lead to destructive behavior. Paul Ekman, the pioneering researcher agrees: "When we are being *attentive* . . . we are able to observe ourselves during an emotional episode. . . . We recognize that we are being emotional and can consider whether or not our response is justified. We can reevaluate, reappraise, and if that is not successful, then direct what we say and do. This occurs while we are experiencing the emotion, as soon as we have become conscious of our emotional feelings and actions."<sup>30</sup> Let's consider a practical example to observe how the mindful impartial spectator relates to emotional reactivity.

## The Case of the Anxious Engineer

I once worked with a respected and technically brilliant engineer who was affiliated with a large defense contractor. Call him Marv. Though he was very well liked, he was known to erupt verbally when he was presented with bad news. This reaction overwhelmed whoever delivered the news. To make matters worse, Marv's eruptions took place in meetings with his superiors, and they were negatively affecting his prospects for promotion. So, he sought my help.

Marv learned how to train his impartial spectator to become aware of how the verbal eruption actually worked. With some practice and observation, he realized his verbal explosion was actually the *result* of something else he hadn't noticed before. He perceived something new.

Preceding the eruption, Marv clearly

sensed a rush of energy in his chest that came out in the form of a panicked verbal reaction. Armed with this information, he could become mindful of the emergence of the energetic impulse. When he sensed an eruption was imminent, that was his signal to take a deep breath and pause for a moment. The impulse would rise, come to a peak, and then subside. With practice, he became increasingly able to catch the reaction before it erupted verbally. Marv used his attention to perceive the situation and make a different choice. That resulted in better relationships with his colleagues and higher productivity.

What Marv did was to use the principle of neuroplasticity to decouple the rush in his chest from verbal action. In time, by using his attention, he became better able to stop himself. He said he felt a sense of control and confidence that he had never experienced before. Without the weight of this debilitating reaction, he was freer to put his brilliant mind to work for the firm.

## Drucker, the Great Liberator

We have only scratched the surface of how self-management improves knowledge worker productivity. There is much more to explore. We have seen how enhanced perception (or attention) plays a pivotal role in the process, and we have discussed some basic ways in which perception can be trained to focus as well as manage the knowledge worker's mindset and emotional reactivity.

Peter Drucker was gifted with an exceptional perceptive power—a capacity to see what was already there, but remained largely invisible to most. The author of 39 books and numerous articles, a one-time apprentice in the cotton trade, journalist,

university professor, and sought-after consultant, Drucker was a highly productive knowledge worker. The issue of making other knowledge workers productive was a central concern of his work for almost 50 years.

In her work *The Definitive Drucker*, Elizabeth Haas Edersheim mentioned that a core characteristic of Peter's personality was his ability to liberate people.<sup>31</sup> By asking the right question, challenging a closely held assumption, and pushing person after person to see something that was previously unseen, he liberated them from their self-imposed boundaries. By shifting our perceptions ever so slightly, he revealed a new world full of possibilities. Because Drucker is no longer here to liberate us from our own limitations of thought, emotion, and action, we—guided by his work—must adopt new tools and learn to liberate ourselves.

This chapter was published in *The Drucker Difference: What the World's Greatest Management Thinker Means to Today's Business Leaders*, edited by Craig L. Pearce, Joseph A. Maciariello and Hideki Yamawaki and published by McGraw-Hill, 2009 in celebration of the Drucker Centennial.



## Authors' Biographies

**Jeremy P. Hunter, PhD**, has been affiliated with the Drucker School of Management at Claremont Graduate University in California since 1999. He teaches a series of popular executive education programs dedicated to managing oneself and transforming “the executive mind.” Hunter is committed to improving not only an executive's effectiveness and productivity, but also the quality of his or her professional and personal lives.

He co-founded the Quality of Life Research Center with Mihaly Csikszentmihalyi and Jeanne Nakamura. Currently, he is a principal at CoreWorks Consulting and is an Executive Coach at Corporate Coaching International. Hunter holds advanced degrees from The University of Chicago and Harvard University. He graduated Phi Beta Kappa from Wittenberg University.

Hunter lived with a potentially terminal illness for 17 years. When he was told he needed life-saving surgery, more than a dozen of his former students came forward as potential organ donors. He received a new kidney from one of them in December 2008.

**J. Scott Scherer** is a graduate of the Executive Management Program at The Drucker School and holds a degree in economics from Duke University. He is a principal at CoreWorks Consulting and serves as an executive coach. He received his training in Integral Coaching at New Ventures West in San Francisco.

For the past 20 years, Scherer has devoted his professional life to creating transformational learning experiences, pilgrimages and executive retreats. He co-founded and owns a global business, serving a wide variety of educational, religious and healthcare institutions. Scherer creates programs that transform individuals and communities by deepening self-knowledge and enhancing internal management skills

- <sup>1</sup> Peter F. Drucker, *Management Challenges for the 21<sup>st</sup> Century* (New York: Harper Collins, 1999), 157.
- <sup>2</sup> Thomas Davenport, *Thinking for a Living: How to Get Better Performance and Results from Knowledge Workers*. (Cambridge: Harvard Business School Press, 2005), 7.
- <sup>3</sup> Drucker, *Management Challenges*, 157.
- <sup>4</sup> Davenport, *Thinking*, 4.
- <sup>5</sup> [http://www.babsonknowledge.org/2005/12/was\\_drucker\\_wrong.htm](http://www.babsonknowledge.org/2005/12/was_drucker_wrong.htm), accessed April 1, 2009
- <sup>6</sup> Drucker, *Management Challenges*, 149.
- <sup>7</sup> Drucker, *Management Challenges*, 148.
- <sup>8</sup> Peter F. Drucker, *The Practice of Management* (New York: HarperCollins, 1993), 3.
- <sup>9</sup> Kirk Warren Brown, Richard M. Ryan, and J. David Creswell. "Mindfulness: Theoretical Foundations and Evidence for its Salutary Effects" *Psychological Inquiry* 18 no. 4 (2007): 211-237.
- <sup>10</sup> See the University of Massachusetts Center for Mindfulness in Medicine, Health Care and Society website at: [www.umassmed.edu/cfm/mbsr/](http://www.umassmed.edu/cfm/mbsr/)
- <sup>11</sup> Leonard L. Riskin, "The Contemplative Lawyer: On the Potential Contributions of Mindfulness Meditation to Law Students and Lawyers and their Clients," *Harvard Negotiation Law Review* 7, (2002): 1-66.
- <sup>12</sup> Phil Jackson, *Sacred Hoops: Spiritual Lessons from a Hardwood Warrior*. (New York: Hyperion Press, 1995).
- <sup>13</sup> Jeremy Hunter and Don McCormick, "Mindfulness in the Workplace: An Exploratory Study" Paper presented at the meeting of the 2008 *Academy of Management Annual Meeting*. Anaheim, CA.
- <sup>14</sup> Drucker, *Management Challenges*, 161.
- <sup>15</sup> (Not to mention put in place policies that support healthy brain activity, but that is not the scope of this chapter.)
- <sup>16</sup> William James. *Principles of Psychology v1*. (New York: Holt, 1890), 424.
- <sup>17</sup> Drucker, *The Essential Drucker*, 345.
- <sup>18</sup> Drucker, *The Essential Drucker*, 344.
- <sup>19</sup> Peter F. Drucker, *Innovation and Entrepreneurship*, (New York: Harper Perennial, 1985), 104.
- <sup>20</sup> Mihalyi Csikszentmihalyi, *Flow: The Psychology of Optimal Experience* (New York: HarperCollins, 1993).
- <sup>21</sup> Joshua S. Rubinstein, David E. Meyer and Jeffrey E. Evans, "Executive Control of Cognitive Processes in Task Switching," *Journal of Experimental Psychology - Human Perception and Performance*, 27. No. 4.
- <sup>22</sup> Karin Foerde, Barbara J. Knowlton, and Russell A. Poldrack "Modulation of Competing Memory Systems by Distraction" *Proceedings of the National Academy of Sciences* 103, no. 31 (2006).
- <sup>23</sup> Concentration meditation is one of the many varieties of meditation practice.
- <sup>24</sup> Herbert Benson and Miriam Klipper, *The Relaxation Response* (New York: HarperPaperback, 2000).
- <sup>25</sup> If you would like to see the data, go here: <https://nmr.mgh.harvard.edu/~lazar/>  
If you would like to read the paper, go here:  
[http://surfer.nmr.mgh.harvard.edu/pub/articles/Lazar\\_Meditation\\_Plasticity\\_05.pdf](http://surfer.nmr.mgh.harvard.edu/pub/articles/Lazar_Meditation_Plasticity_05.pdf)
- Sarah Lazar, et al, "Mediation Experience is Associated with Increased Cortical Thickness" *NeuroReport*, 16 (2005): 1893-1897.
- <sup>26</sup> If you would like to know more, I suggest the website of the Center For Contemplative Mind in Society ([www.contemplativemind.org](http://www.contemplativemind.org)). They have plenty of resources to help you.
- <sup>27</sup> The classic work on neuroplasticity is *The Mind and The Brain: Neuroplasticity and the Power of Mental Force* by UCLA professor Jeffrey Schwartz and Sharon Begley. (Harper Perennial, 2003)
- <sup>28</sup> [www.adamsmith.org/smith/tms/tms-p3-c2.htm](http://www.adamsmith.org/smith/tms/tms-p3-c2.htm)
- <sup>29</sup> Carol Dweck, *Mindset: The New Psychology of Success*. (New York: Ballantine Books, 2006).
- <sup>30</sup> Paul Ekman, *Emotions Revealed*. (New York: Owl Books, 2003),75.
- <sup>31</sup> Elizabeth Haas Edersheim, *The Definitive Drucker*. (New York: McGraw-Hill, 2007), 9-10.



Published in final edited form as:

*Rheum Dis Clin North Am.* 2011 February ; 37(1): 63–75. doi:10.1016/j.rdc.2010.11.010.

## Mindfulness Meditation: A Primer for Rheumatologists

**Laura A. Young, M.D., Ph.D.[Assistant Professor of Medicine]**

Division of Endocrinology Department of Internal Medicine University of North Carolina School of Medicine

### Keywords

fibromyalgia; rheumatoid arthritis; osteoarthritis; mindfulness meditation; Mindfulness Based Stress Reduction (MBSR); stress

### Introduction

Meditation, with its origins rooted in ancient religious and spiritual practices dating back over 2,500 years ago, has only in the past several decades begun to capture the attention of mainstream Western researchers and healthcare providers who are gradually beginning to value this mind-body practice as a tool to foster improved physiological and psychological health [1]. In the current medical environment, it is not uncommon for patients to report the use of mind-body therapies as an adjunct to Western medical treatment[2]. Over the past decade there has been increasing interest in meditation as a mind-body approach, in mindfulness meditation, given its potential to alleviate emotional distress and promote improved well-being in a variety of populations[3-5]. The overall purpose of this review is to provide the practicing rheumatologist with an overview of mindfulness and how it can be applied to Western medical treatment plans to enhance both the medical and psychological care of patients.

### What is Mindfulness?

The word mindfulness is derived from the Pali word *sati*, meaning “to remember”, with secondary meanings of “attention” and “awareness”. Remembering refers to reconnecting to the immediate moment of experience, not the recollection of a past event. A contemporary definition of mindfulness offered by Kabat-Zinn, states that mindfulness is the awareness that emerges through, “paying attention on purpose, in the present moment, and non-judgmentally, to the unfolding of experience moment to moment”[6]. Similar descriptions are offered by other leaders in the field including: “mindfulness is the nonjudgmental observation of the ongoing stream of internal and external stimuli as they arise”; and “a receptive attention to and awareness of present events and experience”[7,8]. Notably, two concepts pervade these descriptions of mindfulness: 1) holding one’s attention in the present moment; and 2) maintaining an attitude of acceptance, openness, and non-judgment [9]. The

© 2010 Elsevier Inc. All rights reserved.

Corresponding author: Laura A. Young, MD, PhD Assistant Professor of Medicine Division of Endocrinology University of North Carolina 8023 Burnett Womack Building Campus Box # 7170 UNC-CH Chapel Hill, NC 27599-7170 Phone: (919) 966-3465 office phone Fax: (919) 966-6025 Laura\_Young@med.unc.edu.

**Publisher's Disclaimer:** This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

validity of this two component model has been debated; however, it still remains a useful, widely accepted definition[10,11].

Mindfulness meditation (process) is a mental technique which is used to strengthen the capacity to establish and sustain mindful awareness (outcome) [12]. The practice of mindful meditation cultivates attentional focus and stability by directing the mind to remain connected to the present moment experience. Attention is usually sustained by concentrating on the breath [6]. Participants are instructed to follow the flowing cycle of breathing with their full attention. Depending upon the exercise, the focus of attention can vary and may include sensations in the body during rest or movement, a sound, or a visual focus like a candle flame or an image. Although the object of focus varies, in all instances the goal of the practice is to train attention to remain fully engaged with the experience and remain in the present moment. While this may seem simple; after attempting to keep attention focused for only a few moments, it is natural for novices to relate difficulty maintaining focus on the present moment. Without training attention drifts and becomes lost in memories of the past and thoughts of the future. With practice over time, remaining in the present becomes easier and is more likely to occur spontaneously. Meditation is simply a tool to assist in the acquisition of an awareness which is broad, balanced, present-focused, and behaviorally neutral.

### **Health Benefits Linked to Mindfulness Practice**

A relatively wide collection of studies, of varying quality, in healthy subjects have linked mindfulness training to improvements in stress, anxiety, and depressed mood [13-16]. Mindfulness is also effective at decreasing stress and promoting positive mood states in patients with a variety of chronic health conditions [17-28]. Studies examining the effects of mindfulness training on traditional Western medicine outcomes, including morbidity and mortality, are beginning to emerge [28]. Data from the field of psychiatry and mental health shows that mindfulness interventions can be efficacious in the treatment of mood disorders [5,7,29]. Furthermore, accumulating data supports the notion that mindfulness meditation may ameliorate physiological changes that accompany chronic mental and emotional stress, including improved cortisol secretion profiles and beneficial anatomic changes in the brain [30,31]. While these early findings are encouraging, clearly additional work examining psychological and physiological changes that occur during and following mindfulness meditation training to further examine the health benefits are necessary.

### **Proposed Mechanisms of Action**

Given the significant salutary effects of mindfulness training, the question remains, “what mechanisms are mediating these outcomes?” [5,7,31]. The mechanisms through which mindfulness decreases stress and increases well-being are not well understood; however a variety of proposed mechanisms of action abound in the literature. We will briefly review several of the more prominent theories. One popular hypothesis is that the cultivation of mindfulness facilitates a fundamental shift in perspective, termed reperceiving [11]. Similar to decentering, reperceiving refers to observing one’s thoughts and feelings as temporary, emotion-neutral events occurring in the mind which do not require judgment. Shapiro theorized that reperceiving leads to greater clarity, objectivity, and equanimity, and facilitates improved self-regulation, values clarification, cognitive and emotional flexibility. Empiric testing of this theory however suggests that reperceiving and mindfulness are in fact overlapping constructs and there is little support that reperceiving alone mediates improvements in psychological outcome variables [32]. Others speculate that it is the development of mindful awareness that mediates improved psychological outcomes [33]. In a group of novices, there was a positive relationship between the time practicing meditation

and 1) the tendency to be mindful in daily life; 2) psychological improvements. Increased mindfulness in turn mediated the relationship between time spent meditating and reductions in stress and improvements in psychological functioning [34]. Additional work supporting this concept showed that long-term meditation practice is associated with being able to describe one's internal experiences with words and to be nonjudgmental and non-reactive toward them [35]. Furthermore, these key constructs of mindfulness were found to mediate the relationship between meditation experience (measured in months) and well-being in experienced meditators. These findings support the notion that mindfulness is cultivated through meditation and may mediate the relationship between meditation practice and improved mental health.

Experimentally, changes in the ability to direct and manage attention have been demonstrated after only five days of mindfulness meditation training as well as after longer periods of training [36,37], however what is the therapeutic value of maintaining a present-focused attention that is non-judgmental and non-reactive? Self-focused attention, in the form of rumination, is linked to a variety of psychological maladies and poor outcomes. Rumination is the mental propensity to repetitively think about situations, thoughts, feelings or emotions which are typically of a negative nature. It has been theorized that the self-focused nature of the rumination is not harmful; rather it is how one processes these thoughts that predicts maladaptive outcomes. Sustaining a mindful self-focus that encourages a non-judgmental, non-reactive awareness of the present moment, even in subjects prone to rumination, promotes a mode of self-thought processing that is more adaptive [38,39]. Additional benefits of self-focused attention have been theorized including increased mental flexibility, improved self-regulation, decreased emotional reactivity, and reduced avoidance [24,40-42]. For a more in depth consideration of these issues, readers are directed to Baer's thoughtful review [43].

## Common Methods Used to Teach Mindfulness

In this section we will briefly review the most common mindfulness approaches utilized by patients. The intent is to enable the practicing rheumatologist to make more informed recommendations to patients interested in incorporating mindfulness into their treatment plans. The completely secular nature these approaches accommodates a wide audience. These interventions follow in the footsteps of earlier psychological approaches, including behavioral therapy and cognitive behavioral therapy (CBT). In stark contrast to CBT, where the emphasis is on the use of cognitive restructuring of beliefs that mediate negative affect, the so called "third wave" therapies promote the creation of a constructive relationship with disturbing emotions, which ultimately promotes acceptance[44].

### Mindfulness Based Stress Reduction (MBSR)

Likely the most well-known and popular program designed to train participants in mindfulness, is the Mindfulness-Based Stress Reduction (MBSR) program, developed in the 1970's by Jon Kabat-Zinn at the University of Massachusetts [24]. Initially developed as a behavioral intervention for patients with chronic pain and stress-related conditions, MBSR has expanded globally and can now be found in a variety of health care and community settings and in over 400 hospital and medical school settings in the United States [21]. MBSR is a standardized program conducted as an 8-week class with weekly sessions typically lasting 2.5 to 3 hours. During the training participants practice: 1) sitting meditation using the breath as an anchor; 2) contemplative walking; 3) mindful movement through the use of gentle Hatha type yoga postures; and 4) the body scan in which participants practice attention control by systematically focusing on the sensations in various parts of the body. Near the end of the 8-week training program application of mindful awareness to daily activities, often referred to as "informal mindfulness practice," is

encouraged. Mindfulness activities are practiced both in class and as homework. Audio recordings are provided to support home practice. Participants are expected to complete approximately 45 minutes of formal mindfulness practice at least 6 days per week during the eight week period. During an all day retreat near the end of the training, participants remain in silence and have the opportunity to practice their newly acquired mindfulness skills during a sustained and uninterrupted period of time. An essential component of the weekly classes includes discussion about the experiences that occur during the practice of mindfulness both in and out of the classroom. The impact of teacher experience, frequency of weekly session attendance, duration of home practice and frequency of home practice likely affects the degree of symptomatic improvement reported by participants, but results have been mixed [18,19,45-49]. Patients can be referred to the Center for Mindfulness in Medicine, Healthcare, and Society at the University of Massachusetts for a listing of teachers who have completed standardized MBSR training (<http://www.umassmed.edu/cfm/stress/index.aspx>).

### **Mindfulness Based Cognitive Therapy (MBCT)**

Largely based on the concepts of mindfulness derived from MBSR, the focus of MBCT is on the treatment of depression rather than stress [50]. Specifically designed for use in the prevention of depression relapse, its theoretical foundation rests upon research showing that those individuals most vulnerable to depression relapse are those who have mood-related reactivation of negative thinking patterns and inappropriate responses to negative thoughts and emotions [51-53]. A combination of mindfulness training and cognitive therapy are utilized to cultivate a de-centered approach to internal experience. Unlike traditional CBT exercises that attempt to change thoughts, in MBCT the focus is on acceptance rather than change. Since this is a relatively new intervention there is currently no network of qualified providers. Creators of the intervention recommend using their book, *The Mindful Way Through Depression*, and/or working with a teacher or therapist who incorporates MBSR or other mindfulness practices into their work for those interested in this approach [54].

### **Dialectical Behavior Therapy (DBT)**

Originally developed through insight gained while working with patients who had suicidal ideation and borderline personality disorder, this treatment program is a modified CBT program, drawing from principals in behavioral science, dialectical philosophy and Zen meditation practice [55]. Therapists and clients work to balance change with acceptance. Traditional cognitive behavioral therapy helps the participant change inappropriate behaviors, thoughts and emotions, while mindfulness training helps to facilitate acceptance and change. Participants are asked to make a one year commitment to the therapy. There are several components to DBT therapy including individual psychotherapy, group skills training, and telephone consultations between sessions. Readers are referred to the DBT training manual for a more in depth review [40].

## **Clinical Applications of Mindfulness Specific to the Practicing Rheumatologist**

While there is a growing body of evidence supporting the use of mindfulness training as an adjunct to conventional therapy for a variety of medical and psychological conditions, studies specifically examining this intervention in patients with rheumatologic conditions are limited. The discussion below highlights several clinical concerns that are frequently encountered by the practicing rheumatologist in which the mindfulness training may be beneficial.

## Chronic Pain

Collectively, rheumatologic diseases have been classified to be the most prominent cause of chronic pain in the developed world [56,57]. Chronic pain is often associated with a multitude of challenges not only for the patient, but also the cadre of family, friends, and healthcare providers caring for them. Uncontrolled chronic pain can lead to poorer quality of life, disability, and psychosocial problems in patients with rheumatologic conditions[58]. While most health care providers are aware of the role the mind-body connection has in partially mediating chronic pain symptoms, many feel under-prepared and/or unqualified to make recommendations for therapeutic interventions intended to target this important, symptom modifying axis [59,60]. Despite the fact that a wide range of mind-body therapies have been shown to be effective for the treatment of chronic pain and the inclusion of these interventions into comprehensive treatment plans has been recommended by consensus panels, only 20% of patients with chronic pain report the use of such adjunctive therapies [61,62].

Cognitive behavioral therapy (CBT) is a widely utilized and accepted mind-body approach which utilizes cognitive restructuring to modify maladaptive thoughts and behaviors related to pain; however the overall reported effects sizes for CBT are generally small in patients with chronic pain [63,64]. Eliminating maladaptive thoughts may not be a realistic strategy in patients with rheumatologic conditions who suffer from chronic pain since most face continual daily reminders of their chronic medical problems. A more realistic approach may be the promotion of acceptance. Mindfulness-based approaches to pain management encourage participants to alter their relationships and reflexive, behavioral responses to these maladaptive thoughts through non-judgmental acceptance. Pain acceptance has been described as “a willingness to experience continuing pain without needing to reduce, avoid, or otherwise change it” [65]. Experienced mindfulness practitioners demonstrate reduced anticipation and negative appraisal of pain under experimental conditions [66]. Higher degrees of mindfulness in patients with chronic pain are related to lower self-reported pain, emotional distress, disability, and utilization of pain medication [67]. Lower degrees of mindfulness are related to greater distorted thinking about pain, specifically pain catastrophizing, characterized by rumination about pain, feelings of hopelessness, and exaggeration of pain-related symptoms [68].

Training in mindfulness, particularly through the use of MBSR, has been shown to be effective for the treatment of chronic pain originating from a variety of causes, although not all studies have shown positive results related to pain reduction [21-26]. A recent uncontrolled, observational study suggests that of participants enrolled in a community based MBSR training program who reported chronic pain, exhibit improvements in pain scores following completion of the course [49]. Participants with chronic neck/back pain and arthritis were most likely to have significant improvements in pain following the MBSR training, while those with fibromyalgia and chronic headache did not have significant improvement in self-reported pain, suggesting a potential role in certain patients with rheumatologic disease.

Some of the highest quality evaluations of mindfulness interventions in chronic pain have been in patients with rheumatoid arthritis, osteoarthritis, and fibromyalgia. After 8 weeks of training, self reported pain significantly improved in 144 participants with rheumatoid arthritis regardless of intervention (CBT vs. mindfulness training vs. disease education), although greater effects were seen with CBT and education compared to mindfulness training [69]. Mindfulness training did not positively impact subjects' perceived control over their pain, while CBT and education did show beneficial effects. The relative value of the treatments in patients with RA varied based upon depression history. Those with a history of

2 or more episodes of depression who completed mindfulness training were more likely to show improvements in pain coping self-efficacy, pain catastrophizing, and physician assessed joint tenderness and joint swelling. The data supporting the use of mindfulness in patients with pain due to osteoarthritis is less compelling. In two different heterogeneous groups of older adults with chronic low back pain, in which a large proportion of the participants attributed the cause of their pain to osteoarthritis, MBSR subjects report of pain was not significantly different from those in the wait-list control or educational control conditions [70,71]. Chronic pain self-efficacy and disability scores improved in both the mindfulness and educational control groups [71]. In the first randomized controlled trial of a mindfulness based intervention for women with fibromyalgia, significant improvements in pain were noted for those in the mindfulness group compared to the waitlist control condition [72]. Similar findings were noted in 58 women with fibromyalgia participating in a quasi-randomized trial. Self-reported pain scores, pain perception, and the ability to cope with pain improved following an 8-week MBSR training compared to the support control group immediately following the intervention. Improvements were maintained over a 3 year follow-up time period [73]. In contrast, Astin showed similar improvements in pain in subjects with fibromyalgia completing a mindfulness based movement class compared to those in an educational control group [74]. While no conclusive recommendations can be made regarding the use of mindfulness interventions as an adjunctive means to control pain in patients with rheumatologic conditions, these initial findings suggest mindfulness training does not cause harm.

## Mental Health

The benefits of mindfulness training particularly on depression and anxiety have been repeatedly shown in a variety of populations, including in those with chronic medical conditions [5,75-78]. As discussed above, a more mindful awareness might buffer against the harmful influence of perceived stress on psychological well-being, particularly in people who are susceptible to poor psychological functioning. Similar to other populations, improvements in mood have been shown to occur following mindfulness training in patients with rheumatologic conditions. In patients with rheumatoid arthritis, immediately following MBSR training, there were no notable improvements in psychological distress or depressive affect; however, 4 months following the intervention, improvements in psychological distress, but not depression, were noted [46]. In a second study of patients with rheumatoid arthritis, positive affect improved for both those receiving CBT and mindfulness, but the greatest improvements in both negative and positive affect were seen in those with a history of 2 or more episodes of depression, suggesting that those with recurrent depression were most responsive to the mindfulness intervention [79]. Modest improvements in psychological distress have been shown following completion of mindfulness training in patients with fibromyalgia compared to controls [72]. In a group of 91 women with fibromyalgia, Sephton showed specific improvements in depression in those who had mindfulness training compared to controls [80]. Furthermore, mindfulness training in women with fibromyalgia has been shown to improve patients' sense of optimism and control over their life, which was related to lower depressive symptoms [81]. Mindfulness, combined with a movement intervention was shown to be as efficacious as an educational control group at improving symptoms of depression in subjects with fibromyalgia [74]. Observational data evaluating changes in depression and anxiety before and after MBSR training suggest that patients with fibromyalgia had small non-significant changes in psychological distress, while patients with arthritis had the largest improvements in psychological distress when compared with patients with a other types of chronic pain [49]. Based upon the data, a significant amount of work still needs to be done to evaluate the impact of mindfulness training on mental health in patients with rheumatologic conditions. Given the high rates of clinically significant depression in patients with rheumatologic



disease, MBCT is a particularly appealing mindfulness approach for the rheumatologist given MBCT's proven track record for depression relapse prevention. MBCT has yet to be formally evaluated in a cohort with a specific rheumatologic disease. One word of caution to practitioners who may want to suggest mindfulness training as an adjunctive approach to a multidisciplinary care plan is that mindfulness interventions may not be appropriate for people who are actively suffering from acute clinical depression. It has been theorized that intensity of negative thoughts, poor concentration and restlessness that often accompany an episode of acute depression might make meaningful participation in mindfulness exercises difficult and uncomfortable. Developing the necessary attentional control skills may be difficult during a major depressive episode, although this long held belief has recently been challenged [82,83].

## Immune function

Accumulating data suggests training in mindfulness meditation may also support improved physiological functioning. While the exact mechanisms remain unknown, it is hypothesized that mindfulness meditation may exert its favorable effects through a variety of pathways including decreased sympathetic activation and improved neuro-endocrine function, two pathways intimately coupled to immune function [84]. In a landmark study, Davison demonstrated that training in mindfulness meditation enhanced antibody production following the influenza vaccination in healthy adults [47]. Extending this work into conditions where immune dysfunction plays an important role, including cancer and HIV infection, has also yielded promising results. In patients with breast and prostate cancer, a shift away from a pro-inflammatory response, to a more anti-inflammatory response, following MBSR participation has been observed [17,18]. This shift away from a pro-inflammatory state was maintained at the 1 year follow-up time point in this cohort of breast and prostate cancer subjects as evidenced by a continued decrease in Th1 cytokine production [85]. In HIV positive individuals, notable increases in NK cell activity from baseline were noted following MBSR training [86]. In women with early stage breast cancer not undergoing chemotherapy, those who underwent MBSR training displayed a restoration of natural killer cell activity and improvement in cytokine profiles, while those in the control group continued to show immune function abnormalities [87]. The authors speculate that this favorable shift in immune function may be related to lower cortisol secretion in the MBSR group compared to the non-MBSR group. The relationship between improved psychological well-being and improved immune function is less clear, with some studies showing a positive relationship between the two and others showing no association [17,86,88]. While these findings are interesting, they are also preliminary, and require confirmation in larger populations. To date, little work has been done on the impact of mindfulness training in patients with rheumatoid arthritis or other rheumatologic conditions, and thus far, mindfulness training has not been shown to have a beneficial effect. Mindfulness training has not been shown to impact disease activity assessed using the Disease Activity Score (DAS) in 28 joints, which includes a measure of the erythrocyte sedimentation rate, or IL-6 concentrations [46,79].

## Conclusion

Although historically mindfulness meditation is ancient, as described in this review, research in the field is in its early stages though, rapidly expanding in both quality and quantity. This is may be, in part, a response to a controversial AHRQ review that called into question the efficacy of meditation for improving health which cited the rigor of the current studies of meditation as generally poor [89]. None-the-less, it is clear that for many, mindfulness training can have powerful psychological and possibly physiological effects. Many questions remain unanswered and further investigation is warranted. Studies of mindfulness

do demonstrate that training leads to improved quality of life, including in patients with rheumatologic disease. Taking into consideration that decreased quality of life is common among people with chronic disease and given the generally benign nature of this behavioral intervention, it is perhaps surprising that it is not recommended more often by health care providers in all fields. The clinical importance of improved quality of life as a predictor of morbidity and mortality is debated, but it is difficult to not argue that part of our role as clinicians should be to encourage patients to optimally enjoy life despite chronic medical conditions. We are quickly learning through the power of biomedical research what other cultures have recognized for thousands of years: mindfulness meditation is a powerful tool that can foster improved coping and growth. There is a great deal more that we need to learn, but it seems certain that mindfulness-based interventions have a future in both Western medicine and society.

## Acknowledgments

This work was supported by Grant No. 5K23AT004946-02 from the National Institutes of Health.

## References

1. Ludwig DS, Kabat-Zinn J. Mindfulness in medicine. *JAMA* 2008;300(11):1350–2. [PubMed: 18799450]
2. Barnes PM, Bloom B, Nahin RL. Complementary and alternative medicine use among adults and children: United States, 2007. *Natl Health Stat Report* 2008;(12):1–23. (12). [PubMed: 19361005]
3. Reibel DK, Greeson JM, Brainard GC, et al. Mindfulness-based stress reduction and health-related quality of life in a heterogeneous patient population. *Gen Hosp Psychiatry* 2001;23(4):183–92. [PubMed: 11543844]
4. Chiesa A, Serretti A. Mindfulness-based stress reduction for stress management in healthy people: a review and meta-analysis. *J Altern Complement Med* 2009;15(5):593–600. [PubMed: 19432513]
5. Grossman P, Niemann L, Schmidt S, et al. Mindfulness-based stress reduction and health benefits. A meta-analysis. *J Psychosom Res* 2004;57(1):35–43. [PubMed: 15256293]
6. Kabat-Zinn, J. *Full Catastrophe Living: Using the Wisdom of Your Body and Mind to Face Stress, Pain, and Illness*. 15th Anniversary Ed. Delta Trade Paperback/Bantam Dell; New York, NY US: 2005.
7. Baer RA. Mindfulness training as a clinical intervention: A conceptual and empirical review. *Clinical Psychology: Science and Practice* 2003;10(2):125–43.
8. Brown KW, Ryan RM. The benefits of being present: mindfulness and its role in psychological well-being. *J Pers Soc Psychol* 2003;84(4):822–48. [PubMed: 12703651]
9. Bishop SR, Lau M, Shapiro S, et al. Mindfulness: A proposed operational definition. *Clinical Psychology: Science and Practice* 2004;11(3):230–41.
10. Hayes, SC.; Strosahl, KD.; Wilson, KG. *Acceptance and Commitment Therapy: An Experiential Approach to Behavior Change*. Guilford Press; New York, NY US: 1999.
11. Shapiro SL, Carlson LE, Astin JA, et al. Mechanisms of mindfulness. *J Clin Psychol* 2006;62(3):373–86. [PubMed: 16385481]
12. Shapiro, SL.; Carlson, LE. *The Art and Science of Mindfulness: Integrating Mindfulness into Psychology and the Helping Professions*. American Psychological Association; Washington, DC US: 2009.
13. Astin JA. Stress reduction through mindfulness meditation: Effects on psychological symptomatology, sense of control, and spiritual experiences. *Psychother Psychosom* 1997;66(2):97–106. [PubMed: 9097338]
14. Jain S, Shapiro SL, Swanick S, et al. A Randomized Controlled Trial of Mindfulness Meditation Versus Relaxation Training: Effects on Distress, Positive States of Mind, Rumination, and Distraction. *Annals of Behavioral Medicine* 2007;33(1):11–21. [PubMed: 17291166]

15. Klatt MD, Buckworth J, Malarkey WB. Effects of low-dose mindfulness-based stress reduction (MBSR-ld) on working adults. *Health Education & Behavior* 2009;36(3):601–14. [PubMed: 18469160]
16. Shapiro SL, Schwartz GE, Bonner G. Effects of mindfulness-based stress reduction on medical and premedical students. *J Behav Med* 1998;21(6):581–99. [PubMed: 9891256]
17. Carlson LE, Speca M, Patel KD, et al. Mindfulness-based stress reduction in relation to quality of life, mood, symptoms of stress, and immune parameters in breast and prostate cancer outpatients. *Psychosom Med* 2003;65(4):571–81. [PubMed: 12883107]
18. Carlson LE, Speca M, Patel KD, et al. Mindfulness-based stress reduction in relation to quality of life, mood, symptoms of stress and levels of cortisol, dehydroepiandrosterone sulfate (DHEAS) and melatonin in breast and prostate cancer outpatients. *Psychoneuroendocrinology* 2004;29(4):448–74. [PubMed: 14749092]
19. Shapiro SL, Bootzin RR, Figueredo AJ, et al. The efficacy of mindfulness-based stress reduction in the treatment of sleep disturbance in women with breast cancer: an exploratory study. *J Psychosom Res* 2003;54(1):85–91. [PubMed: 12505559]
20. Ledesma D, Kumano H. Mindfulness-based stress reduction and cancer: A meta-analysis. *Psychooncology* 2009;18(6):571–9. [PubMed: 19023879]
21. Kabat-Zinn J, Lipworth L, Burney R. The clinical use of mindfulness meditation for the self-regulation of chronic pain. *J Behav Med* 1985;8(2):163–90. [PubMed: 3897551]
22. Plews-Ogan M, Owens JE, Goodman M, et al. A pilot study evaluating mindfulness-based stress reduction and massage for the management of chronic pain. *J Gen Intern Med* 2005;20(12):1136–8. [PubMed: 16423104]
23. Teixeira ME. Meditation as an intervention for chronic pain: an integrative review. *Holist Nurs Pract* 2008;22(4):225–34. [PubMed: 18607236]
24. Kabat-Zinn J. An outpatient program in behavioral medicine for chronic pain patients based on the practice of mindfulness meditation: theoretical considerations and preliminary results. *Gen Hosp Psychiatry* 1982;4(1):33–47. [PubMed: 7042457]
25. Gregg JA, Callaghan GM, Hayes SC, et al. Improving diabetes self-management through acceptance, mindfulness, and values: a randomized controlled trial. *J Consult Clin Psychol* 2007;75(2):336–43. [PubMed: 17469891]
26. Rosenzweig S, Reibel DK, Greeson JM, et al. Mindfulness-based stress reduction is associated with improved glycemic control in type 2 diabetes mellitus: a pilot study. *Altern Ther Health Med* 2007;13(5):36–8. [PubMed: 17900040]
27. Kreitzer MJ, Gross CR, Ye X, et al. Longitudinal impact of mindfulness meditation on illness burden in solid-organ transplant recipients. *Prog Transplant* 2005;15(2):166–72. [PubMed: 16013466]
28. Sullivan MJ, Wood L, Terry J, et al. The Support, Education, and Research in Chronic Heart Failure Study (SEARCH): a mindfulness-based psychoeducational intervention improves depression and clinical symptoms in patients with chronic heart failure. *Am Heart J* 2009;157(1):84–90. [PubMed: 19081401]
29. Bohlmeijer E, Prenger R, Taal E, et al. The effects of mindfulness-based stress reduction therapy on mental health of adults with a chronic medical disease: a meta-analysis. *J Psychosom Res* 2010;68(6):539–44. [PubMed: 20488270]
30. Matousek RH, Dobkin PL, Pruessner J. Cortisol as a marker for improvement in mindfulness-based stress reduction. *Complement Ther Clin Pract* 2010;16(1):13–9. [PubMed: 20129404]
31. Chiesa A, Serretti A. A systematic review of neurobiological and clinical features of mindfulness meditations. *Psychol Med* 2010;40(8):1239–52. [PubMed: 19941676]
32. Carmody J, Baer RA, Lykins ELB, et al. An empirical study of the mechanisms of mindfulness in a mindfulness-based stress reduction program. *J Clin Psychol* 2009;65(6):613–26. [PubMed: 19267330]
33. Baer RA, Smith GT, Hopkins J, et al. Using self-report assessment methods to explore facets of mindfulness. *Assessment* 2006;13(1):27–45. [PubMed: 16443717]

34. Carmody J, Baer RA. Relationships between mindfulness practice and levels of mindfulness, medical and psychological symptoms and well-being in a mindfulness-based stress reduction program. *J Behav Med* 2008;31(1):23–33. [PubMed: 17899351]
35. Baer RA, Smith GT, Lykins E, et al. Construct validity of the five facet mindfulness questionnaire in meditating and nonmeditating samples. *Assessment* 2008;15(3):329–42. [PubMed: 18310597]
36. Jha AP, Krompinger J, Baime MJ. Mindfulness training modifies subsystems of attention. *Cogn Affect Behav Neurosci* 2007;7(2):109–19. [PubMed: 17672382]
37. Tang YY, Ma Y, Wang J, et al. Short-term meditation training improves attention and self-regulation. *Proc Natl Acad Sci U S A* 2007;104(43):17152–6. [PubMed: 17940025]
38. Sanders WA, Lam DH. Ruminative and mindful self-focused processing modes and their impact on problem solving in dysphoric individuals. *Behav Res Ther* 2010;48(8):747–53. [PubMed: 20494334]
39. Watkins E, Teasdale JD. Adaptive and maladaptive self-focus in depression. *J Affect Disord* 2004;82(1):1–8. [PubMed: 15465571]
40. Linehan, MM. *Skills Training Manual for Treating Borderline Personality Disorder*. Guilford Press; New York, NY US: 1993.
41. Moore A, Malinowski P. Meditation, mindfulness and cognitive flexibility. *Conscious Cogn* 2009;18(1):176–86. [PubMed: 19181542]
42. Hayes SC, Luoma JB, Bond FW, et al. Acceptance and commitment therapy: model, processes and outcomes. *Behav Res Ther* 2006;44(1):1–25. [PubMed: 16300724]
43. Baer RA. Self-Focused Attention and Mechanisms of Change in Mindfulness-Based Treatment. *Cogn Behav Ther* 2009;1. [PubMed: 19697176]
44. Hayes SC. Acceptance and commitment therapy, relational frame theory, and the third wave of behavioral and cognitive therapies. *Behavior Therapy* 2004;35(4):639–65.
45. Carmody J, Baer RA. How long does a mindfulness-based stress reduction program need to be? A review of class contact hours and effect sizes for psychological distress. *J Clin Psychol* 2009;65(6):627–38. [PubMed: 19309694]
46. Pradhan EK, Baumgarten M, Langenberg P, et al. Effect of Mindfulness-Based Stress Reduction in rheumatoid arthritis patients. *Arthritis Rheum* 2007;57(7):1134–42. [PubMed: 17907231]
47. Davidson RJ, Kabat-Zinn J, Schumacher J, et al. Alterations in brain and immune function produced by mindfulness meditation. *Psychosom Med* 2003;65(4):564–70. [PubMed: 12883106]
48. Gross CR, Kreitzer MJ, Russas V, et al. Mindfulness meditation to reduce symptoms after organ transplant: a pilot study. *Adv Mind Body Med* 2004;20(2):20–9. [PubMed: 15356953]
49. Rosenzweig S, Greeson JM, Reibel DK, et al. Mindfulness-based stress reduction for chronic pain conditions: variation in treatment outcomes and role of home meditation practice. *J Psychosom Res* 2010;68(1):29–36. [PubMed: 20004298]
50. Segal, ZV.; Williams, JM.; Teasdale, JD. *Mindfulness-Based Cognitive Therapy for Depression: A New Approach to Preventing Relapse*. Guilford Press; New York, NY US: 2002.
51. Teasdale JD, Moore RG, Hayhurst H, et al. Metacognitive awareness and prevention of relapse in depression: Empirical evidence. *J Consult Clin Psychol* 2002;70(2):275–87. [PubMed: 11952186]
52. Teasdale JD. Cognitive vulnerability to persistent depression. *Cognition and Emotion* 1988;2(3): 247–74.
53. Persons JB, Miranda J. Cognitive theories of vulnerability to depression: Reconciling negative evidence. *Cognitive Therapy and Research* 1992;16(4):485–502.
54. Williams, M.; Teasdale, J.; Segal, Z., et al. *The Mindful Way through Depression: Freeing Yourself from Chronic Unhappiness*. Guilford Press; New York, NY US: 2007.
55. Linehan MM, Armstrong HE, Suarez A, et al. Cognitive-behavioral treatment of chronically parasuicidal borderline patients. *Arch Gen Psychiatry* 1991;48(12):1060–4. [PubMed: 1845222]
56. Fitzcharles MA, Shir Y. New concepts in rheumatic pain. *Rheum Dis Clin North Am* 2008;34(2): 267–83. [PubMed: 18638677]
57. Montecucco C, Cavagna L, Caporali R. Pain and rheumatology: An overview of the problem. *European Journal of Pain Supplements* 2009;3(2):105–9.

58. Reginster JY, Khaltav NG. Introduction and WHO perspective on the global burden of musculoskeletal conditions. *Rheumatology (Oxford)* 2002;41(Supp 1):1–2. [PubMed: 12173275]
59. Fitzcharles MA, Almahrezi A, Shir Y. Pain: understanding and challenges for the rheumatologist. *Arthritis Rheum* 2005;52(12):3685–92. [PubMed: 16329076]
60. Borenstein D. The role of the rheumatologist in managing pain therapy. *Nat Rev Rheumatol* 2010;6(4):227–31. [PubMed: 20357792]
61. Integration of behavioral and relaxation approaches into the treatment of chronic pain and insomnia. NIH Technology Assessment Panel on Integration of Behavioral and Relaxation Approaches into the Treatment of Chronic Pain and Insomnia. *JAMA* 1996;276(4):313–8. [PubMed: 8656544]
62. Wolsko PM, Eisenberg DM, Davis RB, et al. Use of mind-body medical therapies. *J Gen Intern Med* 2004;19(1):43–50. [PubMed: 14748859]
63. Astin JA, Beckner W, Soeken K, et al. Psychological interventions for rheumatoid arthritis: a meta-analysis of randomized controlled trials. *Arthritis Rheum* 2002;47(3):291–302. [PubMed: 12115160]
64. Dixon KE, Keefe FJ, Scipio CD, et al. Psychological interventions for arthritis pain management in adults: a meta-analysis. *Health Psychol* 2007;26(3):241–50. [PubMed: 17500610]
65. McCracken LM. Behavioral constituents of chronic pain acceptance: Results from factor analysis of the Chronic Pain Acceptance Questionnaire. *Journal of Back & Musculoskeletal Rehabilitation* 1999;13(2)
66. Brown CA, Jones AK. Meditation experience predicts less negative appraisal of pain: Electrophysiological evidence for the involvement of anticipatory neural responses. *Pain*. 2010
67. McCracken LM, Gauntlett-Gilbert J, Vowles KE. The role of mindfulness in a contextual cognitive-behavioral analysis of chronic pain-related suffering and disability. *Pain* 2007;131(1-2): 63–9. [PubMed: 17257755]
68. Schutze R, Rees C, Preece M, et al. Low mindfulness predicts pain catastrophizing in a fear-avoidance model of chronic pain. *Pain* 2010;148(1):120–7. [PubMed: 19944534]
69. Zautra AJ, Davis MC, Reich JW, et al. Comparison of cognitive behavioral and mindfulness meditation interventions on adaptation to rheumatoid arthritis for patients with and without history of recurrent depression. *J Consult Clin Psychol* 2008;76(3):408–21. [PubMed: 18540734]
70. Morone NE, Greco CM, Weiner DK. Mindfulness meditation for the treatment of chronic low back pain in older adults: a randomized controlled pilot study. *Pain* 2008;134(3):310–9. [PubMed: 17544212]
71. Morone NE, Rollman BL, Moore CG, et al. A mind-body program for older adults with chronic low back pain: results of a pilot study. *Pain Med* 2009;10(8):1395–407. [PubMed: 20021599]
72. Goldenberg DL, Kaplan KH, Nadeau MG, et al. A Controlled Study of a Stress-Reduction, Cognitive-Behavioral Treatment Program in Fibromyalgia. *J Musculoskeletal Pain* 1994;2(2):53–66.
73. Grossman P, Tiefenthaler-Gilmer U, Raysz A, et al. Mindfulness training as an intervention for fibromyalgia: Evidence of postintervention and 3-year follow-up benefits in well-being. *Psychother Psychosom* 2007;76(4):226–33. [PubMed: 17570961]
74. Astin JA, Berman BM, Bausell B, et al. The efficacy of mindfulness meditation plus Qigong movement therapy in the treatment of fibromyalgia: a randomized controlled trial. *J Rheumatol* 2003;30(10):2257–62. [PubMed: 14528526]
75. Coelho HF, Canter PH, Ernst E. Mindfulness-based cognitive therapy: evaluating current evidence and informing future research. *J Consult Clin Psychol* 2007;75(6):1000–5. [PubMed: 18085916]
76. Godfrin KA, van Heeringen C. The effects of mindfulness-based cognitive therapy on recurrence of depressive episodes, mental health and quality of life: A randomized controlled study. *Behav Res Ther* 2010;48(8):738–46. [PubMed: 20462570]
77. Williams JM, Alatiq Y, Crane C, et al. Mindfulness-based Cognitive Therapy (MBCT) in bipolar disorder: preliminary evaluation of immediate effects on between-episode functioning. *J Affect Disord* 2008;107(1-3):275–9. [PubMed: 17884176]

78. Bohlmeijer E, Prenger R, Taal E, et al. The effects of mindfulness-based stress reduction therapy on mental health of adults with a chronic medical disease: a meta-analysis. *J Psychosom Res* 2010;68(6):539–44. [PubMed: 20488270]
79. Zautra AJ, Davis MC, Reich JW, et al. Comparison of cognitive behavioral and mindfulness meditation interventions on adaptation to rheumatoid arthritis for patients with and without history of recurrent depression. *J Consult Clin Psychol* 2008;76(3):408–21. [PubMed: 18540734]
80. Sephton SE, Salmon P, Weissbecker I, et al. Mindfulness meditation alleviates depressive symptoms in women with fibromyalgia: results of a randomized clinical trial. *Arthritis Rheum* 2007;57(1):77–85. [PubMed: 17266067]
81. Weissbecker I, Salmon P, Studts JL, et al. Mindfulness-based stress reduction and sense of coherence among women with fibromyalgia. *Journal of Clinical Psychology in Medical Settings* 2002;9(4):297–307.
82. Finucane A, Mercer SW. An exploratory mixed methods study of the acceptability and effectiveness of Mindfulness-Based Cognitive Therapy for patients with active depression and anxiety in primary care. *BMC Psychiatry* 2006;6:14. [PubMed: 16603060]
83. Eisendrath SJ, Delucchi K, Bitner R, et al. Mindfulness-based cognitive therapy for treatment-resistant depression: a pilot study. *Psychother Psychosom* 2008;77(5):319–20. [PubMed: 18600038]
84. Glaser R, Kiecolt-Glaser JK. Stress-induced immune dysfunction: implications for health. *Nat Rev Immunol* 2005;5(3):243–51. [PubMed: 15738954]
85. Carlson LE, Speca M, Faris P, et al. One year pre-post intervention follow-up of psychological, immune, endocrine and blood pressure outcomes of mindfulness-based stress reduction (MBSR) in breast and prostate cancer outpatients. *Brain Behav Immun* 2007;21(8):1038–49. [PubMed: 17521871]
86. Robinson FP, Mathews HL, Witek-Janusek L. Psycho-endocrine-immune response to mindfulness-based stress reduction in individuals infected with the human immunodeficiency virus: a quasiexperimental study. *J Altern Complement Med* 2003;9(5):683–94. [PubMed: 14629846]
87. Witek-Janusek L, Albuquerque K, Chroniak KR, et al. Effect of mindfulness based stress reduction on immune function, quality of life and coping in women newly diagnosed with early stage breast cancer. *Brain Behav Immun* 2008;22(6):969–81. [PubMed: 18359186]
88. Fang CY, Reibel DK, Longacre ML, et al. Enhanced Psychosocial Well-Being Following Participation in a Mindfulness-Based Stress Reduction Program Is Associated with Increased Natural Killer Cell Activity. *J Altern Complement Med*. 2010
89. Ospina MB, Bond K, Karkhaneh M, et al. Meditation practices for health: state of the research. *Evid Rep Technol Assess (Full Rep)* 2007;(155):1–263. (155). [PubMed: 17764203]



## MINDFULNESS MICRO-PRACTICES PERSONAL PLANNING WORKSHEET

Meditation is a central and powerful method for cultivating mindfulness. However, micro-practices are essential to bring mindfulness into our day. Eventually, mindfulness evolves as a skill and becomes a trait we can count on. Below are mindfulness ‘Micro-Practice’ ideas for you to consider and a worksheet to begin to identify practices that may work for you throughout your day.

### Mindfulness Micro-Practice Ideas to Consider

1. **Pause:** Identify a task or activity you do often (e.g. put hand on doorknob as you walk into a patient room; pour a cup of tea; walk up and down a set of stairs, etc.) or a sound (e.g. a pager) that is routinely in your environment. Each time you do that activity or hear that sound, pause briefly. Feel the sweet spot between your breath and thoughts.
2. **Radical Noticing:** When you feel yourself reacting versus responding and listening, just notice, relax and listen. You might even try making the next thing you say what you noticed that you appreciate (e.g. “I really appreciate how passionate you are about this issue you are raising here.”). Or you might express your feelings and needs (e.g. “I am feeling rushed for time and because I need to be able to focus on this well, I’d like to find a better time to have this important discussion with you.”) You may be surprised what comes forth as a conscious response not only manages personal reactivity, but it also engages creativity.
3. **See-Hear-Feel 3 Things.** Notice three things you can see and as you notice them, name them. So, “I see the chair, I see the window, I see my hands”. Then do the same with three sounds you can hear, and three sensations you can feel. You can do the last two steps more easily with your eyes closed. Or all three if you have X-Ray Vision.
4. **Count 3 Breaths.** When I was learning to meditate, you were supposed to count up to 10 breaths (in and out = 1 breath), while focusing your mind on your breathing. Somewhere around “five” I’d usually discover the limits of my arithmetical capacity and get distracted by tonight’s dinner, what I was doing after meditation, whether today was a good beach day, how good I was (or, usually, wasn’t) at meditation, etc. So “five” was a challenge and being a lazy person, but with some ego attached, “three” seemed within reach. Try it. Start from “one” if you have to. “The journey of a thousand miles...”
5. **Sit for 20 seconds.** Old bumper sticker from either the Maharishi or Bhagwan said “Don’t Just Do Something – Sit There!” They were talking about zazen or sitting meditation – usually for 20 minutes and more. My version goes for 20 seconds, BUT you do it 15-20 times a day. (You do sit still for more than 400 seconds a day don’t you?).

But when you sit mindfully, that's all you do – no phone calls, no reading, no texting or email. Eyes open or closed, it doesn't matter, but just sit still. And notice that you're sitting. If it helps, say to yourself, "I am here, sitting" or "I am sitting. Here." And pay attention. Be there.

6. **Walk Mindfully.** Walking to the bathroom, walking to your car, walking to get water, walking to a meeting. But not just one foot in front of another. Put your mind in your feet. Feel the contact of the ball of your foot with the ground. Feel your weight roll forward over your toes. Feel that foot leave the ground and kick forward. Feel your ankles moving. Feel your weight shifting, pausing as you find balance, shifting from side to side (did you know that's what happens when you walk – there's up-down motion as well – pay attention!). Feel your arms swinging as you walk. Where are you tense? Where are you loose and relaxed? See if you can do this for 100 metres without getting caught up in your thoughts.
7. **Drive Mindfully.** On the way to or while driving home from work, turn off the radio, make an agreement with car-mates to be silent and notice the small things. Become fully present to your environment, the traffic light and how you feel in your body.
8. **Speak Mindfully:** Allow yourself to speak slowly as you need to to be mindful.
9. **Daily Chores and Tasks Mindfulness:** Pick a task you do not like to be mindful with if you are feeling bold! The main goal is do what you are doing versus doing what you are doing thinking about what you will do next (e.g. take out the trash while thinking about checking the mail, checking the mail while thinking about putting the clothes in the washing machine, etc.). **Tasks to consider:** Taking the trash out, cutting vegetables, washing dishes, brushing your teeth, opening the mail, collapsing boxes for recycling, cleaning the cat box, paying bills, folding clothes...
10. **Pick A Day, Any Day:** Practice mindfulness as much as you can in one day and record your experiences on your Wheel of Awareness Events Calendars.
11. **Pick A Meeting, Any Meeting:** Same as above, but with a work meeting.
12. **Exercise:** Take 2 minutes during a workout to become fully present with the sensations in your body. Say in your mind what you are experiencing or noticing.
13. **Go With It:** Engage with what is happening fully, even if it is not engaging to you. For instance, in a meeting, get really curious and related. You could also just go with something that you normally react to or try to control or redirect, such as a behavior of a spouse, of yourself or a child. Instead of reacting, get curious about what underlies the behavior and relate to that. Turn to the one inside that is insisting you have that extra piece of chocolate—in yourself or others—and try to understand its feelings and needs and mirror these to yourself or that other.
14. **Turn Off AutoPilot:** Identify things you normally just go with on autopilot and decide to really pay attention. Could be showering, taking vitamins, hugging someone goodbye.
15. **Transition to Home:** Pick an activity that can center you when you arrive home. This is the time that we often move into behaviors that do not serve our highest health (e.g. overeating, watching things on TV that are not interesting to us, etc.). Take time to change clothes mindfully and sit and breath 10 breaths. Do walking meditation on the way to the mailbox or walk around the block mindfulness for 5 mintues.



## MINDFULNESS PERSONAL MICRO-PRACTICE PLANNING

Name: \_\_\_\_\_ (Date: \_\_\_\_\_)

Time of Day	Micro-Practice #1	Micro-Practice Idea #2
1. Upon Awakening in the Morning		
2. Getting Ready In the Morning		
3. Commuting to Work (Drive; Walk)		
4. Settling In At Work		
5. During Meetings and While Communicating with Co-Workers		
6. While At Your Desk		
7. Going In Between Meetings, Calls or Tasks		
8. Commuting Home		
9. When you Get Home and		
10. Communicating with Family Members or Housemates		
11. Getting Ready for Bed		

## 21 Ways to Be Mindful (Reduce Stress) During the Workday (Saki F. Santorelli)

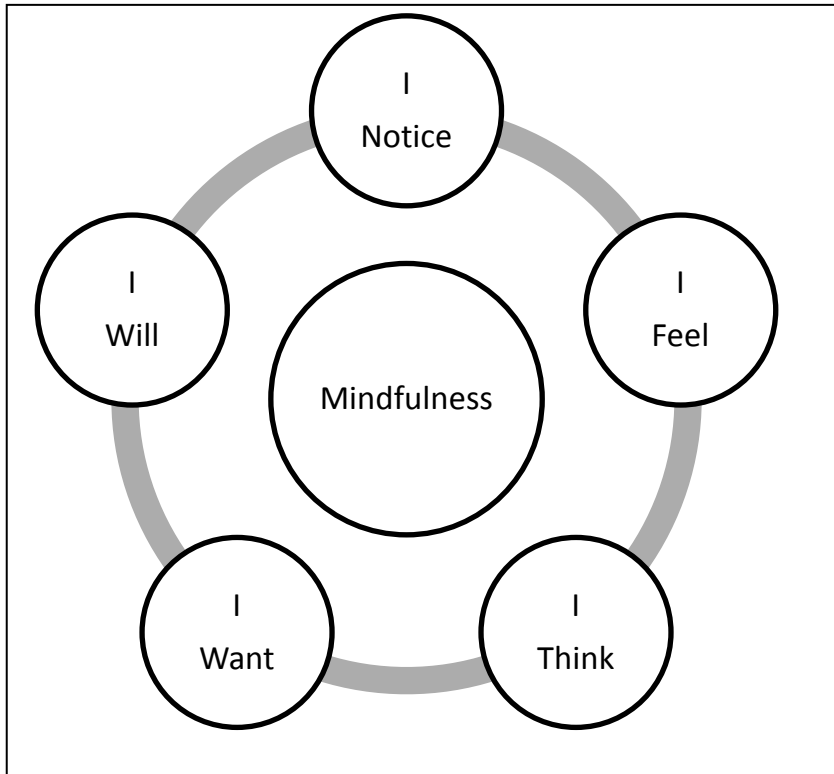
*The little things?  
The little moments?  
They aren't little.*  
– Jon Kabat-Zinn

1. Take a few minutes in the morning to be quiet and still, sit or lie down and be with yourself. Gaze out the window, listen to the sounds of nature or take a slow, quiet walk.
2. While your car is warming up, take a minute to quietly pay attention to your breathing.
3. While driving, become aware of body tension, e.g. hands wrapped tightly around the steering wheel, shoulders raised, stomach tight, etc. Consciously work at releasing, dissolving that tension. Does being tense help you drive better? What does it feel like to relax, breathe and drive?
4. Decide not to play the radio and be present with yourself – tune in.
5. Stay in the right lane and go 55 miles per hour.
6. Pay attention to your breathing or to the sky, trees, etc. when stopped at a red light or a toll plaza.
7. After parking your car at your workplace, take a moment to orient yourself to your workday – set an intention.
8. While sitting at your desk, keyboard, etc., monitor bodily sensations and tension levels, and consciously breathe, relax and let go of excess tension.
9. Use your breaks to truly relax rather than simply "pause". For example, instead of having coffee and a cigarette, take a two-to-five minute walk, or sit at your desk and recoup.
10. At lunch, changing your environment can be helpful.
11. Or, try closing the door (if you have one) and take some time to consciously relax.
12. Decide to "stop" for one to three minutes every hour during the workday. Become aware of your breathing and bodily sensations. Use it as a time to regroup and recoup.
13. Use the everyday cues in your environment as reminders to "center" yourself, e.g., the telephone ringing, turning on the computer, etc.
14. Take some time at lunch or break to connect with close associates. Choose topics not necessarily work related.
15. Choose to eat one or two lunches per week in silence. Use it as a time to eat slowly and be with yourself.
16. At the end of the workday, retrace your activities of the day, acknowledging and congratulating yourself for what you've accomplished and make a list or set an intention for tomorrow.
17. Pay attention to the short walk to your car, breathing the air. The feeling of the cold or warmth of your body, accept it rather than resist it. Listen to the sounds outside the office. Can you walk without feeling rushed?
18. While your car is warming up, sit quietly, and consciously make the transition from work to home. Take a moment to simply be. Enjoy it for a moment. Like most of us, you're heading into your next full-time job: home!
19. While driving, notice if you are rushing. What does this feel like? What could you do about it? Remember, you've got more choice than you imagine.
20. When you pull into the driveway or park on the street, take a minute to come back to the present. Orient yourself to being with your family or household members.
21. Change out of work clothes when you get home; it helps you to make a smoother transition into your next "role". You can spare the five minutes to do this. Say hello to each of the family members. Center yourself at home. If possible, make the time to take five to ten minutes to be quiet and still.

## A Few Simple Micro-Practices For Busy Providers

1. Practice one: whenever your pager or phone rings, pause, take 3 breaths, relax mind and body and then answer the page (unless of course it was a stat page!) With our hectic clinical activities, it would be professionally and personally beneficial to pause and be present/mindful at times throughout the day. This is hard to do. One way to accomplish it is to allow the interruption of a page to signal us to pause, breathe, relax and release whatever we were doing and then in a clearer state of mind begin to address the next task.
2. Practice two: whenever you enter an exam room or a patient's room, as you have your hand on the door handle, pause and take 1-3 breaths and become mindful of the beginning of a new interaction, leaving behind what just came before. For most patients and families, a visit with their health provider is the most important event of the day (or greater, depending on the reason for the visit). For providers, the next patient is simply the next patient. In treating and interacting with each patient as the unique individual they are, it is important to leave past interactions/upset at the door and then enter with a clear mind ready for whatever comes next.
3. Practice three: when eating, pay attention to each bite. Busy providers often skip meals and when they do eat, it is often quite hurried and not really appreciated. Eating more slowly (when possible), appreciating each bite helps to slow the mind and calm emotions allowing a mindfully enjoyed meal to nourish more than just the body.

## Cultivating Mindfulness Using the Wheel of Awareness and “Events” Calendars



**I notice...** In this moment of experience what do you notice going on? What is the raw sensory data available to you directly through your sense perceptions – what do you see, hear, smell, touch, or taste? This is the kind of objective information that could be recorded by a video camera or tape recorder.

**I feel...** How does this experience make you feel? Do you feel anxious or at ease, happy or sad, mad or glad, depressed or excited? Be watchful of the tendency to respond by saying, “I feel that...” Adding the word that after I feel probably indicates that you’re moving into thinking and judging rather than your emotional response.

**I think...** What are your thoughts or “internal conversations” about your experience? Are you creatively thinking about a situation or are you replaying old thoughts? What is the story you’re telling yourself about a situation – your thoughts, fantasies and assumptions?

**I want...** What are your values, intentions and motivations? What do you really want or need? Understanding this is essential for effective communication and action.

**I will...** What action are you willing to take in this situation? What are you unwilling to do? What are you willing to stop doing? Your actions and inactions can speak more loudly than your words.

(Levy & Levey, 1998)

**SUGGESTION:** Use this Mindfulness Wheel and begin a calendar related to:(1) Pleasant Events;(2) Negative Events; (3) Communications With Others. Below is a table to help you begin, including a list of feelings and needs to consider (often it can be challenging to identify feelings and needs!). Draw on guidelines and information from the Non-Violent Communication Handout to help structure a mindful conversation with others about your pleasant and unpleasant experiences. Being present to and “presencing” with others your experience cultivates authenticity and is key to helping you feel alive and real in your own life. These tools can help you be more mindful, alive and authentic.

# Pleasant Events Calendar

Adapted from *Full Catastrophe Living* by Jon Kabat-Zinn, Ph.D

Date	What was the experience?	Were you aware of the pleasant feelings <u>while</u> the event was happening?	How did your body feel, in detail, during this experience?	What moods, feelings, and thoughts accompanied this event?	What thoughts are in your mind now as you write about this event?

# Unpleasant Events Calendar

Adapted from *Full Catastrophe Living* by Jon Kabat-Zinn, Ph.D

Date	What was the experience?	Were you aware of the unpleasant feelings <u>while</u> the event was happening?	How did your body feel, in detail, during this experience?	What moods, feelings, and thoughts accompanied this event?	What thoughts are in your mind now as you write about this event?

# Communication Calendar

Adapted from *Full Catastrophe Living* by Jon Kabat-Zinn, Ph.D

Date	Describe the communication. With whom? Subject?	How did the difficulty come about?	What did you really want from the person or situation? What did you actually get?	What did the other person(s) want? What did they actually get?	How did you feel during and after this time?

## **FEELINGS INVENTORY**

**(c) 2005 by Center for Nonviolent Communication**

Feelings when your  
needs are satisfied:

### **AFFECTIONATE**

compassionate  
friendly  
loving  
open hearted  
sympathetic  
tender  
warm

### **CONFIDENT**

empowered  
open  
proud  
safe  
secure

### **ENGAGED**

absorbed  
alert  
curious  
engrossed  
enchanted  
entranced  
fascinated  
interested  
intrigued  
involved  
spellbound  
stimulated

### **INSPIRED**

amazed  
awed  
wonder

### **EXCITED**

amazed  
animated  
ardent  
aroused  
astonished  
dazzled  
eager  
energetic  
enthusiastic  
giddy  
invigorated  
lively  
passionate  
surprised  
vibrant

### **EXHILARATED**

blissful  
ecstatic  
elated  
enthralled  
exuberant  
radiant  
rapturous  
thrilled

### **GRATEFUL**

appreciative  
moved  
thankful  
touched

### **HOPEFUL**

expectant  
encouraged  
optimistic

### **JOYFUL**

amused  
delighted  
glad  
happy  
jubilant  
pleased  
tickled

### **PEACEFUL**

calm  
clear headed  
comfortable  
centered  
content  
equanimous  
fulfilled  
mellow  
quiet  
relaxed  
relieved  
satisfied  
serene



still  
tranquil  
trusting

**REFRESHED**

enlivened  
rejuvenated  
renewed  
rested  
restored  
revived

**Feelings when your  
needs are not satisfied**

**AFRAID**

apprehensive  
dread  
foreboding  
frightened  
mistrustful  
panicked  
petrified  
scared  
suspicious  
terrified  
wary  
worried

**ANNOYED**

aggravated  
dismayed  
disgruntled  
displeased  
exasperated  
frustrated  
impatient

irritated  
irked

**ANGRY**

enraged  
furious  
incensed  
indignant  
irate  
livid  
outraged  
resentful

**AVERSION**

animosity  
appalled  
contempt  
disgusted  
dislike  
hate  
horrified  
hostile  
repulsed

**CONFUSED**

ambivalent  
baffled  
bewildered  
dazed  
hesitant  
lost  
mystified  
perplexed  
puzzled  
torn

**DISCONNECTED**

alienated  
aloof  
apathetic  
bored  
cold  
detached  
distant  
distracted  
indifferent  
numb  
removed  
uninterested  
withdrawn

**DISQUIET**

agitated  
alarmed  
discombobulated  
disconcerted  
disturbed  
perturbed  
rattled  
restless  
shocked  
startled  
surprised  
troubled  
turbulent  
turmoil  
uncomfortable  
uneasy  
unnerved  
unsettled  
upset

**EMBARRASSED**

ashamed  
chagrined  
flustered  
guilty  
mortified  
self-conscious

**FATIGUE**

beat  
burnt out  
depleted  
exhausted  
lethargic  
listless  
sleepy  
tired  
weary  
worn out

**PAIN**

agony  
anguished  
bereaved  
devastated  
grief  
heartbroken  
hurt  
lonely  
miserable  
regretful  
remorseful

**SAD**

depressed  
dejected  
despair

despondent  
disappointed  
discouraged  
disheartened  
forlorn  
gloomy  
heavy hearted  
hopeless  
melancholy  
unhappy  
wretched

**TENSE**

anxious  
cranky  
distressed  
distraught  
edgy  
fidgety  
frazzled  
irritable  
jittery  
nervous  
overwhelmed  
restless  
stressed out

**VULNERABLE**

fragile  
guarded  
helpless  
insecure  
leery  
reserved  
sensitive  
shaky

**YEARNING**

envious  
jealous  
longing  
nostalgic  
pining  
wistful

stability  
support  
to know and be known  
to see and be seen  
to understand and  
be understood  
trust  
warmth

communion  
ease  
equality  
harmony  
inspiration  
order

**AUTONOMY**  
choice  
freedom  
independence  
space  
spontaneity

The contents of this page can be downloaded and copied by anyone so long as they credit CNVC as follows:

(c) 2005 by Center for Nonviolent Communication  
Website: [www.cnvc.org](http://www.cnvc.org) Email: [cnvc@cnvc.org](mailto:cnvc@cnvc.org)  
Phone: +1.505-244-4041

## **10 STEPS TO PEACE**

- (1)** Spend some time each day quietly reflecting on how we would like to relate to ourselves and others.
- (2)** Remember that all human beings have the same needs.
- (3)** Check our intention to see if we are as interested in others getting their needs met as our own.
- (4)** When asking someone to do something, check first to see if we are making a request or a demand.
- (5)** Instead of saying what we DON'T want someone to do, say what we DO want the person to do.
- (6)** Instead of saying what we want someone to BE, say what action we'd like the person to take that we hope will help the person be that way.
- (7)** Before agreeing or disagreeing with anyone's opinions, try to tune in to what the person is feeling and needing.
- (8)** Instead of saying "No," say what need of ours prevents us from saying "Yes."
- (9)** If we are feeling upset, think about what need of ours is not being met, and what we could do to meet it, instead of thinking about what's wrong with others or ourselves.
- (10)** Instead of praising someone who did something we like, express our gratitude by telling the person what need of ours that action met.

## MANAGING YOUR CALENDAR MICRO-PRACTICE

Once we understand and practice the basics of formal mindfulness meditation, we are ready to take the training into everyday life through informal practices. Some of the richest explorations of mindfulness come from simply paying attention to the daily calendar.

### **Step 1: Notice**

In this practice, notice the sensations in your body as you review a single calendar page from your schedule. Pause long enough to notice sensations in your chest or stomach or neck.

### **Step 2: Be Curious**

Become curious about any messages from your body and begin to question the status quo of how you set and agree to meetings, calls and deadlines. For many of us, a calendar of meeting after meeting seems inevitable. We have to do it!

But is the schedule that's been laid down for us—often by us based on our inner template for what it means to be a good leaders as well as by a variety of other people. Are these carved in stone? Do we believe that if someone thinks we are needed in a meeting, we can't turn it down? After all, we are leaders, so we must be needed, right?

### **Step 3: Pause and Decide**

With a pause that opens us to the present—that allows you to notice how the body is meeting the beginning of the day—you can then become more reflective about your choices. What is the best use of your time? How many meetings do you attend even when others on your team are in attendance? Do you attend because we work in a culture where everyone needs to know everything? Do you live in an environment that is so competitive that there is a sense that constant visibility is necessary to ensure advancement? How many meetings are a complete waste of time? In a global economy with increasingly scarce resources, is this how leaders should be meeting the day?

Calendar practice also raises questions about cultivating space for the teams we lead to grow, about the barriers to innovation that arise from a simple lack of space in the day, and about the allure of reacting to situations simply to get something off the to-do list. These and many other discoveries all begin with the simple act of intentionally pausing to practice mindfulness for a few moments. In that small opening, the possibility emerges of meeting the day with more openness and flexibility in our chest, stomach, and neck, and a corresponding spaciousness of mind that allows us to lead ourselves and others more effectively through the chaos and complexity of our day.

---

# The Role of Mindfulness in Healthcare Reform: A Policy Paper

| Kelley McCabe Ruff, MBA and Elizabeth R. Mackenzie, PhD |

## Contributing Authors:

Michael Baime, MD – University of Pennsylvania  
 Gina Biegel, MA, LMFT – Kaiser Permanente  
 Jeff Brantley, MD – Duke Intergrative Medicine  
 Jeanne Chadwick, PhD – University of Connecticut  
 Connem O'Connell, MA – Won Institute  
 Jeffery Dusek, PhD – Penny George Institute for Health and Healing, Abbott Northwestern Hospital  
 Jackie Gardner-Nix, PhD, MRCP (UK) – St. Michael's Hospital Pain Clinic, Sunnybrook Health Sciences Centre Pain Management Programme  
 Arnold Kozak, PhD – University of Vermont  
 Ellen Langer, PhD – Harvard University  
 Sasha Loring, MA – Duke Intergrative Medicine  
 Elizabeth R. Mackenzie, PhD – School of Arts and Sciences, University of Pennsylvania  
 Elise Mahovlich – Living Yoga Studios  
 Timoty McCall, MD – Medical Editor of Yoga Journal  
 Jane McCool, PhD – Northeastern University  
 Lisa Dalle Miller, MFT – private practice  
 David Nixa – eMindful Inc.  
 Beatriz Olson, MD – Yale University  
 Helen Rosen, PhD – Won Institute  
 Kelley McCabe Ruff, MBA – CEO eMindful Inc.  
 Kevin Thompson – eMindful Inc.  
 Glenn Wallis, PhD – Won Institute  
 Ruth Wolever, PhD – Duke Intergrative Medicine  
 Elaine Yuen, PhD – Thomas Jefferson University  
 Lidia Zylowska, MD – UCLA

*“Awareness and meditation are, for me, fundamental to the deep change that is necessary for healing. Chronic illness is a way of life as well as, perhaps even more than, a disease entity. Before we can be free of the symptoms of illness and the role of the sick person, we need to know what has precipitated those symptoms, and how we are responding to our sickness. We need to recognize in our own lives the psychological, biological, and sociological factors that may affect our health.*

*Awareness allows us to see where we are; to stand for a moment outside ourselves; to appreciate in a powerful, personal way, how the world around us affects us; to observe the thoughts, feelings, and sensations that arise in us. Meditation is a state of moment-to-moment awareness that over time may help to dissolve physical symptoms and habitual ways of thinking and acting. Both awareness and meditation enable us to experience the way our mind may limit or free us. Together they prepare us to use our mind to make the deep changes in thought, feeling, and action that are necessary for our healing.”*

—James S. Gordon, MD<sup>1</sup>

numbers of Americans are uninsured (medical bills are a leading cause of bankruptcy), and the aging of the so-called baby boomer generation threatens to burden Medicare beyond its capacity. The United States spends over \$2 trillion annually on healthcare, yet some key national health indicators lag significantly behind other developed nations (eg, infant mortality rates in the United States rank 23rd globally, on par with Poland and Slovakia). As a percentage of gross domestic product, healthcare spending exceeds 16% and is projected to reach 17.7%

by 2012.<sup>2</sup> Clearly, our healthcare system is unsustainable both in terms of its financial and human costs. However, despite a nearly unanimous call for reform, there remains a lack of consensus about what form the changes should take, and different stakeholders have put forth a variety of approaches.

At this stage, one of the most important questions we can ask is, “What is driving healthcare costs?” It is reasonable to assume that if we can identify the underlying problem, we will increase our chances of arriving at an effective solution.

Like most commodities, healthcare is subject to the rule of supply and demand. Right now, we have a high demand for healthcare procedures characterized by sophisticated and expensive medical technology. The evidence suggests that advances in medical technology are the single biggest factor driving up healthcare costs over the last 50 years or so, eclipsing all the other factors such as aging population, costs of health insurance, rising incomes, defensive medicine, administrative costs, lower productivity, end-of-life care, and the like.<sup>2</sup> However, since advances in medical technology have also tended to produce better health outcomes for certain conditions,<sup>3</sup> we do not want to thwart technological progress. The problem is that the nation, regardless of who pays for healthcare, can no longer afford to keep supplying the ever-increasing demand. One solution is to put limits on the supply—to engage in healthcare rationing. There are many serious objections to this approach, chief among them the moral issue of denying potentially life-saving procedures to human beings. Fortunately, there is another more humane and sensible solution: *reducing the demand by leveraging preventive medicine.*

## THE URGENCY OF HEALTHCARE REFORM

By now it is clear to everyone—economists, lawmakers, health professionals, and the public—that healthcare reform is an urgent need, a national emergency that requires immediate and focused attention. Costs continue to spiral out of control, large

The fundamental problem in our healthcare system—the factor most responsible for driving up healthcare costs—is the neglect of low-tech strategies to prevent disease and promote health in favor of high-tech interventions to treat disease after it has arisen. We must change the way we think about health and healthcare if we are to produce meaningful and lasting healthcare reform. As a society, we have become habituated to looking outside ourselves for answers to our problems, often turning to technological solutions that, although typically effective in the short-term, may not be the best long-term approach. Thus, we have a high incidence of cardiovascular disease and a plethora of sophisticated approaches to treating it, ranging from pharmaceutical interventions to heart transplants. The success of these interventions is wonderful to behold, and they are responsible for saving many lives. But what if we were able to reduce the demand for such interventions by lowering the incidence of heart disease in the United States? What if we had a healthcare system that successfully improved the health of our population so much that the demand for costly procedures declined, resulting in both cost savings *and* a healthier citizenry? In this scenario, healthcare rationing (limiting the supply) would be irrelevant due to the significantly reduced demand for costly procedures. Sophisticated medical technology would be there to serve patients whose lives depended on it. However, there would be fewer such cases, lowering costs overall and increasing the general well-being of the population. Such a scenario is feasible if we can tap into the potential of preventive medicine.

By leveraging preventive medicine, we can reduce the incidence of catastrophic illness and serious disease, thereby diminishing the need for expensive interventions. As the old adage has it, “an ounce of prevention is worth a pound of cure,” yet our current system focuses mostly on cure and largely overlooks the advantages of investing in prevention. Paying more attention to disease prevention and health promotion will result in a healthier population with less call for expensive medical interventions. Low-tech, cost-effective approaches to disease prevention and health promotion already exist; it is merely a matter of exploring how best to employ them

for greatest impact. Strategies for health promotion and disease prevention—those that focus on *self-responsibility* and that support *positive behavioral change*—will yield the greatest long-term cost savings and are the foundation for a sustainable healthcare system for the 21st century.

As Risa Lavizzo-Mourey, MD, MBA, the CEO of the Robert Wood Johnson Foundation, recently pointed out, although we spend over \$2 trillion annually in the United States on healthcare, only 5% of that money goes toward public health and disease prevention.<sup>4</sup> Perhaps these figures can explain why we have become so good at treating disease, but so deficient in preventing disease from occurring in the first place. Lavizzo-Mourey calls on lawmakers to “. . . reconfigure what we spend to build a ‘culture of wellness’ in this country.”<sup>4</sup>

In summary, the problem facing us is a disease-oriented healthcare system. It is a problem because the costs—both human and financial—are unsustainable. The humane and sensible solution is to employ a low-tech approach to health promotion that is successful, accessible, feasible, equitable, and cost effective. Luckily, this approach has already been discovered and is now being implemented and tested across the nation.

#### **COST-SAVINGS ASSOCIATED WITH MIND-BODY MEDICINE**

Mind-body medicine focuses on the relationships among the mind, body, brain, and behavior, and produces interventions that use these connections to achieve and maintain health.<sup>5</sup> A small cadre of researchers has been quietly compiling data for many years on mind-body interventions and their potential cost savings. Among them is David S. Sobel, MD, MPH, of Kaiser Permanente, who summarized years of research in a short review article published in the *Journal of the American Medical Association* in 2000<sup>6</sup>:

- one study of 107 patients with heart disease found that psychosocial interventions (ie, stress management practices) reduced the risk of subsequent cardiac events by 75% (compared to usual care only)
- Kaiser Permanente and Stanford University implemented a seven-week patient education program for patients

with chronic disease; the randomized controlled trial (RCT) of 952 patients indicated a cost savings of approximately \$750 per participant, more than 10 times the cost of the program

- in an RCT of 335 patients scheduled for surgery, those who listened to guided imagery audiotapes beforehand experienced a 43% reduction in blood loss and were able to leave the hospital a day earlier
- two RCTs of premature infants found that those who were massaged three times a day for 10 days gained weight more rapidly and were discharged from the hospital five to six days earlier, yielding a savings of more than \$10,000 per infant

As Sobel has pointed out, the beauty of these low-tech mind-body interventions is that they result in both better health outcomes *and* significant cost-savings.<sup>6</sup> As the evidence mounts that mind-body medicine is both clinically effectual and cost effective, it is increasingly clear that the time has come to integrate these approaches into conventional healthcare. In fact, with support from the Bravewell Collaborative, an award-winning documentary titled *The New Medicine*, produced in 2006, presented many of the ways in which new scientific knowledge about the mind-body connection can be integrated within existing healthcare systems to both improve health outcomes and lower costs.<sup>7</sup>

#### **MIND-BODY APPROACHES TO DISEASE PREVENTION AND HEALTH PROMOTION**

Mind-body medicine is not just a promising avenue for treating disease; there are many indications that it can actually prevent disease from occurring at all.

“Heart disease, diabetes, prostate cancer, breast cancer, and obesity account for 75% of health-care costs, and yet these are largely preventable and even reversible by changing diet and lifestyle. . . . The latest scientific studies show that our bodies have a remarkable capacity to begin healing, and much more quickly than we had once realized, if we address lifestyle factors that often cause these chronic diseases.”<sup>8</sup>

The authors of this *Wall Street Journal* op-ed cite the INTERHEART study,<sup>9</sup> which “followed 30,000 men and women on six continents and found that changing lifestyle could prevent at least 90% of all

---

heart disease.”<sup>8</sup> Clearly, it is more cost effective to spend money to help people eat healthfully, exercise, and manage their stress than to treat heart disease after it has developed. This is the proverbial “no-brainer,” and yet we have been slow to invest in relatively inexpensive health promotion programs known to prevent all manner of diseases, like cardiovascular disease, that are very expensive to treat after they have arisen.

## MEDITATION

There are a number of mind-body practices and interventions that researchers have found to be effective for a variety of conditions, including yoga, tai chi, Qi gong (or Chi Kung), biofeedback, and therapeutic bodywork techniques that address both mind and body. All of these modalities are worthy of discussion and have enormous potential to promote health and treat disease; however, they are beyond the scope of this paper, which focuses on meditation. There are many different styles of meditation—too many to enumerate here—and some are rooted in spiritual traditions (eg, Christianity, Buddhism, Taoism, and Hinduism), whereas others are not tied to any specific religious practice.

The fundamental concept at the core of meditation is similar across all traditions—to promote increased awareness through focused attention in the present moment. Meditation is primarily a reflective discipline that requires a quiet introspection, typically leading to a fundamental shift in one’s perspective on daily life. Interestingly, the practice of meditation is associated with increased resilience to stress and significant health improvements. Researchers have demonstrated that psychosocial stress plays a pivotal role in the development of disease.<sup>10,11</sup> This may explain why meditation can both prevent and treat a large range of conditions, everything from cardiovascular disease to fibromyalgia.

## MEDITATION: THE PHYSICAL EFFECTS

The practice of meditation is known to have effects on human physiology, including improved blood pressure and cardiac functioning (eg, Anderson et al,<sup>12</sup> Schnei-

der et al,<sup>13</sup> and Dusek et al<sup>14</sup>). Stressors activate the sympathetic nervous system (the fight-or-flight response), causing higher blood pressure and having a deleterious effect on the heart. Meditation, on the other hand, actually reduces sympathetic activation (measured by blood biomarkers and cardiac indices). For example, a study of 19 patients with congestive heart failure found that a 12-week meditation program reduced blood levels of the stress hormone norepinephrine, improved cardiovascular function, and enhanced quality of life.<sup>15</sup> Walton et al<sup>16</sup> evaluated studies of meditation and cardiovascular disease and found that meditation “may be responsible for reductions of 80% or greater in medical insurance claims and payments to physicians.” Another study of meditation among 23 African Americans recently hospitalized with congestive heart failure found that the meditation group had fewer rehospitalizations and better cardiac function than the control group.<sup>17</sup> Not surprisingly, they also exhibited improved mood and enhanced quality of life. The seminal study by Dean Ornish et al<sup>18</sup> published in the *Journal of the American Medical Association* found that lifestyle changes that included meditation-based stress management actually *reversed* coronary atherosclerosis over a five-year period in a group of 20 persons with moderate to severe coronary heart disease. Patients in the control group (n = 15) had more than twice as many cardiac events than those in the experimental group. As many mind-body medicine advocates have pointed out, if there were a pill that could do this, the government would mandate its immediate and widespread use.

Psychoneuroimmunology is a growing field of research that seeks to map the biomechanical pathways associated with the mind-body connection. It is no secret that our thoughts and emotions can influence our immune systems, but the science of exactly how this happens is still not completely understood. What the psychoneuroimmunology studies have documented is that our perceptions, thoughts, and feelings can influence our immune and hormonal systems in both adaptive and nonadaptive ways. How we perceive daily life experiences (eg, being overwhelmed or feeling threatened) can lead to chronic psychological stress. Such chronic stress has been shown to have a deleterious

effect on immunity and the overall homeostatic regulation of the body.

Recent studies point to the role of meditation in bolstering immunity by modulating the stress response. In a landmark study, Davidson et al<sup>19</sup> were the first to demonstrate that meditation changes both brain and immune function. They found that an eight-week mindfulness meditation program produced beneficial changes in both brain and immune function in a group of 25 healthy participants. In addition to showing that the meditation group, compared to the controls, had increased brain activity in an area associated with positive emotions, they also demonstrated increased production of antibodies in response to a flu vaccine. Similarly, when Pace et al<sup>20</sup> randomized 61 healthy adults to a short meditation training (six weeks) or a control group, they found that the new meditators responded to stressors differently than the controls. Specifically, following a standardized stressor, those who meditated had lower levels of both distress and inflammation, suggesting that meditation reduces stress-induced immune responses. Another study looked at a form of mindfulness meditation on immune function, quality of life, and psychological coping in a group of women recently diagnosed with breast cancer.<sup>21</sup> They found that the women in the eight-week meditation group (when compared to controls over time) had better immune system biomarkers, reduced stress hormones, improved quality of life, and better coping skills. Carlson et al<sup>22</sup> explored an eight-week mindfulness meditation program as an intervention for early-stage breast and prostate cancer patients and found that the persons in the mindfulness group had enhanced quality of life, decreased stress symptoms, and may have experienced beneficial changes in the endocrine system, a component of the immune system. In sum, meditation appears to protect the body from the potentially damaging effects of psychological stress by physiologically interrupting stress pathways and strengthening the body’s immune responses, thus improving health directly.

## MEDITATION AND THE BRAIN

Neuroscience studies of meditation have demonstrated enduring and beneficial



changes in both the function and structure of the brain that persist beyond the period of meditation.<sup>19,23-26</sup> Neuroscientist Daniel Siegel<sup>27</sup> concludes that mindfulness produces a form of neural integration and coherence that leads to more adaptive functioning. The areas of the prefrontal cortex that show increases in gray matter are responsible for emotional regulation (including modulating fear) and an increased ability to be resilient in the face of stress. Other capacities affected include the regulation of body systems, attuning to others, responding flexibly, and exhibiting insight and empathy. For example, Lazar et al<sup>24</sup> found that mindfulness meditation led to a thickening in areas of the prefrontal cortex linked to these functions, and that these changes were correlated with the length of time practicing. Lutz et al<sup>25</sup> conclude that:

Many of our core mental processes such as awareness and attention and emotion regulation, including our very capacity for happiness and compassion, should best be conceptualized as trainable skills. The meditative traditions provide a compelling example of strategies and techniques that have evolved over time to enhance and optimize human potential and well-being. The neuroscientific study of these traditions is still in its infancy but the early findings promise to reveal the mechanisms by which such training may exert its effects as well as underscore the plasticity of the brain circuits that underlie complex mental functions.<sup>25</sup>

As this fledging field progresses, it is very likely that neuroscientists will be able to demonstrate—in scientific terms—exactly how and why meditative practices produce the kinds of health benefits practitioners report anecdotally and researchers have found in their clinical studies.

### **MEDITATION AND THE MIND**

Meditation can protect the body from the negative effects of psychological stress, as discussed above; it can also help to prevent and treat mental health problems such as depression and anxiety. Depression is one of the most common chronic mental health problems, and it inflicts a heavy societal toll in terms of both human and financial costs. Meditation has been

found to have a beneficial effect for this and many other mental health problems.<sup>28</sup> In fact, a meditation-based intervention for depression was shown to be better at preventing relapse into depression than the standard treatment (antidepressant medication),<sup>29</sup> and a meditation-based stress reduction intervention was found to successfully treat anxiety disorders, not only in the short term but even at the three-year follow-up.<sup>30</sup> Meditation also holds promise as an intervention for the treatment of posttraumatic stress disorder (PTSD), a particularly debilitating condition that plagues many US veterans.<sup>31</sup> Although not yet systematically studied in a population of US veterans, an RCT of a mind-body intervention that included meditation was found to successfully treat adolescents suffering from PTSD in post-war Kosovo.<sup>32</sup> Researchers at the Veterans Affairs Health Care System in San Diego tested a mantra meditation practice in a group of veterans and found it to be an effective method of reducing symptoms of stress and anxiety.<sup>33</sup>

Meditation not only improves health directly (eg, normalizing blood pressure, enhancing immunity, lowering levels of stress hormones, and improving brain function), it improves health indirectly by helping individuals to avoid maladaptive responses to stress (eg, excessive drinking, substance abuse, smoking, binge eating), thus improving health indirectly. It has long been known that five behavioral factors significantly contribute to the rising costs associated with the chronic disease burden in the United States: excessive drinking, smoking, eating, inactivity, and stress. Meditation has been shown to help in all these areas. Meditation addresses stress directly by enhancing our ability to cope with psychological stressors that would otherwise adversely affect our physiology, as discussed above. It can also assist persons in making the lifestyle changes (eg, smoking cessation, reducing or eliminating alcohol consumption) necessary for good health.<sup>34</sup> For example, studies have shown that mindfulness meditation can help people quit smoking,<sup>35</sup> decrease binge eating,<sup>36</sup> and reduce alcohol and substance abuse.<sup>37</sup> Mindfulness-based interventions specifically targeted for substance abuse relapse prevention have proved successful. Mindfulness-based relapse prevention is an eight-week program

designed to prevent future relapse, and research shows that it is more effective than treatment as usual.<sup>37,38</sup>

There is also some evidence suggesting that mindfulness meditation discourages self-destructive behavior in response to stress through acceptance rather than avoidance of negative emotions such as sorrow, guilt, or loneliness.<sup>39,40</sup> Anecdotal evidence suggests that mind-body practices such as meditation help individuals make the journey from self-destructive to self-supportive behavior. Furthermore, mind-body interventions serve as catalysts for virtuous cycles, initiating a cascade of positive side effects. As with all truly holistic interventions, the effects of meditation are not confined to a single symptom or condition. For example, someone may begin a meditation program to stop smoking and find that not only does their craving for cigarettes decrease, their mood improves, their relationships are more harmonious, and their hypertension diminishes.

### **AGING AND THE MIND**

Finding cost-effective ways to support the healthy aging of the US population is one of the cornerstones of healthcare reform, and researchers continue to uncover intriguing indications that the mind has a profound influence on how the body ages. For example, following her studies on self-efficacy and longevity,<sup>41,42</sup> Ellen Langer's groundbreaking 1979 study on the psychology of aging raises a number of questions about the conventional perspective on the biological causes of aging.<sup>43</sup> In this study, a group of male nursing home residents in their late 70s and early 80s were taken on a weeklong retreat, where they were encouraged to live as if it were 1959. The researchers took steps to create a psychological environment that took the participants' imaginations back in time, allowing them to live in a fictional 1959. They then measured a range of indicators of chronological age, and they found significant changes in the experimental group, including improvements in joint flexibility, manual dexterity, and even finger length. Other studies have demonstrated that a simple change in mental attitude can result in weight loss and lower blood pressure,<sup>44</sup> as well as improved vision.<sup>43</sup> Findings of this nature fly in the face of the conventional view of human physiology

yet are the fruits of legitimate research. What might explain these research findings? One clue is found in studies suggesting that mind-body practices such as meditation can actually alter gene expression. Jeffery Dusek et al<sup>45</sup> conducted a study on long-term practitioners of a variety of mind-body practices and found that, compared with control subjects, the mind-body practitioners had more than 2,000 differently expressed genes. When they exposed the nonpractitioners to eight weeks of meditation training, the expression of more than 1,500 genes was altered. Replicating and confirming these studies would open up a new world of possibility for healthy aging, among other things, with important implications for both improved quality of life and reduced medical costs among the elderly.

## MINDFULNESS MEDITATION AND MEDICINE

The most common form of meditation found in clinical settings is mindfulness-based stress reduction (MBSR), a clinically tested, secular form of meditation popularized by Jon Kabat-Zinn, PhD, professor emeritus at the University of Massachusetts Medical School, and founding director of both the Stress Reduction Clinic and the Center for Mindfulness in Medicine, Healthcare and Society. Kabat-Zinn's work has provided a foundation for the use of mindfulness meditation as a medical intervention, and his books, scholarly articles, and scientific studies have greatly advanced our understanding of the mind-body connection.

The concept of mindfulness is simple. "The goal of all mindfulness is to maintain awareness moment by moment, disengaging oneself from strong attachment to beliefs, thoughts, or emotions, thereby developing a greater sense of emotional balance and well-being."<sup>46</sup> Detachment from thoughts and emotions allows individuals to observe their habitual patterns of behavior without judgment, creating space for wiser choices. Using his own experiences with mindfulness meditation, Kabat-Zinn developed and standardized an eight-week mindfulness meditation program for use in clinical settings that he called mindfulness-based stress reduction. His MBSR program has become a guide and a standard for virtually all other clinically oriented mindfulness programs.

Interest in the clinical application of mindfulness is gaining momentum, and there is convincing evidence that mindfulness can improve health and quality of life through the following:

- decreased perception of pain
- increased ability to tolerate pain
- reduced stress, anxiety, and depression
- diminished use of medication (lessening adverse effects of drugs)
- enhanced medical decision making
- better adherence to medical treatments
- increased motivation to make lifestyle changes
- more social connection and enriched interpersonal
- enhanced neuroendocrine and immune system function<sup>46</sup>

## MINDFULNESS-BASED INTERVENTIONS FOR CHRONIC CONDITIONS

Mindfulness-based stress reduction has been tested as a clinical intervention for a wide range of conditions. A brief overview of mindfulness-based interventions for chronic disease shows that it may be an effective treatment or adjunct intervention for a range of disorders, including depression,<sup>47,29</sup> anxiety,<sup>48</sup> substance abuse,<sup>37</sup> eating disorders,<sup>49</sup> binge eating,<sup>50</sup> insomnia,<sup>51</sup> chronic pain,<sup>52</sup> psoriasis,<sup>53</sup> type 2 diabetes,<sup>54</sup> fibromyalgia,<sup>55</sup> rheumatoid arthritis,<sup>56,57</sup> attention-deficit/hyperactivity disorder,<sup>58</sup> HIV,<sup>59</sup> cancer,<sup>21</sup> and heart disease.<sup>60</sup> A comprehensive literature review of four of the largest health sciences databases (EBSCO, CINAHL, PSYCHLINE, and MEDLINE) found that "MBSR is an effective treatment for reducing the stress and anxiety that accompanies daily life and chronic illness. . . . No negative side effects from MBSR have been documented."<sup>61</sup> Researchers hypothesize that its effectiveness for so many different types of conditions is due to its ability to modulate the stress response. In other words, MBSR allows us to use the wisdom of our minds and the innate healing capacity of our bodies to improve our physical health.

## STUDIES OF MINDFULNESS THAT INCLUDED COST IMPLICATIONS

Accumulating data indicates that mindfulness meditation is clinically efficacious

and cost effective, particularly in the treatment of chronic disease.

Roth and Stanley<sup>62</sup> report that an eight-week MBSR program at a community health center (N = 73) resulted in a significant decrease in chronic care office visits after the MBSR program was completed, based on a review of utilization records. The authors conclude that MBSR programs may help to contain healthcare costs in similar inner-city community health centers.

A small study of adult offenders with mild intellectual disabilities (N = 6) found that a simple mindfulness exercise reduced physical aggression so much that "no Stat medication or physical restraint was required, and there were no staff or peer injuries."<sup>63</sup> The authors estimate a 95.7% reduction in costs associated with lost workdays and rehabilitation.

A German study of 21 persons with chronic illnesses (physical and psychological) found that an eight-week mindfulness meditation program resulted in lasting reductions in symptoms as well as improved quality of life and general well-being as measured in a three-month poststudy follow-up.<sup>64</sup> The authors conclude that mindfulness training has important cost-control benefits.

A 2008 qualitative study of 27 older adults with chronic lower back pain (a condition associated with significant healthcare costs) found that an eight-week mindfulness meditation program produced numerous health improvements including diminished pain, improved attention, better sleep, enhanced well-being, and improved quality of life.<sup>52</sup>

Kreitzer et al<sup>51</sup> studied the effects of an eight-week mindfulness meditation program on 20 organ transplant recipients. Transplant recipients typically experience a host of symptoms after their surgery, such as anxiety, depression, and insomnia, all of which add to the expense of their recuperation. The recipients who completed the relatively low-cost mindfulness meditation program experienced better sleep quality even six months after completing the course, resulting in decreased anxiety/depression and better quality of life.

## MINDFULNESS FOR HEALTH PROFESSIONALS: THE IMPORTANCE OF SELF-CARE

The routine training of health professionals (eg, physicians, nurses, clinical social

---

workers, psychologists) in mindfulness programs such as MBSR may be one of the most effective ways to disseminate its benefits widely throughout the healthcare system, improving both the professional lives of clinicians and the health of patients.

A stressed healthcare workforce leads to increased costs associated with practitioner burnout, high staff turnover, clinical errors, and lower quality care for patients. Costs associated with medical errors are approximately \$17 billion annually, whereas those stemming from high rates of staff turnover are about \$21 billion per year.<sup>65</sup> Poor physician-patient communication is one of the factors responsible for the practice of defensive medicine,<sup>66</sup> which is associated with annual costs of about \$210 billion.<sup>65</sup> Mindfulness training can address these concerns (eg, Kabat-Zinn,<sup>67</sup> Baime,<sup>68</sup> and Brown and Ryan<sup>69</sup>). There are many immediate benefits to exposing clinicians to mindfulness training:

- evidence suggests that mindfulness training of physicians can reduce medical errors<sup>70</sup>
- a study of 53 medical residents suggests that training in self-awareness enhances the ability to conduct patient-centered interviews,<sup>71</sup> thereby improving physician-patient communication and ultimately resulting in higher quality of care<sup>68</sup>
- a number of studies and reviews have suggested that increased self-awareness can help prevent and manage stress and burnout, and increase empathy<sup>72-77</sup>
- studies suggest that teaching mindfulness to health professionals improves the quality of care they deliver through enhancing caregiver self-efficacy,<sup>78</sup> improving clinician well-being and coping skills,<sup>79</sup> and that training psychotherapists in mindfulness significantly improves the mental health of the patients under their care<sup>80</sup>

What the research underscores is the crucial importance of self-care for health professionals if they are to have the capacity to deliver truly high-quality care to patients, minimizing clinical errors, improving physician-patient communication, lessening the incidence of burnout, enhancing patient-centered care, and reducing the fear of litigation. Health professionals can receive training in mindfulness through a number of avenues. First, mindfulness training can

be integrated into existing curricula in schools of medicine, nursing, and social work. In fact, a number of programs seeking to address clinician burnout and stress already offer mindfulness training. Kabat-Zinn and his colleagues have taught mindfulness techniques to medical students at the University of Massachusetts for over 20 years,<sup>79</sup> and similar programs are being offered elsewhere, such as the Penn Program for Mindfulness at the University of Pennsylvania and the Mindfulness Institute at Thomas Jefferson University.<sup>76</sup> These programs could be expanded, encouraged, and replicated through National Institutes of Health training grants. Health professionals already in the workplace can be encouraged to seek mindfulness training through programs and workshops that offer continuing education credits (CEUs).

#### **MINDFULNESS IN THE SCHOOLS: PROMOTING HEALTH AND ACADEMIC ACHIEVEMENT**

Children often experience just as much psychological stress as their parents, yet have few resources with which to cope. Children and adolescents living in low-income, high-crime areas, or whose parents are coping with high levels of psychosocial stress (for example, due to divorce, job loss, chronic disease, or substance abuse) are especially vulnerable. This can lead to a host of dysfunctions such as behavioral problems, eating disorders, substance abuse, depression/anxiety, interpersonal conflict, aggression, and poor academic performance.<sup>81</sup> A number of researchers across the nation are pioneering the study of MBSR in schools, and the results of their research are promising. For example, Park Day School in Oakland, California, has initiated a program in mindfulness for elementary students in the Oakland area.<sup>82</sup> Over 5,000 children in 20 schools have received mindfulness training. Analysis of the research findings is ongoing, but preliminary data show that 93% of students report that mindfulness has helped them in some way, 85% say they will use mindfulness techniques in the future, 61% say it helps them calm down; and 59% say it helps them focus better in the classroom. Among teachers, 96% say that the mindfulness training has benefited them personally, and 94% plan

to continue using mindfulness in the classroom. A recent RCT demonstrated that adolescents with a whole host of medical and mental health problems experienced significant improvements after an eight-week program of MBSR, including reduced anxiety, depression, and improved self-esteem and sleep quality. These clinically significant changes were sustained over the three-month follow-up.<sup>83</sup>

Such research suggests that mindfulness training could be an important complement to existing public health initiatives to address childhood obesity, reduce school violence, and improve educational achievement. Teaching children the basics of mindfulness has the immeasurable added benefit of giving young people coping skills that may prevent the development of mental and physical disease later in life.<sup>84</sup> Researchers have found a correlation between childhood abuse (physical and/or sexual) and certain kinds of illnesses later in life (eg, irritable bowel syndrome, fibromyalgia).<sup>85,86</sup> One recently published study of over 15,000 individuals found that "childhood traumatic stress increased the likelihood of hospitalization with a diagnosed autoimmune disease decades into adulthood."<sup>87</sup> The authors discussed these findings in connection with recent biological studies on the impact of childhood stress on subsequent inflammatory responses.<sup>87</sup> The findings strongly suggest that giving children an effective method to cope with psychological stressors can help to prevent the development of serious, debilitating, and costly diseases later in life.

#### **TELEMEDICINE AND THE DELIVERY OF MINDFULNESS TRAINING**

Currently, the most common method of delivery of mindfulness instruction is face-to-face group trainings in classroomlike settings. It is a cost-effective way to promote physical and psychological well-being, yet there are limitations to how many persons can access mindfulness instruction due to a finite number of qualified mindfulness meditation teachers. New information technologies can improve access to mindfulness instruction. The age of telemedicine has arrived. Based on a growing awareness of the benefits of telemedicine, state governments are beginning to support its use. For example, in June 2009

---

the state of Maine passed a law requiring health insurance plans to cover telemedicine services.<sup>88</sup> Telemedicine (or telehealth or eHealth) refers to the use of communications and information technologies in the delivery of clinical care, and its proponents are enthusiastic about telemedicine's potential to address rising costs, inequities in healthcare delivery, and barriers to care.<sup>89</sup> Examples of telemedicine include distant health education initiatives, telephone-based case management and home monitoring programs, use of communication technologies to coordinate care, and the use of Internet-based clinical interventions.

Although this is a newly emergent field, several studies point to the effectiveness of therapies delivered over the Internet. A review of 14 studies comparing the effectiveness of Internet versus face-to-face psychological interventions showed no differences in outcomes.<sup>90</sup> Perini et al<sup>91</sup> found that a clinician-assisted delivery over the Internet of cognitive behavioral treatment for depression produced clinically significant results. Twenty persons diagnosed with depression completed an eight-week online program consisting of online sessions, weekly assignments, and email contact with a clinical psychologist. Individuals in the treatment group reported significantly reduced symptoms of depression. Another study examined the use of telemedicine to deliver mindfulness-based meditation to patients with chronic pain.<sup>92</sup> In this study, over 200 chronic pain patients were assigned to three groups: a present site, distant site, or a wait-list control group. Videoconferencing and CDs were used to deliver the intervention to the distant site participants (n = 57). The researchers found that the distant site group's improvements were comparable to the present site group in two of the four key measures and conclude that telemedicine is a promising way to help chronic pain patients in rural areas manage their condition. Not only can such Web-based interventions improve access to care for persons living in remote areas or who find it difficult to leave their homes due to disabilities, caregiving duties, frailty, or lack of transportation, delivering clinically supervised care over the Internet is extremely cost effective. All indications are that telemedicine is a clinically

and cost-effective adjunct to conventional face-to-face care.

The use of Web-based, online mindfulness programs is a convenient, practical, and cost-effective way to allow large numbers of people (health professionals, patients, and the public) to access mindfulness meditation. At present, one of the main barriers to the widespread dissemination of mindfulness is the paucity of highly qualified and experienced meditation teachers. Although there is no formal licensure or credentialing for meditation instructors, it is generally agreed that only persons trained at a handful of professional training programs (such as the stress reduction program at the University of Massachusetts) should be considered qualified to teach others how to meditate.<sup>93</sup>

Internet-based mindfulness programs, featuring live instruction in virtual classrooms by experienced teachers, can greatly expand the reach of the existing network of mindfulness teachers, helping them to reach many more students than otherwise possible. Online mindfulness training programs can also increase the number of health professionals trained in mindfulness techniques by adding a distance education component to existing professional training programs. For example, health professionals could receive conventional, face-to-face mindfulness training in a single workshop and then continue their practice with support from the mindfulness teacher in online sessions over the course of several months. Patients who have completed the standard eight-week MBSR program could access ongoing instruction and support via Web-based instruction.

School-based mindfulness programs could maximize their resources by augmenting in-person training with Internet-based meditation instruction. As the emerging research findings suggest, some patients who would otherwise not be able to access mindfulness programs can successfully learn the practice of mindfulness from qualified teachers in the virtual classroom. Students of mindfulness are already using CDs produced by nationally recognized teachers such as Jon Kabat-Zinn to support them in their practice. Internet-based meditation instruction takes this idea a step further, using concepts from both telemedicine and distance education to disseminate the benefits of mindfulness practice to as many individuals as possible.

## **PAYING FOR MINDFULNESS TRAINING**

The costs associated with delivering mindfulness-based services and training health-care professionals to deliver such services will pay for themselves if the prevailing paradigm within healthcare can be shifted from treating to preventing disease. Currently, many individuals receiving mindfulness meditation instruction pay for it out of pocket. Insurance companies, who would incur significant cost savings in the long run, may choose to cover the costs, perhaps with a modest copay, discounts in premiums, or with flexible spending accounts. Employers, wishing to support the health and productivity of their employees, could support mindfulness programs. Private foundations may be interested in supporting such programs, particularly if they have a rigorous evaluation component. The National Institutes of Health could fund training grants for health professionals, encouraging the widespread training of clinicians in schools of medicine, nursing, and social work, with the ultimate goal of standardizing mindfulness training into the curriculum. Healthcare organizations currently bearing the burden of increased costs associated with high rates of clinician turnover, clinician stress, and burnout may opt to pay for mindfulness training for their practitioners.<sup>94</sup> Health professionals could pay for such training as they do for other CEUs; in fact, some organizations already offer CEUs for mindfulness education programs such as those offered through the National Institute for the Clinical Application of Behavioral Medicine.<sup>95</sup> Finally, state and local governments could fund train-the-trainer programs through Area Agencies on Aging, YMCAs, Big Brother/Big Sister groups, and other community organizations.

## **A VISION FOR THE FUTURE**

Our vision is that mindfulness is widely recognized as an indispensable tool in health promotion and disease prevention initiatives, as well as a cost-effective intervention for many chronic conditions and as an adjunct to conventional care. We envision the creation of mindfulness programs (using the MBSR program as a basic model) for a number of constituencies across a variety of settings. A number of

---

these programs already exist, such as mindfulness-based cognitive therapy, mindfulness-based chronic pain management, and mindful eating for bariatric patients, and these can serve as templates.

Mindfulness training for patients with conditions shown to be responsive to this intervention will become the standard of care, reducing costs and improving health outcomes across a spectrum of diseases and conditions. We envision a widespread inclusion of mindfulness training in the healthcare education system. Health professions training will integrate concepts and techniques of mindfulness into the existing professionalism and humanism curricula, diminishing burnout, reducing clinical errors, and enhancing patient care. Large-scale public health initiatives will leverage our understanding of the mind-body connection and the role of stress in determining health behavior by including components of mindfulness training in their health promotion efforts to combat obesity, substance abuse, cigarette smoking, domestic and school violence, and prevalent mental health disorders such as anxiety and depression.

Telemedicine will be employed to expand access to high-quality mindfulness training and maintenance programs. Internet-based instruction will connect individuals with mindfulness teachers in the virtual classrooms accessible through clinics, schools, workplaces, community centers, and households across the United States. Mindfulness meditation teachers, who formerly were limited by their geographic location in their ability to train students, will be able to reach a far greater audience. In this way, mindfulness meditation will become a key component of self-care for health promotion, as well as an important adjunct to conventional clinical care.

## RESEARCH AND POLICY RECOMMENDATIONS

Practical next steps include the expansion of research that explores the mechanisms of mindfulness in different diseases, compares its effects with other approaches in diverse populations, investigates different delivery models, demonstrates cost-savings, and establishes training requirements. We also need to explore the implementation of mindfulness training in different settings, such as workplaces, clinics, schools, and community centers.

1. Comparative effectiveness studies need to evaluate mindfulness practice against usual care for individuals with anxiety and depression, pain, cardiovascular disease, and other chronic conditions.<sup>96</sup>
2. The feasibility, effectiveness, and cost savings need to be studied of mindfulness practices and modalities in diverse populations (eg, ethnicity, age, gender, rural/urban) in the United States.
3. Cost-effectiveness studies need to demonstrate the cost savings associated with mindfulness interventions compared with usual care in populations for which there are already reliable records of cost (eg, Medicare).
4. Large-scale, longitudinal effectiveness studies are needed that document the cascade of positive side effects of mindfulness. Research into this area has been slow to emerge due to the tendency of scientific study to narrow its focus to one symptom or condition in the interests of clarity and precision). Although this reductionist approach has many benefits, it can miss the “big picture.” Developing a new kind of “person-centered” rather than “disease-centered” research model could assist us in better comprehending the cascade of positive effects characteristic of mindfulness interventions.
5. Rigorous research on telemedicine and the delivery of mindfulness training, comparing mindfulness instruction in the virtual classroom with face-to-face instruction, needs to continue.
6. Should additional research support the findings of the virtual classroom as an effective and inexpensive delivery medium, equitable insurance and flexible-spending reimbursements for Internet-based interventions should be considered.
7. Veterans Affairs Medical Centers would be an ideal setting for multi-site trials of mindfulness for PTSD, cardiovascular disease, substance abuse, depression, and other conditions that are prevalent in this population, evaluating both its efficacy and cost-savings.
8. Mindfulness-based training programs could be implemented and evaluated at federal workplaces and healthcare centers (eg, Veterans Affairs Medical Centers).
9. Employers who offer mindfulness programs and collect data on the cost savings related to reduced absenteeism, better employee retention, and enhanced productivity could receive tax incentives and/or discounts on health insurance products.
10. Institutions responsible for health professions education can begin the process of integrating mindfulness training into their curricula for the benefit of both practitioners and patients. This effort could be supported through National Institutes of Health training grants.
11. It is important to understand the extent to which clinicians understand the health benefits of mindfulness practices so they will recommend these modalities to their patients. Although the research evidence on the benefits of mindfulness practice are well established, these modalities have not been disseminated widely to the general public, and research on healthcare professionals’ attitudes and knowledge of mindfulness is critical in implementing these programs. Making mindfulness training a required component of annual CEUs would be one way to further education amongst healthcare professionals.
12. Because the practice of defensive medicine costs approximately \$210 billion each year, we need studies that explore how mindfulness training influences physician-patient communication. Previous research suggests that physicians with better communication skills are less likely to be the targets of malpractice suits. Can mindfulness training of health professionals decrease the incidence and fear of litigation, thereby reducing the practice of defensive medicine?
13. We need to conduct studies exploring the impact of mindfulness training on clinician errors (currently costing about \$17 billion annually) and health staffing turnover (\$21 billion).
14. Evaluating school-based mindfulness training will help us to understand how best to implement the mindful-schools model currently being developed, and whether this approach can be a corner-

stone of pediatric public health promotion in the future.

## CONCLUSION

Mindfulness practices can be an important tool in addressing our public health problems. Mindfulness training can enhance other nationwide health promotion efforts by helping people become more self-aware, more resilient to stress, and more responsible about their lifestyle choices. One of the great advantages of mindfulness training is that it assists people in making those lifestyle changes we all know we should make. It is one thing to *know* that smoking or obesity very often lead to disease, but another thing to have the capacity for behavioral change. Mindfulness-based practices can help us to cope with psychological stress and support us while we make the lifestyle changes we know will help us to become healthier. Creating a “culture of wellness” entails promoting a culture of self-responsibility, which requires a society composed of individuals cultivating self-awareness.

As researchers have repeatedly noted, by increasing awareness in the present moment, we can interrupt existing patterns of behavior and make wiser choices. In essence, practicing mindfulness skills throughout the day leads to the possibility of a different relationship to any situation. With mindfulness, one moves from being distracted and inattentive, or stuck on “autopilot,” to being present and aware in every moment. In this way, mindfulness training can help individuals make and sustain the lifestyle changes that lead to improved health. The regular practice of mindfulness meditation can also help our bodies to become more “stress hardy,” less likely to succumb to the wear and tear of chronic psychological stress. As the evidence mounts that the mind exerts a real and demonstrable influence on the central nervous system, the endocrine system, and the immune system, policy makers are called upon to explore the ways in which training the mind can prevent disease and promote the health of populations. What the scientific studies suggest is that we have, within us, the key to better health. Mindfulness practices unlock this potential and greatly increase the odds of avoiding debilitating and costly disease, while simultaneously improving quality of life, enhancing mood, and promoting general well-being.

At a hearing in June 2009, Tim Ryan, representative from the state of Ohio, asked Department of Health and Human Services Secretary Kathleen Sebelius to keep in mind the positive effects of mindfulness when reworking the nation's healthcare system.<sup>97</sup> “When we have these discussions about healthcare, there's always an issue we never really talk about, and it's the issue of stress,” Ryan said. “A lot of us are seeing it in our Congressional districts because of the economic situation we're dealing with. And the issue of stress leads to, I think, we know, increased illness.” Sebelius agreed that the technique was useful as a form of preventive medicine that could reduce the need for more costly treatments. “I think it's a prevention strategy that I know has the potential of paying huge dividends.” Sebelius said.

Regardless of who pays for healthcare in the United States, the costs must come down. Without a reduction in healthcare expenditures, no system will be sustainable for long. Applying what we know about the potential for mindfulness-based interventions to prevent disease, promote health, treat chronic conditions, and improve the quality of care may well turn out to be a cornerstone of a more humane, equitable, and effective approach to health and healthcare that can actually reduce costs in a meaningful way. Leveraging the body's innate capacity to heal itself may be the key to creating a sustainable healthcare system for the 21st century.

## REFERENCES

1. Gordon JS, *Manifesto for a New Medicine*. Reading Mass: Perseus Books; 1996:107-108.
2. Keenan PS. What's driving health care costs? November 2004. The Commonwealth Fund/Kennedy School of Government Bipartisan Congressional Health Policy Conference, January 15-17, 2004.
3. Cutler D, McClellan M. Is technological change in medicine worth it? *Health Aff*. 2001;20(5):11-29.
4. *Hearings Before the Committee on Health, Education, Labor, and Pensions*. Access to Prevention and Public Health for High-Risk Populations. (2009) (testimony of Risa Lavizzo-Mourey, MD, MBA, president and CEO, Robert Wood Johnson Foundation. Available at: <http://www.rwjf.org/about/product.jsp?id=37948>. Accessed June 18, 2009.

5. National Center for Complementary and Alternative Medicine. Mind-body medicine: an overview. *Background*. October 2004. Available at: [http://nccam.nih.gov/health/whatiscam/mind-body/D239\\_BKG.pdf](http://nccam.nih.gov/health/whatiscam/mind-body/D239_BKG.pdf). Accessed June 30, 2009.
6. Sobel DS. Mind matter, money matters: the cost effectiveness of mind-body medicine. *JAMA*. 2000;284:1705.
7. *The New Medicine* [documentary]. 2006. Minneapolis, MN: Bravewell Collaborative.
8. Chopra D, Ornish D, Roy R, Weil A. Alternative medicine is mainstream. *Wall Street Journal*. Jan 9, 2009, A13.
9. Yusef S, Hawken S, Ounpuu S, et al. Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case control study. *Lancet*. 2004;364:937-952.
10. Hemingway H, Marmot M. Evidence based cardiology: psychosocial factors in the aetiology and prognosis of coronary heart disease. Systematic review of prospective cohort studies. *BMJ*. 1999;318:1460-1467.
11. Innes KE, Vincent HK, Taylor AG. Chronic stress and insulin resistance-related indices of cardiovascular disease risk, part 2: a potential role for mind-body therapies. *Altern Ther Health Med*. 2007;13:44-51.
12. Anderson JW, Liu C, Kryscio RJ. Blood pressure response to transcendental meditation: a meta-analysis. *Am J Hypertens*. 2008;21:310-316.
13. Schneider RH, Walton KG, Salerno JW, Nidich SI. Cardiovascular disease prevention and health promotion with the TM program. *Ethn Dis*. 2006;16(3 suppl 4):15-26.
14. Dusek JA, Hibberd PL, Buczynski B, et al. Stress management versus lifestyle modification on systolic hypertension and medication elimination: a randomized trial. *J Altern Complement Med*. 2008;14:129-138.
15. Curiati JA, Bocchi E, Freire JO, et al. Meditation reduces sympathetic activation and improves the quality of life in elderly patients with optimally treated heart failure: a prospective randomized study. *J Altern Complement Med*. 2005;11:465-472.
16. Walton KG, Schneider RH, Salerno JW, Nidich SI. Psychosocial stress and cardiovascular disease. [Part 3: TM] *Behavioral Modification*. 2005;30(4):173-183.
17. Jayadevappa R, Johnson JC, Bloom BS, et al. Effectiveness of transcendental meditation on functional capacity and quality of life of African Americans with congestive heart failure: a randomized controlled study. *Ethn Dis*. 2007;17:72-77.

18. Omish D, Scherwitz LW, Billings JH, et al. Intensive lifestyle changes for reversal of coronary heart disease. *JAMA*. 1998;280:2001-2007.
19. Davidson RJ, Kabat-Zinn J, Schumacher J, et al. Alterations in brain and immune function produced by mindfulness meditation. *Psychosom Med*. 2003;65:564-570.
20. Pace TW, Negi LT, Adame DD, et al. Effect of compassion meditation on neuroendocrine, innate immune and behavioral responses to psychosocial stress. *Psychoneuroendocrinology*. 2009;34:87-98.
21. Witek-Janusek L, Albuquerque K, Chroiniac KR, et al. Effect of mindfulness-based stress reduction on immune function, quality of life, and coping in women newly diagnosed with early stage breast cancer. *Brain Behav Immun*. 2008;22:969-981.
22. Carlson LE, Speca M, Patel KD, Goodey E. Mindfulness-based stress reduction in relation to quality of life, mood, symptoms of stress and levels of cortisol, DHEAS and melatonin in breast and prostate cancer outpatients. *Psychoneuroendocrinology*. 2004;29:448-474.
23. Farb NA, Segal ZV, Mayberg H, et al. Attending to the present: mindfulness meditation reveals distinct neural modes of self-reference. *Soc Cogn Affect Neurosci*. 2007;2:313-322.
24. Lazar SW, Kerr CE, Wasserman RH, et al. Meditation experience is associated with increased cortical thickness. *Neuroreport*. 2005;16:1893-1897.
25. Lutz A, Brefczynski-Lewis J, Johnstone T, Davidson RJ. Regulation of the neural circuitry of emotion by compassion meditation: effects of meditative expertise. *PLoS One*. 2008;3:e1897.
26. Luders E, et al. The underlying anatomical correlates of long-term meditation: larger hippocampal and frontal volumes of gray matter. *Neuroimage*. 2009;45:672-678.
27. Siegel DJ. *The Mindful Brain*. New York, NY: Norton; 2007.
28. Shapiro SL. The integration of mindfulness and psychology. *J Clin Psychol*. 2009;65:555-560.
29. Kuyken W, Byford S, Taylor RS, et al. Mindfulness-based cognitive therapy to prevent relapse in recurrent depression. *J Consult Clin Psychol*. 2008;76:966-978.
30. Miller J, Fletcher K, Kabat-Zinn J. Three-year follow-up and clinical implications of a mindfulness meditation-based stress reduction intervention in the treatment of anxiety disorders. *Gen Hosp Psychiatry*. 1995;17:192-200.
31. Cuellar NG. Mindfulness meditation for veterans—implications for occupational health providers. *AAOHNJ*. 2008;56:357-363.
32. Gorden JS, Staples JK, Blyta A, Bytygi M, Wilson AT. Treatment of post-traumatic stress disorder in postwar Kosovar adolescents using mind-body skills groups: a randomized controlled trial. *J Clin Psychiatry*. 2008;69:1469-1476.
33. Bormann JE, Smith TL, Becker S, et al. Efficacy of frequent mantram repetition on stress, quality of life, and spiritual well-being in veterans: a pilot study. *J Holist Nurs*. 2005;23:395-414.
34. Greeson JM. Mindfulness research update 2008. *Complementary Health Practice Review Online First*. January 13, 2009;0:1533210108329862V1.
35. Davis JM, Fleming MF, Bonus KA, and Baker TB. A pilot study on mindfulness based stress reduction for smokers. *BMC Complementary and Alternative Medicine*. 2007;7:2.
36. Kristeller JL, Baer RA, Quillian-Wolever R. Mindfulness-based approaches to eating disorders. In: Baer RA, ed. *Mindfulness-Based Treatment Approaches: A Clinician's Guide to Evidence Base and Applications*. San Diego, Calif: Academic Press; 2006:75-91.
37. Bowen S, Witkiewitz K, et al. Mindfulness meditation and substance use in an incarcerated population. *Psychol Addict Behav*. 2006;20:343-347.
38. Witkiewitz K, Marlatt A, Walker D. Mindfulness-based relapse prevention for alcohol and substance use disorders. *J Cogn Psychother*. 2005;19:211-228.
39. Bowen S, Witkiewitz K, Dillworth TM, Marlatt GA. The role of thought suppression in the relationship between mindfulness meditation and alcohol use. *Addict Behav*. 2007;32:2324-2328.
40. Greeson. 2009;0:1533210108329862V1.
41. Langer EJ and Rodin J. 1976. Long-term effects of a control-relevant intervention with the institutionalized aged. *J Personality and Social Psychology*. 1977;35:897-902.
42. Rodin J and Langer EJ. 1977. Long-term effects of a control-relevant intervention with the institutionalized aged. *J Personality and Social Psychology*. 1977;35:897-902.
43. Langer EJ. *Counterclockwise: Mindful Health and the Power of Possibility*. New York, NY: Ballantine Books; 2009.
44. Crum AJ, Langer EJ. Mind-set matters: exercise and the placebo effect. *Psychol Sci*. 2007;18:165-171.
45. Dusek JA, Otu HH, Wohlhueter AL, et al. Genomic counter-stress changes induced by the relaxation response. *PLoS One* 2008; 3:e2576.
46. Ludwig DS, Kabat-Zinn J. Mindfulness in medicine. *JAMA*. 2008;300:1350-1352.
47. Jain S, Shapiro SL, Swanick S, et al. A randomized controlled trial of mindfulness meditation versus relaxation training: effects on distress, positive states of mind, rumination, and distraction. *Ann Behav Med*. 2007;33:11-21.
48. Baer RA. Mindfulness training as clinical intervention: a conceptual and empirical review. *Clin Psychol (New York)*. 2003;10:125-143.
49. Baer RA, ed. *Mindfulness-Based Treatment Approaches. Clinician's Guide to Evidence Base and Applications*. San Diego, Calif: Academic Press; 2006.
50. Kristeller, Baer RA, Quillian-Wolever R, et al. 2006.
51. Kreitzer MJ, et al. Longitudinal impact of mindfulness meditation on illness burden in solid-organ transplant recipients. *Prog Transplant*. 2005;15:166-172.
52. Morone NE, et al. "I felt like a new person"—the effects of mindfulness meditation on older adults with chronic pain: qualitative narrative analysis of diary entries. *J Pain*. 2008;9:841-848.
53. Kabat-Zinn, et al. Influence of mindfulness-meditation based stress reduction intervention on rate of skin clearing in patients with moderate to severe psoriasis undergoing phototherapy (UVB) and photochemotherapy (PUVA). *Psychosom Med*. 1998;60:625-632.
54. Rosenzweig S, et al. Mindfulness-based stress reduction is associated with improved glycemic control in Type 2 diabetes mellitus: a pilot study. *Altern Ther Health Med*. 2007;13:36-38.
55. Grossman P, Tiefenthaler-Gilmer U, Raysz A, Kesper U. Mindfulness training as an intervention for fibromyalgia: evidence of post-intervention and 3-year follow-up benefits in well-being. *Psychother Psychosom*. 2007;76:226-233.
56. Zutra AJ, Davis MC, Reich JW, et al. Comparison of cognitive behavioral mindfulness meditation interventions on adaptation to rheumatoid arthritis for patients with and without history of recurrent depression. *J Consult Clin Psychol*. 2008;76:408-421.
57. Pradhan EK, Baumgarten M, Langenberg P, et al. Effect of mindfulness-based stress reduction in rheumatoid arthritis patients. *Arthritis Rheum*. 2007;57:1134-1142.
58. Zylowska L, Ackerman DL, Yang MH, et al. Mindfulness meditation training in adults and adolescents with ADHD: a feasibility study. *J Atten Disord*. 2008;11:737-746.
59. Creswell JD, Myers HF, Cole SW, Irwin MR, et al. Mindfulness meditation training effects on CD4+ T lymphocytes in HIV-1 infected adults: a small, randomized controlled trial. *Brain Behav Immun*. 2009;23:184-188.
60. Sullivan MJ, Wood L, Terry J, et al. The Support, Education, and Research in Chronic Heart Failure Study (SEARCH): a mindfulness-based psychoeducational intervention improves depression and clinical symptoms in patients with chronic heart failure. *Am Heart J*. 2009;157:84-90.

61. Praissman S. Mindfulness-based stress reduction: a literature review and clinician's guide. *J Am Acad Nurse Pract.* 2008;20:212-216.
62. Roth B and Stanley TW. Mindfulness-based stress reduction and healthcare utilization in the inner city: preliminary findings. *Altern Ther Health Med.* 8:60-62, 64-66.
63. Singh NN, Lancioni GE, Winston AS, et al. Clinical and benefit-cost outcomes of teaching a mindfulness-based procedure to adult offenders with intellectual disabilities. *Behav Modif.* 2008;32:622-637.
64. Majumdar M, Grossman P, Dietz-Waschkowski B, Kersig S, Walach H. Does mindfulness meditation contribute to health? Outcome evaluation of a German sample. *J Altern Complement Med.* 2002;8:719-730.
65. Kavilanz PB. Health care's big money wasters. *CNN.com.* August 2009. Available at: [http://money.cnn.com/2009/08/10/news/economy/healthcare\\_moneywasters/index.htm](http://money.cnn.com/2009/08/10/news/economy/healthcare_moneywasters/index.htm).
66. Levinson W, Roter DL, Mullooly JP, Dull VT, Frankel RM. Physician-patient communication. The relationship with malpractice claims among primary care physicians and surgeons. *JAMA.* 1997;277:553-559.
67. Kabat-Zinn J. Mindfulness meditation. What it is, what it isn't and its role in health care and medicine. In: Haruki Y, Ishii Y, Suzuki M, eds. *Comparative and Psychological Study on Meditation.* Delft, The Netherlands: Eburon; 1996:161-170.
68. Baime MJ. Meditation and spirituality for health care providers. In: Chez RA, Jonas WB, eds. *Spiritual Transformation and Health Throughout the Lifecyle.* Alexandria, Va: Samuelli Institute for Information Biology; 2003:42-52.
69. Brown KW, Ryan RM. The benefit of being present: mindfulness and its role in psychological well-being. *J Person Soc Psychol.* 2003;84:822-848.
70. Epstein RM. Mindful practice. *JAMA.* 1999;282:833-839.
71. Smith RC, Dorsey AM, Lyles JS, Frankel RM. Teaching self-awareness enhances learning about patient-centered interviewing. *Acad Med.* 1999;74:1242-1248.
72. Novack DH, Suchman AL, Clark W, et al. Calibrating the physician: personal awareness and effective patient care. *JAMA.* 1997;278:502-509.
73. Shapiro SL, Schwartz GE, Bonner G. Effects of mindfulness-based stress reduction on medical and premedical students. *J Behavioral Medicine.* 1998;21:581-599.
74. Meier DE, Back AL, Morrison RS. The inner life of physicians and care of the seriously ill. *JAMA.* 2001;286:3007-3014.
75. Milstein JM, Gerstenberger AE, Barton S. Healing the caregiver. *J Altern Complement Med.* 2002;8:917-920.
76. Rosenzweig S, Reibel DK, Greeson JM, Brainard GC, Hojat M. Mindfulness-based stress reduction lowers psychological distress in medical students. *Teach Learn Med.* 2003;15:88-92.
77. Beddoe AE, Murphy SO. Does mindfulness decrease stress and foster empathy among nursing students? *J Nurs Educ.* 2004;43:305-312.
78. Oman D, Richards TA, Hedberg J, Thoresen CE. Passage meditation improves caregiving self-efficacy among health professionals: a randomized trial and qualitative assessment. *J Health Psychol.* 2008;13:1119-1135.
79. Irving JA, Dobkin PL, Park J. Cultivating mindfulness in health care professionals: a review of empirical studies of mindfulness-based stress reduction (MBSR). *Complement Ther Clinl Pract.* 2009;15:61-66.
80. Grepmaier L, Mitterlehner F, Loew T, et al. Promoting mindfulness in psychotherapists in training influences the treatment results of their patients: a randomized, double-blind, controlled study. *Psychother Psychosom.* 2007;76:332-338.
81. Greene JW, Walker LS. Psychosomatic problems and stress in adolescence. *Pediatr Clin North Am.* 1997;11:1557-1572.
82. Mindful Schools: A Community Outreach Program of Park Day School. <http://www.mindfulschools.org>. Accessed July 5, 2009.
83. Biegel GM, Shapiro SL, Brown KW, et al. Mindfulness-based stress reduction for the treatment of adolescent psychiatric outpatients: a randomized clinical trial. *J Clin Consult Psychol.* 2009;77:855-866.
84. Frydenberg E, et al. Prevention is better than cure: coping skills training for adolescents in school. *Educ Psychol Pract.* 2004;20:117-134.
85. Drossman DA, et al. Sexual and physical abuse and gastrointestinal illness: review and recommendations. *Ann Inter Med.* 1995;123:782-794.
86. Finnerstone HM, et al. Chronic pain and health care utilization in women with a history of childhood sexual abuse. *Child Abuse Negl.* 2000;24:547-556.
87. Dube SR, Fairweather D, Pearson WS, Felitti VJ, Anda RF. Cumulative childhood stress and autoimmune diseases in adults. *Psychosom Med.* 2009;71:243-250.
88. Main law requires health plans to cover telemedicine services. [www.iHealthBeat.org](http://www.iHealthBeat.org). Last accessed June 12, 2009. Available at: <http://www.ihealthbeat.org/Articles/2009/>. California Healthcare Foundation.
89. Bashur RL, Shannon GW. National telemedicine initiatives: essential to healthcare reform. *Telemed eHealth.* 2009;15:1-11.
90. Barak A, et al. A comprehensive review and a meta-analysis of the effectiveness of Internet-based psychotherapeutic interventions. *J Technol Hum Serv.* 2008;26:109-169.
91. Perini S, Titov N, Andrews G. Clinician-assisted Internet-based treatment is effective for depression: randomized controlled trial. *Austr N Z J Psychiatry.* 2009;43:571-578.
92. Gardner-Nix J, Backman S, Barbati J, Grummitt J. Evaluating distance education of a mindfulness-based meditation programme for chronic pain management. *J Telemed Telecare.* 2008;14:88-92.
93. Yuen E, Baime MJ. Meditation and healthy aging. In: Mackenzie ER, Rakel B, eds. *Complementary and Alternative Medicine for Older Adults.* New York, NY: Spring Publishing; 2006.
94. Williams ES, Konrad TR, Scheckler WE, et al. Understanding physicians' intentions to withdraw from practice: the role of job satisfaction, job stress, mental and physical health. *Health Care Manage Rev.* 2001;26:7-19.
95. National Institute for Clinical and Behavioral Medicine. Available at: <http://www.nicabm.com>. Last accessed July 2009.
96. Institute of Medicine. *Initial National Priorities for Comparative Effectiveness Research: Report Brief.* National Academy of the Sciences June 30, 2009. <http://www.iom.edu/en/Reports/2009/ComparativeEffectivenessResearchPriorities.aspx>.
97. Zimmerman E. Add meditation to health-care bill. *The Hill.* June 10, 2009. Available at: <http://thehill.com/blogs/blog-briefing-room/news/legislation/34859-congressman-add-meditation-to-healthcare-bill>. Last accessed June 30, 2009.



By Mark R. Chassin and Jerod M. Loeb

# The Ongoing Quality Improvement Journey: Next Stop, High Reliability

DOI: 10.1377/hlthaff.2011.0076  
HEALTH AFFAIRS 30,  
NO. 4 (2011): 559–568  
©2011 Project HOPE—  
The People-to-People Health  
Foundation, Inc.

**ABSTRACT** Quality improvement in health care has a long history that includes such epic figures as Ignaz Semmelweis, the nineteenth-century obstetrician who introduced hand washing to medical care, and Florence Nightingale, the English nurse who determined that poor living conditions were a leading cause of the deaths of soldiers at army hospitals. Systematic and sustained improvement in clinical quality in particular has a more brief and less heroic trajectory. Over the past fifty years, a variety of approaches have been tried, with only limited success. More recently, some health care organizations began to adopt the lessons of high-reliability science, which studies organizations such as those in the commercial aviation industry, which manage great hazard extremely well. We review the evolution of quality improvement in US health care and propose a framework that hospitals and other organizations can use to move toward high reliability.

**Mark R. Chassin** (mchassin@jointcommission.org) is president of the Joint Commission, in Oakbrook Terrace, Illinois.

**Jerod M. Loeb** is executive vice president for health care quality evaluation at the Joint Commission.

Efforts to improve the quality of health care have used a wide variety of approaches. In the past half-century all of the following have been in vogue at one time or another: redesigning professional education; improving peer review of physician practice; re-engineering systems of care; increasing competition among provider organizations; publicly reporting data on quality; rewarding good performance; punishing bad performance; applying continuous quality improvement or total quality management tools; and measuring and improving the culture of health care organizations to facilitate the adoption of safer systems of care.<sup>1-4</sup>

The answers to vexing quality and safety problems have often appeared clear, and victory has been declared over and over again. Unfortunately, although many small successes have been achieved, they have often been short-lived. And they have not been enough to solve complex, persistent, and deeply rooted quality and safety problems.<sup>5</sup>

Early attempts at quality improvement include

the work of epic figures such as Ignaz Semmelweis, the nineteenth-century obstetrician who introduced hand washing to medical care, and Florence Nightingale, the English nurse who determined that poor living conditions were a leading cause of death of soldiers at army hospitals. Later came pioneers such as Ernest Amory Codman, a crusader for the creation of hospital standards, whose strategy was to assess carefully the end results of care. The efforts of Codman and Abraham Flexner, who in 1910 wrote a groundbreaking report on medical education, jump-started efforts to improve clinical quality at the beginning of the twentieth century. Another important impetus was the American College of Surgeons' formation of the Hospital Standardization Program—the predecessor of the Joint Commission, the not-for-profit organization that accredits and certifies health care organizations (and where Mark Chassin, an author of this paper, serves as president).<sup>6</sup>

## Improvement Efforts In The Early Days Of Medicare

Although the creation of Medicare in 1965 improved access to care, it did little to improve the quality of care that the newly insured could receive. However, in the following year Avedis Donabedian created the first conceptual framework for measuring health care quality—a framework that has powerfully influenced all subsequent efforts to improve quality. Donabedian proposed that quality could be measured by assessing structures, processes, and outcomes of care.<sup>7</sup>

About the same time, researchers began to use new scientific approaches to gather evidence on the contributions of specific clinical practices to improved outcomes. The modern randomized controlled trial had been born in 1948, with a report from the UK Medical Research Council on the treatment of pulmonary tuberculosis.<sup>8</sup> By the 1960s a few hundred articles based on such trials were being published each year in the medical literature. By the mid-1990s that number was 10,000 per year.<sup>9</sup> Today the Cochrane Central Register of Controlled Trials, a bibliographic database of definitive controlled trials, contains more than 640,000 reports.<sup>10</sup>

Although the growing collection of evidence shed light on the clinical efficacy of a variety of tests and treatments, it also magnified the problem of how to rapidly incorporate knowledge of what works into daily care for patients. Andrew Balas and Suzanne Boren have found that it takes an average of seventeen years for research to reach clinical practice.<sup>11</sup>

**UTILIZATION REVIEW COMMITTEES** The law that created Medicare also required hospitals to establish utilization review committees, primarily to identify whether hospital medical staffs were providing appropriate clinical services and to prevent fraud. Identifying ways to improve care, although desirable, was rarely part of utilization review.<sup>12</sup> In addition, these review committees were relatively powerless in terms of improving care because there were no formal evaluation criteria to guide providers' decision making, and no mechanisms to adjust payment based on the quality of care.

**EXPERIMENTAL MEDICAL CARE REVIEW ORGANIZATIONS** Partly because of the ineffectiveness of these utilization review committees, in 1971 Congress created the next generation of quality oversight entities. Called experimental medical care review organizations, these were associations of physicians that were administered and funded by the National Center for Health Services Research. These organizations reviewed inpatient and ambulatory services for quality and appropriateness of care, and they developed

pilot projects that linked quality review with identified improvement strategies. The organizations were themselves pilots. They became the model for Medicare's professional standards review organizations, which were established by the Social Security Amendments of 1972.

**PROFESSIONAL STANDARDS REVIEW ORGANIZATIONS** These organizations, like their experimental predecessors, were not-for-profit physician membership organizations. They were funded by federal grants, and their functions were to assess the medical necessity, appropriateness, and quality of inpatient care and services. They were intended to ensure that physicians and hospitals met their obligations under Medicare to provide high-quality care—obligations that included not overusing services, in spite of the incentives to do so that were implicit in fee-for-service payment.

The organizations were run entirely by physicians and were designed to help oversee the quality of inpatient medical practice. However, they were not supported by the American Medical Association, which viewed them as a type of governmental intrusion into medical practice.<sup>13</sup> By the early 1980s the consensus was that despite annual budgets of over \$170 million, the organizations had not succeeded in keeping Medicare costs down or in improving quality.

**PEER REVIEW ORGANIZATIONS** In 1983 the professional standards review organizations were replaced by the Medicare Utilization and Quality Control Peer Review Organization program, which later became the Quality Improvement Organization program. The principal focus of the new organizations was to control costs by monitoring the use of services.<sup>14</sup> They were designed to work with another innovation: a prospective payment system based on diagnosis-related groups for inpatient care under Medicare. In this system, a predetermined rate was set for reimbursing hospitals for treatment of specific illnesses—an arrangement that gave providers strong incentives to reduce costs below the set levels. The peer review organizations' original charge was to make sure that services provided for Medicare beneficiaries were appropriate, medically necessary, and of high quality.

Instead of being funded by federal grants, like their predecessors, the new organizations submitted competitive bids for contracts covering certain quality-related activities, such as reviewing medical records for evidence of preventable complications and unnecessary invasive procedures. The initial contracts focused on reducing the inappropriate use of services, but later contracts stressed ensuring or improving quality more broadly. In spite of that shift in emphasis, the paucity of data on evidence-based interven-

tions limited the organizations' effectiveness.

Yet research was demonstrating that a combination of results from randomized controlled trials, data from observational studies, and expert consensus could be used to develop evidence-based recommendations that physicians could use to deliver more-effective clinical care. These recommendations came to be known as clinical practice guidelines. The premise was that clinical care would improve if physicians had ready access to a distillation of evidence in the form of the specific recommendations contained in these guidelines.<sup>15</sup>

### The Development Of Practice Guidelines

New data suggesting the existence of large geographic variations in practice patterns within Medicare that were not supported by clinical evidence, along with studies showing that the inappropriate use of common medical and surgical procedures was widespread, helped spark congressional interest in a new program of research on the outcomes and effectiveness of medical treatment.<sup>16,17</sup> In 1989 the Agency for Health Care Policy and Research—later renamed the Agency for Healthcare Research and Quality—was created, replacing the National Center for Health Services Research.

The new agency initially had bipartisan support in Congress, which charged it with developing practice guidelines and conducting research. It was to focus on the more practical aspects of health care delivery (primarily cost and quality) rather than on basic biomedical research.<sup>17</sup> And it was to pay particular attention to addressing large variations in practice and extensive inappropriate use of services.

The agency funded a series of Patient Outcomes Research Teams, multidisciplinary groups designed to review and synthesize clinical evidence, analyze practice variations, and assess patient outcomes. The agency also convened panels of experts that used all available evidence of effectiveness to develop clinical practice guidelines for a variety of clinical conditions. The guidelines were designed to prompt physicians to rely on scientific evidence in providing clinical care. At the same time, the movement to develop and promulgate guidelines gathered momentum, independent of the federal guideline development activity and under the auspices of a number of professional organizations, including the American College of Physicians, the American College of Cardiology, and the American Heart Association.<sup>18,19</sup>

By the late 1980s researchers were increasingly documenting serious and persistent problems in

health care quality.<sup>20</sup> At the same time, hospitals and health systems began applying improvement methods that had worked in industry, such as continuous quality improvement.<sup>21,22</sup> Some of these approaches had been around since the 1920s, although not used in health care.

The Joint Commission modified its traditional accreditation process—which was based on standards like those pertaining to the relationship between organized medical staffs and hospitals—to focus more on Donabedian's framework of structure, process, and outcome.<sup>7</sup> Also, for the first time, the Joint Commission announced that it would require accredited organizations to use evidence-based measures of performance as part of their quality improvement programs, many of which were contained in clinical guidelines.<sup>6,23</sup> For example, work began to examine existing clinical guidelines for trauma care, oncology and cardiovascular care for measures suitable for this use.<sup>23</sup>

Randomized controlled trials continued to produce evidence of linkages between specific processes of care and clinical outcomes. This led to the development of many new performance measures, particularly for common clinical conditions such as acute myocardial infarction, heart failure, and pneumonia. Although there was growing interest on the part of providers, policy makers, and patients in the direct measurement of clinical outcomes, the technical challenges involved were substantial. Risk adjustment was especially complicated. Different patients admitted to a particular hospital have various risk factors that influence particular outcomes. To enable meaningful comparisons of outcomes across hospitals, differences in these risk factors among patients must be measured, and the data combined into one composite measure or score.<sup>24</sup>

### The Turn Away From Guidelines

In the mid-1990s, during President Bill Clinton's efforts to reform the health care delivery system, the literature on "what works" in health care continued to grow. However, shifting political winds in Congress set the stage for the near-demise of the Agency for Health Care Policy and Research, which was the principal funder for a large amount of the work on clinical quality.<sup>17</sup>

The attempt to dismantle the agency began with an effort to cut its budget, particularly in areas that were not deemed to have saved the taxpayer enough money. At the same time, an agency-funded literature review on treatment for low-back pain was published. The review concluded that there was no evidence to support

spinal fusion surgery and suggested that such surgery was commonly accompanied by costly complications. In a concerted effort to discredit agency-funded research, a small group of spine surgeons banded together and publicly criticized the review and the accompanying federal guideline on treatment of acute low-back pain.

Because of the political atmosphere accompanying the debate about health system reform in 1995—and the strong political allies of the spine surgeons—the agency was threatened with extinction in the congressional budgetary process. It survived, but with a sharp reduction in its budget for fiscal year 1996.

Four years later it was given a new name, the Agency for Healthcare Research and Quality, and a modified mandate. The new mandate still included a focus on research related to clinical outcomes and effectiveness as well as Medicare spending, but it no longer included the direct development of clinical practice guidelines. The assumption underlying the agency's creation was that assembling clinical evidence on what works in health care—derived in large part through research funded by the agency—and making it available to providers would increasingly drive improvements in medical practice.<sup>17</sup>

By the turn of the twenty-first century, a great many randomized controlled trials and meta-analyses were providing strong evidence that certain clinical interventions were effective, but it was becoming increasingly clear that patients were often not receiving evidence-based care. Two landmark reports from the Institute of Medicine<sup>25,26</sup> galvanized new efforts to improve quality by further elucidating the magnitude of the problem and reframing it as a matter of patient safety. The new research results, clinical practice guidelines, and improvement strategies were overwhelming to practitioners and health care organizations. They realized that clinical care was inconsistent and performance was often poor, but they struggled to find effective solutions to these problems.

In response to a recommendation of President Clinton's Advisory Commission on Consumer Protection and Quality in the Health Care Industry, the National Quality Forum—a private, not-for-profit organization—was created in 1999. Its mission is to improve health care delivery by promoting the use of standardized quality measurements and public reporting of the resulting data.<sup>27</sup> The National Quality Forum has played an increasingly prominent role in identifying and evaluating measures being used by organizations in the public and private sectors to assess health care quality and patient safety.

## Pockets of excellence coexist with enormously variable performance across the delivery system.

### Where We Are Today

Health care quality and safety today are best characterized as showing pockets of excellence on specific measures or in particular services at individual health care facilities. Excellence across the board is emerging on some important quality measures. In 2009, for example, hospitals, on average, provided life-prolonging beta-blockers to heart attack patients 98 percent of the time. In addition to this very high average, few hospitals demonstrated poor performance: 97 percent of them scored greater than 90 percent on this measure.<sup>28</sup> And hospitals have reduced the percentage of patients who acquire some preventable infections in intensive care units.<sup>29</sup>

In addition, more organizations than ever before are actively engaged in a wide variety of improvement efforts. These include the Medicare quality improvement organizations and a number of state-based initiatives, such as the New York State Cardiac Surgery Reporting System, which stimulates improvement in the outcomes of cardiovascular procedures by collecting and disseminating clinically valid data on risk-adjusted mortality rates by hospital and physician.<sup>30</sup> Private organizations such as the Institute for Healthcare Improvement, the Robert Wood Johnson Foundation,<sup>31</sup> and the Commonwealth Fund have played vital roles in facilitating improvement activities on the part of health care providers and communities. Regional collaboratives of multiple stakeholders<sup>32</sup> have invigorated local improvement efforts, as have numerous initiatives directed by large integrated delivery systems and medical centers.<sup>33</sup> Federal initiatives emanating from the health reform law, such as programs to create accountable care organizations, may further accelerate progress.

What has eluded us thus far, however, is maintaining consistently high levels of safety and quality over time and across all health care services and settings. The pockets of excellence mentioned above coexist with enormously vari-

able performance across the delivery system. Along with some progress, we are experiencing an epidemic of serious and preventable adverse events. These include patients' undergoing surgical procedures intended for others,<sup>34</sup> fires in operating rooms,<sup>35</sup> and patients' committing suicide while in the care of hospitals.<sup>36</sup>

Moreover, the available evidence suggests that the risk of harmful error in health care may be increasing. As new devices, equipment, procedures, and drugs are added to our therapeutic arsenal, the complexity of delivering effective care increases. Complexity greatly increases the likelihood of error, especially in systems that perform at low levels of reliability.

The most complex health care is delivered in hospitals, which are populated by patients whose severity and acuity of illness have been increasing inexorably. This is because many of the least sick patients no longer require hospital stays to receive the care they need. For example, patients are no longer admitted to hospitals for diagnostic evaluations. Surgical procedures previously performed only in hospitals with considerable lengths-of-stay are now routinely and safely done in ambulatory settings. Treatments such as long-term intravenous infusions for combating certain serious infections are performed safely at home. Thus, we face the intersection of two interrelated trends: Hospitals house patients who are increasingly vulnerable to harm due to error, and the complexity of the care hospitals now provide increases the likelihood of those errors.

The need for major improvements in safety and quality has never been greater. Yet current approaches are not producing the pace, breadth, or magnitude of improvement that all stakeholders desire. Along with a number of other observers, we believe that it is essential to look outside health care for solutions.<sup>37</sup> Specifically, we should first get a clear picture of how complex organizations establish and maintain extremely high levels of safety. Then we must apply the lessons we learn from them to health care.

### High Reliability In Health Care

The study of "high reliability"—or consistent performance at high levels of safety over long periods of time—began with investigations of organizations that manage extreme hazards with exemplary safety records, far better than those in health care today. At the turn of the twenty-first century, knowledge of this science was only beginning to seep into health care. Today we have studies of many different "high-reliability organizations," including the nuclear power industry, the commercial air travel system, and the flight decks of aircraft carriers.<sup>37</sup> These studies

have revealed several common key features that facilitate the maintenance of consistent excellence.

These principles have been well described elsewhere.<sup>38</sup> Together they make up what Karl Weick and Kathleen Sutcliffe have called a "collective mindfulness," which is a dominant attitude or cultural feature that all high-reliability organizations display.

Collective mindfulness means that everyone who works in these organizations, both individually and together, is acutely aware that even small failures in safety protocols or processes can lead to catastrophic adverse outcomes. As a matter of routine, workers in these organizations are always searching for the smallest indication that the environment or a key safety process has changed in some way that might lead to failure, if some action is not taken to solve the problem. Continuously uncovering these safety concerns permits an organization to identify safety or quality problems at a stage when they are easily fixed. In health care we are too often in the position of investigating severe adverse events after they have injured patients, which means that we have missed opportunities to pinpoint and correct quality problems before they cause harm.

In addition to the overarching atmosphere of collective mindfulness, high-reliability organizations have two other features in common. First, after organizations identify potential deficiencies in safety processes, they eliminate these deficiencies through the use of powerful tools to improve their processes. These are the tools of robust process improvement, described below.

Second, the organizations rely on a particular organizational culture to ensure the performance of improved safety processes over long periods of time and to remain constantly aware of the possibility of failure. This may be called "safety culture"; it is also described below.

Although high-reliability science has greatly increased our understanding of how these organizations function, it does not provide much practical insight into how organizations can move from low to high reliability. Some studies are beginning to shed light on health care organizations' experiences in adapting high-reliability principles to their operations.<sup>39,40</sup> How effective these principles can be in improving safety and quality in health care remains to be determined. In the following sections, we propose a model that may serve as a guide for health care organizations wishing to travel down the road toward high reliability.

### Three Requirements For Achieving High Reliability

We suggest that for health care organizations to become highly reliable, three interdependent and equally critical changes must take place: Leadership must make a commitment to the goal of high reliability, the organizational culture that supports high reliability must be fully implemented, and the tools of robust process improvement must be adopted.<sup>41</sup>

**LEADERSHIP** We emphasize leadership commitment as the first of these three because without it, no important initiative for organizational change can succeed. This commitment must be shared by boards of trustees and all senior managers, both clinical and administrative. Everyone must be committed to a long-term process and recognize that it may take ten to fifteen years. In addition, leaders must focus on the journey from low to high reliability by making it their highest priority and by requiring all levels of management throughout the organization to do the same.

In practical terms, this kind of commitment requires embedding the aim of high reliability into the vision and mission statements of health care organizations, setting measurable goals, and monitoring their achievement. Each of the components of high reliability described here is as susceptible to these fundamental management processes as are the routinely managed procedures for maintaining financial soundness, improving patient satisfaction, or increasing volume of business.

**SAFETY CULTURE** We believe that the organizational culture that is so essential to establishing and maintaining high reliability in health care is the “safety culture” described by James Reason and Alan Hobbs.<sup>42</sup> They posit that this culture involves three mutually reinforcing imperatives: trust, report, and improve.

Trust is essential in two different ways if an organization is to receive a continuous flow of information about possible hazards or unsafe conditions. First, all front-line workers must trust each other in order to feel safe when they identify a problem that may involve or uncover errors made by others. If a maintenance engineer discovers a problem with how a piece of medical equipment has been serviced, she must not feel that her coworkers will ostracize her if she reports the problem up the chain of command. Second, the engineer must trust that management will fix the problem. Otherwise, any risk she might take in reporting it will not be worthwhile.

High-reliability organizations receive regular reports on potentially unsafe conditions, poorly functioning safety procedures, or simple

changes in the environment that might lead to failures of safety systems. These reports typically reveal problems in their early stages, before they pose major risks. When such a report leads to safety improvements and those improvements are communicated back to the workers who originated the report, the trust that led to the report is reinforced, and the safety culture of the organization is strengthened. Thus, in a healthy, fully functional safety culture, the three imperatives positively reinforce each other.

In organizations where trust is not widespread or deeply ingrained in the workforce, workers typically don't report unsafe situations when they can still be easily corrected. If the organization does not receive such information, it cannot make improvements until the problem becomes worse or harm occurs. If the organization does not take effective steps to improve safety, or if it punishes those who report safety problems, workers' lack of trust in management is reinforced and reporting becomes even less likely. Thus, deficiencies in the “trust, report, and improve” cycle can negatively reinforce each other and block progress toward high reliability.

**ROBUST PROCESS IMPROVEMENT** How have high-reliability organizations created nearly perfect processes? What can health care organizations learn from them in this regard?

In the 1990s health care organizations experimented with the industrial quality improvement tools of the time—specifically, the approaches of continuous quality improvement and total quality management. Some hospitals and systems were able to achieve some improvements in quality with those approaches. However, most of the improvements were in nonclinical areas, and the tools were largely ineffective in solving clinical safety and quality problems.<sup>43</sup>

Today, some health care organizations are adopting the new generation of industrial quality methods and applying them to issues of clinical safety and quality. The new approaches—Six Sigma, lean management, and change management—are far more robust in their ability to solve difficult safety and quality problems. We refer to them, collectively, as “robust process improvement.” Taken together, they are a systematic approach to dissecting complex safety problems and guiding organizations to deploy highly effective solutions.<sup>44,45</sup>

The power of these tools lies in their systematic approach, which involves the following: reliably measuring the magnitude of a problem; identifying the root causes of the problem and measuring the importance of each cause; finding solutions for the most important causes; proving the effectiveness of those solutions; and deploying programs to ensure sustained improve-

ments over time. Robust process improvement enables health care organizations to avoid crucial failures common in many efforts to improve clinical quality. The following example illustrates how and why they can be so effective.

### **An Example: Hand Hygiene**

In late 2008 the Joint Commission created its Center for Transforming Healthcare to work together with hospitals and systems that have mastered robust process improvement methods to apply these tools to vital safety and quality problems.<sup>46,47</sup> Hand hygiene was the first problem addressed by a group of eight hospitals that worked with the center.<sup>48</sup>

Teams from the Joint Commission and the eight hospitals first agreed how to measure hand hygiene, developed the measurement system, and proved its reliability. Applying the measurement system produced the first discovery: Baseline hand hygiene performance at the hospitals in April 2009 was a disappointingly low 48 percent.

The next crucial step was to understand the exact causes of poor hand hygiene. Each hospital team used robust process improvement tools to find every important cause of failure and validated its importance statistically. This led to the second discovery: There were fifteen different causes of poor hand hygiene. Some of the most frequent causes were misleading data suggesting that performance was much better than it actually was; inconvenient placement of dispensers for alcohol hand rub; gaps in training of health care workers in hand hygiene; and a poorly developed safety culture, which did not support people who attempted to prevent others from failing to wash their hands. Each cause requires a different, specific intervention to improve hand hygiene.

The third discovery came when the teams examined the distribution of the causes whose significance they had validated across the eight hospitals: Each hospital had a different set of important causes. The implications of this finding are important.

A time-honored method of improving health care is the replication of “best practices.” For example, if your hospital is struggling with a problem, you identify a hospital that has reported success in dealing with that problem, and you copy at your hospital exactly what the successful hospital did. But if the causes of your hospital’s problem are different from the causes at the institution that generated the “best practice,” its interventions are unlikely to work in your hospital. This phenomenon suggests that the key to effective improvement is to identify the

specific root causes of a problem in each organization, in order to deploy interventions designed to target each important cause.

Robust process improvement can prevent another common problem in clinical quality improvement: the lack of sustainability. Improvement teams focus on identifying and engaging the people who will be responsible for overseeing improved processes. The teams also develop with these “process owners” plans for monitoring the performance of the improved processes and for intervening if performance begins to deteriorate. Using this approach, the eight hospitals reported in August 2010 that their aggregate performance for hand hygiene had risen to 81 percent—a rate they had sustained for ten months.

The Joint Commission has produced tools to spread the knowledge gained from this project to all of the health care organizations it has accredited.<sup>49</sup>

### **Mapping The Road To High Reliability**

What practical steps can health care organizations take to achieve high reliability? We recommend that they begin with a self-assessment that examines their organizational readiness in terms of the three components described above: leadership, safety culture, and the capacity to execute robust process improvement. Exhibit 1 shows some characteristics displayed by organizations in three different stages of readiness for high reliability—minimal, developing, and approaching—for each of the three components. Health care organizations can gain an overall understanding of how close to—or far away from—high reliability they are and where to focus their improvement efforts, by comparing their current state in each of these three areas with the descriptions in Exhibit 1. Note that “approaching” does not represent the achievement of high reliability. That achievement is determined primarily by establishing and maintaining rates of failure that are near zero on important measures of quality across all clinical services provided by the organization. Some existing tools can help organizations look more deeply into some of these areas and begin to translate the self-assessment into action plans for improvement.<sup>38,50,51</sup>

Individual health care organizations that wish to make progress toward high reliability have chosen many different paths. Perhaps the most common strategy is to begin by training their staffs to use robust process improvement tools and methods, and then to apply the tools to various processes in the organization, including fi-

EXHIBIT 1

Stages Of Maturity In Health Care Organizations' Path To High Reliability

Organizational characteristic	Stage of maturity		
	Minimal	Developing	Approaching
Leadership	Quality activities focused on regulatory requirements Strategic importance of quality improvement not recognized Metrics for quality goals not part of strategic plan or incentive compensation Information technology provides little support for quality improvement Physicians not actively engaged in quality improvement	Chief executive officer leads proactive quality agenda Board reviews adverse events Organization sets a few measurable quality aims Information technology supports some quality and safety initiatives Physician leaders champion quality goals in some areas	Organization commits to goal of high reliability for all clinical services Organization aims for near-zero failure rates in vital clinical processes Some services demonstrate near-zero failure rates in some vital clinical processes Reward systems for staff prominently reflect accomplishment of quality goals Information technology integral to sustaining quality improvement Physicians routinely lead quality efforts
Safety culture	No program to assess safety culture No assessment of trust or intimidating behavior Root-cause analyses limited to most serious adverse events; close calls not recognized or evaluated	Establishing safety culture accorded high priority by leaders at all levels First measures of safety culture deployed Beginning initiatives to encourage reporting and analysis of close calls	Safety culture is well established Measurement of safety culture is routine and drives improvement Regular reporting of close calls and unsafe conditions leads to early problem resolution
Robust process improvement	No formal quality management system External requirements are focus of improvement efforts No commitment to sustainable improvement	Organizational commitment to adopt strong quality improvement tools Training of selected staff beginning Improvement tools used to achieve gains in quality and safety in addition to routine business processes	Robust process improvement tools used throughout organization Patients engaged in redesigning care processes Mandatory training of all staff in robust process improvement Proficiency in robust process improvement required for career advancement

SOURCE Authors' analysis.

nancial and other business processes.

Developing and implementing such a program will consume resources. However, the costs of adoption can be recovered by using these methods to improve revenue-generating activities—for example, by ensuring that all allowable charges are included in bills for services, and that payment is received for all bills—and to reduce other costs in order to generate overall savings. In this way, an organization can learn how to use robust process improvement to address crucial safety and quality problems while generating a return on its investment.

**Conclusion**

Many organizations outside of health care been able to establish high levels of excellence in managing hazardous processes and to maintain

those levels over long periods of time, with rates of adverse events many hundreds of times lower than occur commonly in health care. Can health care reach this state of high reliability and stay there?

We know of no health care organizations that have achieved that goal. High reliability may be beyond the reach of health care. However, based on the lessons of high-reliability science and past efforts to improve health care quality, we believe that leadership commitment, full implementation of a safety culture, and thorough adoption of robust process improvement tools and methods together are the pathway most likely to lead to success. This approach offers the best hope yet for health care to achieve and sustain the elusive goal of consistent excellence in safety and quality. ■

The authors are full-time employees of the Joint Commission and gratefully acknowledge the contributions made by members of the Board of

Commissioners of the Joint Commission and the Board of Directors of Joint Commission Resources to the development of the model presented

here for how high reliability may be approached by health care organizations.



## NOTES

- 1 Colton D. Quality improvement in health care. *Eval Health Prof.* 2000;23(1):7-42.
- 2 Luce JM, Bindman AB, Lee PR. A brief history of health care quality assessment and improvement in the United States. *West J Med.* 1994; 160(3):263-8.
- 3 McIntyre D, Rogers L, Heier EJ. Overview, history, and objectives of performance measurement. *Health Care Financ Rev.* 2001;22(3):7-21.
- 4 Loeb JM. The current state of performance measurement in health care. *Int J Qual Health Care.* 2004; 16(Suppl 1):i5-9.
- 5 Bohmer RMJ. *Designing care: aligning the nature and management of health care.* Boston (MA): Harvard Business Press; 2009.
- 6 Roberts JS, Coale JG, Redman RR. A history of the Joint Commission on Accreditation of Hospitals. *JAMA.* 1987;258(7):936-40.
- 7 Donabedian A. Evaluating the quality of medical care. *Milbank Mem Fund Q.* 1966;44(3 Suppl):166-206.
- 8 Streptomycin treatment of pulmonary tuberculosis. *Br Med J.* 1948; 2(4582):769-82.
- 9 Chassin MR. Is health care ready for Six Sigma quality? *Milbank Q.* 1998;76(4):565-91, 510.
- 10 Cochrane Library. Cochrane central register of controlled trials [Internet]. Oxford (UK): The Library; [cited 2011 Jan 6]. Available from: <http://www.thecochranelibrary.com/view/0/AboutTheCochraneLibrary.html#CENTRAL>
- 11 Balas EA, Boren SA. Managing clinical knowledge for health care improvement. In: Bemmel J, McCray AT, editors. *Yearbook of medical informatics: patient centered systems.* Stuttgart (Germany): Schattauer; 2000. p. 65-70.
- 12 Nelson AR. Relation between quality assessment and utilization review in a functioning PSRO. *N Engl J Med.* 1975;292(13):671-5.
- 13 Starr P. *The social transformation of American medicine.* New York (NY): Basic Books; 1982.
- 14 Lohr KN, editor. *Medicare: a strategy for quality assurance. Vol. 1.* Washington (DC): National Academies Press; 1990.
- 15 Lohr KN, editor. *Medicare: a strategy for quality assurance. Vol. 2, Sources and methods.* Washington (DC): National Academies Press; 1990.
- 16 Chassin MR, Koseoff J, Winslow CM, Kahn KL, Merrick NJ, Keesey J, et al. Does inappropriate use explain geographic variations in the use of health services? A study of three procedures. *JAMA.* 1987;258(18): 2533-7.
- 17 Gray BH, Gusmano MK, Collins S. AHCPR and the changing politics of health services research. *Health Aff (Millwood).* 2003;22:w3-283-307. DOI: 10.1337/hlthaff.w3.283.
- 18 Qaseem A, Snow V, Owens DK, Shekelle P. Development of clinical practice guidelines and guidance statements of the American College of Physicians: summary of methods. *Ann Intern Med.* 2010;153(3):194-9.
- 19 Pepine CJ, Allen HD, Bashore TM, Brinker JA, Cohn LH, Dillon JC, et al. ACC/AHA guidelines for cardiac catheterization and cardiac catheterization laboratories. American College of Cardiology/American Heart Association Ad Hoc Task Force on Cardiac Catheterization. *Circulation.* 1991;84(5):2213-47.
- 20 Laffel G, Berwick DM. Quality in health care. *JAMA.* 1992;268(3): 407-9.
- 21 Berwick DM. Continuous improvement as an ideal in health care. *N Engl J Med.* 1989;320(1):53-6.
- 22 Kritchevsky SB, Simmons BP. Continuous quality improvement: concepts and applications for physician care. *JAMA.* 1991;266(13):1817-23.
- 23 O'Leary DS. The Joint Commission looks to the future. *JAMA.* 1987; 258(7):951-2.
- 24 Iezzoni LI. Assessing quality using administrative data. *Ann Intern Med.* 1997;127(8 Pt 2):666-74.
- 25 Kohn LT, Corrigan JM, Donaldson MS, editors. *To err is human: building a safer health system.* Washington (DC): National Academies Press; 2000.
- 26 Institute of Medicine. *Crossing the quality chasm: a new health system for the 21st century.* Washington (DC): National Academies Press; 2001.
- 27 Kizer KW. Establishing health care performance standards in an era of consumerism. *JAMA.* 2001;286: 1213-7.
- 28 Joint Commission. *Improving America's hospitals: the Joint Commission's annual report on quality and safety, 2010* [Internet]. Oakbrook Terrace (IL): Joint Commission; 2010 [cited 2011 Jan 6]. Available from: [http://www.jointcommission.org/assets/1/18/2010\\_Annual\\_Report.pdf](http://www.jointcommission.org/assets/1/18/2010_Annual_Report.pdf)
- 29 Pronovost P, Needham D, Berenholtz S, Sinopoli D, Chu H, Cosgrove S, et al. An intervention to decrease catheter-related bloodstream infections in the ICU. *N Engl J Med.* 2006;335(26):2725-32.
- 30 Chassin MR, Hannan EL, DeBuono BA. Benefits and hazards of reporting medical outcomes publicly. *N Engl J Med.* 1996;334(6):394-8.
- 31 Robert Wood Johnson Foundation. *Aligning forces for quality* [Internet]. Princeton (NJ): RWJF; [cited 2011 Mar 3]. Available from: <http://www.rwjf.org/qualityquality/af4q/>
- 32 Wisconsin Collaborative for Healthcare Quality [home page on the Internet]. Middleton (WI): The Collaborative; [cited 2011 Mar 3]. Available from: <http://www.wchq.org/>
- 33 Leonhardt D. Making health care better. *New York Times Magazine.* 2009 Nov 3.
- 34 Chassin MR, Becher EC. The wrong patient. *N Engl J Med.* 2002;136(11): 826-33.
- 35 Joint Commission. *Preventing surgical fires* [Internet]. Oakbrook Terrace (IL): Joint Commission; 2003 Jun 24 [cited 2011 Mar 3]. (Sentinel Event Alert, issue 29). Available from: [http://www.jointcommission.org/assets/1/18/SEA\\_29.PDF](http://www.jointcommission.org/assets/1/18/SEA_29.PDF)
- 36 Joint Commission. *A follow-up report on preventing suicide: focus on medical/surgical units and the emergency department.* Oakbrook Terrace (IL): Joint Commission; 2010 Nov 17 [cited 2011 Mar 3]. (Sentinel Event Alert, issue 46). Available from: [http://www.jointcommission.org/assets/1/18/SEA\\_46.pdf](http://www.jointcommission.org/assets/1/18/SEA_46.pdf)
- 37 Reason J. Human error: models and management. *BMJ.* 2000; 320(7237):768-70.
- 38 Weick KE, Sutcliffe KM. *Managing the unexpected: resilient performance in an age of uncertainty.* 2nd ed. San Francisco (CA): Jossey-Bass; 2007.
- 39 Dixon NM, Shofer M. Struggling to invent high-reliability organizations in health care settings: insights from the field. *Health Serv Res.* 2006; 41(4 Pt 2):1618-32.
- 40 Fei K, Vlasses FR. Creating a safety culture through the application of reliability science. *J Healthc Qual.* 2008;30(6):37-43.
- 41 Frankel AS, Leonard MW, Denham CR. Fair and just culture, team behavior, and leadership engagement: the tools to achieve high reliability. *Health Serv Res.* 2006; 41(4 Pt 2):1690-709.
- 42 Reason J, Hobbs A. *Managing maintenance error: a practical guide.* Aldershot (UK): Ashgate; 2003.
- 43 Goldberg HI. Continuous quality improvement and controlled trials are not mutually exclusive. *Health Serv Res.* 2000;35(3):701-5.
- 44 DelliFraine JL, Langabeer JR, Nembhard IM. Assessing the evidence of Six Sigma and Lean in the health care industry. *Qual Manag Health Care.* 2010;10(3):211-5.
- 45 DuPree E, Anderson R, Kathuria N, Redich D, Porter C, Chassin MR. Improving patient satisfaction with pain management using Six Sigma tools. *Jt Comm J Qual Patient Saf.* 2009;35(7):343-50.
- 46 Joint Commission Center for Transforming Healthcare. *Hand hygiene project: best practices from hospitals participating in the Joint Commission Center for Transforming*

Healthcare project [Internet]. Oakbrook Terrace (IL): The Center; 2010 Nov [cited 2011 Jan 6]. Available from: <http://www.hpoe.org/resources-and-tools/resources/hand-hygiene-project.pdf>

- 47 For additional information on how causes of poor hand hygiene differed among hospitals, see Joint Commission Center for Transforming Healthcare [storyboard on the Internet]. Oakbrook Terrace (IL): The Center; [cited 2011 Jan 6]. Available from: [http://www.centerfortransforminghealthcare.org/UserFiles/file/hand\\_hygiene\\_](http://www.centerfortransforminghealthcare.org/UserFiles/file/hand_hygiene_)

storyboard.pdf

- 48 The eight original hospitals that worked on the hand hygiene project with the center were the Cedars-Sinai Health System, in California; Exempla Healthcare, in Colorado; Froedtert Hospital, in Wisconsin; the Johns Hopkins Hospital and Health System, in Maryland; Memorial Hermann Healthcare System, in Texas; Trinity Health, in Michigan; Virtua, in New Jersey; and Wake Forest University Baptist Medical Center, in North Carolina.
- 49 Joint Commission Center for Transforming Healthcare. Targeted solu-

tions tool [Internet]. Oakbrook Terrace (IL): The Center; [cited 2011 Feb 24]. Available from: <http://www.centerfortransforminghealthcare.org/tst.aspx>

- 50 Carthey J, de Leval MR, Reason J. Institutional resilience in healthcare systems. *Qual Health Care*. 2001; 10(1):29–32.
- 51 Agency for Healthcare Research and Quality. Hospital survey on patient safety culture [Internet]. Rockville (MD): AHRQ; 2009 Apr [cited 2011 Jan 6]. Available from: [http://www.ahrq.gov/qual/patient\\_safetysurvey/hospindex.htm](http://www.ahrq.gov/qual/patient_safetysurvey/hospindex.htm)

## ABOUT THE AUTHORS: MARK R. CHASSIN & JEROD M. LOEB



**Mark R. Chassin** is president of the Joint Commission.

In their article in this issue of *Health Affairs*, Mark Chassin and Jerod Loeb offer an overview of developments in the campaign to achieve better quality and safety in US health care, particularly during the past two decades. The authors are, respectively, president and executive vice president for health care quality evaluation at the Joint Commission.

Chassin became president of the Joint Commission—previously known as the Joint Commission on Accreditation of Healthcare Organizations—in 2008. The commission accredits and certifies more than 18,000 health care organizations and leads initiatives to improve the care those institutions provide. Before joining the Joint Commission, Chassin was the Edmond A. Guggenheim Professor of Health Policy and

founding chairman of the Department of Health Policy at the Mount Sinai School of Medicine, in New York City, and executive vice president for excellence in patient care at the Mount Sinai Medical Center.

Chassin previously served as commissioner of the New York State Department of Health. Under his tenure, the state conducted the nation's first program to publish annual data on risk-adjusted mortality following coronary artery bypass graft surgery by hospital and surgeon. As Chassin wrote in a 2002 *Health Affairs* article, “many hospitals were prompted by the data to improve their cardiac surgery programs, and statewide mortality fell substantially as a result.”

Chassin also served as a member of the Institute of Medicine committees that authored the two seminal reports on patient safety and quality, *To Err Is Human* and *Crossing the Quality Chasm*. He is a board-certified internist and also practiced emergency medicine. He received his medical degree from Harvard University and a master's degree in public policy from the Kennedy School of Government at

Harvard. He also holds a master of public health degree from the University of California, Los Angeles.



**Jerod M. Loeb** is executive vice president for health care quality evaluation at the Joint Commission.

Loeb has been with the Joint Commission for nearly seventeen years, where he has served in various organizational capacities. Before coming to the Joint Commission, he was assistant vice president for science, technology, and public health at the American Medical Association.

He joined the faculty of the Northwestern University Feinberg School of Medicine in Chicago in 1979 and is currently an adjunct professor of physiology. Loeb completed his graduate education at the State University of New York Downstate Medical Center, earning a doctorate in physiology.

# Comparative Effects of Mindfulness and Skills-Based Parent Training Programs for Parents of Children with Autism: Feasibility and Preliminary Outcome Data

Suzannah J. Ferraioli · Sandra L. Harris

© Springer Science+Business Media, LLC 2012

**Abstract** Parents of children with autism report high levels of stress as compared to parents of typically developing children, children with chronic illnesses, and children with other developmental disabilities. Previous research has supported both parent-focused and child-focused parent training programs as effective in alleviating parental stress and enhancing meaningful parent–child interactions. In the present study, a behavioral skills approach was compared to a parent-oriented model, a mindfulness group. Fifteen parents of children with autism were matched on a measure of parental stress and were randomized to one of the two treatment groups. Each group included an 8-week program that incorporated didactics, discussion, role plays, and homework. Parental stress and global health outcomes were assessed at pre-treatment, post-treatment, and 3-month follow-up. Overall, the mindfulness group alone demonstrated statistically significant improvement on both outcome measures following treatment. Although significant changes were not observed in the skills group, effect sizes suggested moderate to large treatment benefits. The feasibility of the programs as well as implications and future directions of this line of research are discussed.

**Keywords** Mindfulness · Autism spectrum disorders · Parenting stress · Parent training

## Introduction

### Parenting Stress

Although it can be a source of great joy, raising a child is often accompanied by a variety of stressors, which are only enhanced in the context of a child's illness. Most of the literature on parent stress under these conditions suggests a strong link among child chronic illness, increased stress, and increased family dysfunction (Sheeran et al. 1997). Overall, parents of children with autism spectrum disorders (ASD) report higher levels of stress and affective symptoms compared to those of typically developing children, parents of children with other disabilities (e.g., Down syndrome, intellectual disability), and children with chronic illness (Abbeduto, et al. 2004; Bristol and Schopler 1984; Dumas et al. 1991; Smith et al. 2010).

The psychological well-being of parents is paramount considering the bidirectional effects between parent emotion and child outcomes that have been highlighted in families of children with developmental disabilities. For example, the bidirectional, predictive value between longitudinal changes in maternal expressed emotion and behavior problems (e.g., internalizing, externalizing, and asocial behaviors) in adults with intellectual disability was documented by Orsmond and colleagues (Orsmond et al. 2003); these results were extended to parents of adolescents and adults with ASD (Greenberg et al. 2006). Further, an inverse relationship between parenting-specific stress and treatment gains has been reported in mothers of children with ASD (Robbins

---

S. J. Ferraioli (✉)  
Center for Autism Research, Children's Hospital of Philadelphia,  
3535 Market St. Suite 8,  
Philadelphia, PA 19104, USA  
e-mail: sferraioli@gmail.com

S. L. Harris  
Douglass Developmental Disabilities Center, Rutgers University,  
New Brunswick, NJ, USA

et al. 1991). These findings highlight the dynamic relationship between parental emotional states and child outcomes and suggest that intervening at the parent level is an important aspect of treatment for individuals with developmental disabilities. Moreover, research on predictors and moderators of stress and negative outcomes in parents of children with ASD implicates significant parental avoidance and distancing, as well as a lack of perceived control over situations (Dunn et al. 2001; Hastings et al. 2005).

Parent training programs have a strong evidence base in the literature for teaching parents behavioral strategies for increasing functional and adaptive skills and/or for decreasing challenging behavior in their child with ASD (Celiberti and Harris 1993; Crockett et al. 2007; Gillett and LeBlanc 2007; Harris et al. 1983; Rocha et al. 2007; Smith et al. 2000; Solomon et al. 2007). Other approaches have directly targeted parent-based outcomes for parents of children with ASD, such as reduction in maternal symptoms of depression (Bristol et al. 1993) and improved overall mental health (Tonge et al. 2006). Considering these trends, a focus on prophylactic and function-based treatments, rather than those that are merely palliative, is warranted.

### Mindfulness and Parent Stress

Mindfulness encompasses a body of techniques that emphasizes awareness of thoughts, beliefs, and feelings, the objective of which is to change an individual's relationship to and experience of distressing sensations. The most salient features of mindfulness can be conceptualized in many ways, a phenomenon that is illustrated by myriad definitions in the literature. However, the idea of nonjudgmental acceptance of negative sensations is a universal characteristic. It has been described as “bringing one's attention to the present experience on a moment-to-moment basis” (Marlatt and Kristeller 1999, p. 68) and also “paying attention in a particular way: on purpose, in the present moment, and nonjudgmentally” (Kabat-Zinn 1994, p. 4).

The characteristics of mindfulness-based interventions have clear relevance for parents and caregivers of individuals with a variety of presenting issues, and have been the focus of recent treatment research. For instance, the benefits of mindfulness practice have been documented in caregivers of elderly patients (Epstein-Lubow et al. 2011) and chronically ill children (Minor et al. 2006) for improving stress and mood disturbances. These results have been extended to parents of children and adolescents with a variety of externalizing disorders (including children with developmental disabilities) who participated in concomitant mindfulness groups and reported perceived improvement in the children's internalizing symptoms, externalizing symptoms, and sustained attention, as well as in their own subjective happiness ratings (Bögels et al. 2008). In additional research,

parent training in mindfulness practices over a 12-week period was associated with decreases in aggressive behavior and parental-perceived improvements in mother–child interactions in children with developmental disabilities (Singh et al. 2007). With respect to an ASD-specific population, short-term participation in a 2-day mindfulness workshop was associated with reduced depression ratings and improvements in reported global health in distressed parents (Blackledge and Hayes 2006). Further research indicated that a 12-week training program in mindfulness was supported for improving parent–child interactions, increasing parental satisfaction with these interactions, and decreasing child challenging behavior (Singh et al. 2006).

The evidence from these studies validates further investigations of interventions for parents of children with ASD that incorporate mindfulness and comparisons of mindfulness-based programs with traditional skills-based interventions. In light of data evidencing the negative influence of avoidance on parental mental health, a present-focused approach is theoretically aligned with parent training goals. However, research is needed to replicate previous findings and further explicate the relative benefits of mindfulness for this population.

### Current Study

The present study comprised two aims, the first of which was to evaluate the relative benefits of a new parent training approach (i.e., mindfulness-based) through comparison with an established intervention (i.e., skills-based). The second aim was to assess the feasibility of these two 8-week programs. Considering the preliminary nature of this research, high feasibility was conceptualized to comprise adequate recruitment and retention and high treatment acceptability. Qualitative information on participant reactions to treatment was also collected.

### Method

#### Participants

Participants were recruited through the Outreach Division of the Douglass Developmental Disabilities Center (DDDC), a program based out of Rutgers, The State University of New Jersey for the treatment of individuals with ASD aged 3 years into adulthood. Recruitment was also conducted through an advertisement placed in the newsletter of Autism New Jersey—a statewide, nonprofit agency for families of individuals with autism—which reaches over 2,000 members. To qualify for entry into the study, parents were required to be the primary caretaker of at least one child below 18 years of age, who had been diagnosed with an ASD by an outside professional, according to DSM-IV-TR criteria.

Ten mothers and five fathers comprised the completer group. A wide range of ethnic backgrounds was represented; participants identified as white (33 %), Indian (27 %), Asian (13 %), Latina (13 %), Black or African-American (7 %), and other (7 %). This sample represents greater ethnic diversity than is indicated by the overall population of New Jersey (Hispanic=16.3 %, white=76 %, Asian=7.7 %), which may be attributed to the small sample size and the unique demographic variability in Central New Jersey. All parents were married and their household ranged from including one to three children, including the child on the spectrum. One parent was the mother of two children with ASD; she was asked to complete all measures with respect to her younger son, as her elder son was an adult. All participants had graduated college, and the majority held advanced degrees. Socioeconomic background was primarily upper-middle-class (total family annual income ranged from \$20,000 to over \$100,000). The participants' children represented various points on the autism spectrum. Five had a diagnosis of Autistic Disorder, five were diagnosed with Asperger's Disorder, and five were diagnosed with Pervasive Developmental Disorder, Not Otherwise Specified (PDD-NOS). More information on participant characteristics can be found in Table 1.

**Table 1** Participant demographic information

Characteristic	No.	Percent
Gender		
Male	5	33.3
Female	10	66.6
Married	15	100
Number of children		
1	9	60
2	5	33.3
3	1	6.7
Child's diagnosis		
Autistic Disorder	5	33.3
Asperger's Disorder	5	33.3
PDD-NOS	5	33.3
Highest education completed		
Associates/bachelor's	6	40
Advanced degree (MA/MBA/MD/PhD)	9	60
Household yearly income		
\$20,000–40,000	1	6.6
\$40,000–60,000	1	6.6
\$60,000–80,000	3	20
\$80,000–100,000	2	13.3
\$100,000+	8	53.3
Total	15	

## Measures

### *Parenting Stress Index—Short Form*

The Parenting Stress Index—Short Form (PSI-SF) (Abidin 1995) is a self-report measure assessing parenting stress in parents of children 3 months to 10 years of age. It includes 36 items relating to parental feelings and experiences, comprising constructs of Parental Distress, Parent-child Dysfunctional Interaction, and Difficult Child Characteristics. Items are rated on a 5-point Likert scale and include statements such as, "Since having a child I feel that I am almost never able to do things I like to do," (distress), "Most times I feel that my child does not like me and does not want to be close to me," (dysfunctional interaction), and "My child seems to cry or fuss more often than most children," (child characteristics).

### *General Health Questionnaire*

The General Health Questionnaire (GHQ) (Goldberg 1978) is a 28-item self-administered measure of global health, comprising four subscales (somatic symptoms, social dysfunction, anxiety/insomnia, and depression). Participants use a 4-point Likert scale to rate feelings over the past few weeks, including questions such as, "Have you felt that you are ill?" (somatic) and "Have you been able to enjoy your normal day-to-day activities?" (social dysfunction).

### *Manipulation Check*

Two measures were administered to all participants to determine the extent to which (a) group members learned the skills targeted in each intervention, and (b) changes on these measures were specific to group assignment.

*Mindful Attention Awareness Scale* The Mindful Attention Awareness Scale (MAAS) is a measure of dispositional mindfulness and mindful awareness in daily life, which has been shown to be negatively related to the intensity and frequency of negative affect (Brown and Ryan 2003). This 15-item questionnaire solicits Likert ratings of statements such as, "I find it difficult to stay focused on what's happening in the present," and "I find myself preoccupied with the future or the past." High scores are indicative of high awareness and attention.

*Applied Behavior Analysis Questionnaire* This questionnaire was created for the purposes of this study and comprised a series of 23 multiple-choice questions about content covered within the SBPT program.

### Treatment Acceptability

Parents were asked to rate various dimensions of treatment, such as structure, content, and supports on a 5-point Likert Scale (1 = strongly disagree; 5 = strongly agree). Several open-ended questions were also included regarding which topics were preferred and non-preferred as well as suggestions to make the group more accessible and relevant.

### Treatment Fidelity

The first author coded the parent training tapes for therapist adherence to the intervention procedures. Each session was scored on whether or not the leaders included key components of the program (i.e., lecture points, mindfulness exercises, discussion points, role plays, video clips and slides, and homework assignment and review), as outlined by the treatment manuals. Each element was weighted equally, and implementation of 90 % of the treatment components was considered adequate fidelity. Treatment fidelity was established both for the skills-based treatment ( $M=93.5$  %, range=83–100 %) and the mindfulness-based treatment ( $M=97.8$  %, range=89–100 %).

### Procedure

#### Design and Procedure

At the pre-treatment assessment (time 1) participants completed demographic questionnaires, the primary outcome measures (i.e., PSI-SF and GHQ), and the manipulation check measures (i.e., MAAS and Applied Behavior Analysis (ABA) Questionnaire). At this time point, parents were divided into matched pairs based on their total PSI-SF scores; each member of the pair was then randomly assigned to either the mindfulness-based parent training (MBPT) or skills-based parent training (SBPT) treatment group. Matched pairs were used due to anticipated small sample sizes, with the goal of minimizing potential pre-treatment differences in the primary outcome measures. Following randomization, participants entered the treatment phase, which included eight weekly sessions (described below). Immediately post-treatment (time 2), participants completed the primary outcome measures and the treatment acceptability questionnaire. The outcome measures were re-administered 3 months after the completion of treatment (time 3). The T2 assessment was completed in person; at T3, forms were distributed and returned via mail. Participants were paid \$50 at the completion of the study. This study and its procedures were approved by the Rutgers Institutional Review Board prior to advertising and direct recruitment.

### Parent Training Interventions

Each program consisted of eight weekly meetings for 2 h each and was led by two advanced doctoral student facilitators at the DDDC. Two rounds of treatment groups were run: a fall group and a winter group. For the fall cohort, both groups were led by the first author. A co-leader (A) helped facilitate the MBPT group, and another co-leader (B) helped facilitate the SBPT group. For the winter cohort, the first author and co-leader B ran the SBPT intervention. Co-leader A and a new co-leader (C) ran the MBPT intervention. Each group was supervised separately by a licensed clinical psychologist (i.e., two supervisors in total) who specialized in the respective fields of autism/ABA and mindfulness. As the first author led both fall groups, it was important to prevent as much crossover of intervention-specific information and techniques as possible. While the content of the groups was quite different and did not lend itself toward blending, additional measures were taken to prevent contamination. These included (a) standardizing the exercises and discussion points in each manual, (b) conducting separate trainings and supervisions for each group, and (c) taking care not to answer any questions from the participants that directly related to information from the other group (e.g., providing a parent from the mindfulness group advice on managing challenging behavior).

**Mindfulness-Based Parent Training** This training program was adapted from the mindfulness module of Linehan's skills training manual for borderline personality disorder (1993) and from the 8-week course outlined in Segal, Williams, and Teasdale's book on mindfulness-based cognitive therapy for depression (2002). The primary intervention goal was for participants to incorporate mindfulness techniques into their daily lives. Five core mindfulness skills (observing, describing events and personal responses; nonjudgmental acceptance; distancing from thoughts; staying present; and being effective) were addressed throughout the program (see Table 2 for more information on the individual sessions).

Each session included orientation to the current skill, practice exercises, group discussion, and homework to be reviewed in the following week. Participants were also encouraged to engage in ongoing practice of the skills learned throughout the program and then share these experiences and how they related to their children with ASD. In the mindfulness group, the overarching goal was for participants to incorporate mindfulness techniques into their daily lives.

**Skills-Based Parent Training** The skills training program was adapted from curriculum-based and behavioral intervention manuals (Charlop-Christy and Kelso 1997; Koegel et al. 1989; Leaf and McEachin 1999) for working with children with ASD. The primary goal was for participants to implement behavioral strategies at home to help effect behavior

**Table 2** Weekly outline of mindfulness-based parent training manual

Week	Content	Homework
1	Introduction to mindfulness principles: psychoeducation on parent stress; core mindfulness skills (i.e., observe, describe, participate); chocolate kiss exercise, breathing space exercise	Practice observe, describe participate skills, describe experiences and reactions on record form (included in all subsequent homeworks)
2	Nonjudgmental acceptance: differentiating between acceptance and resignation; avoidance versus awareness, discussion of negative thoughts related to group's children; partial sitting meditation	Identify judgments and reactions (at least once with your child), continue mindful observation
3	Identifying thoughts: identifying automatic thoughts; observing thoughts; practice watching thoughts; exploring distressing thoughts; breathing space	Deliberately bring awareness to thoughts (including those related to your child) and observe reactions
4	Accepting/distancing from thoughts: the tape in the mind; thoughts are not facts; strategies to address thoughts in the moment, full body scan	Complete thought log, practice full body scan, continue to observe thoughts (including at least one distressing thought)
5	Staying present (part 1): being one-mindful; choosing when to multi-task and when to focus on the moment; breathing space; mindful walking exercise	Practice mindfulness during daily activities (e.g., walking, eating) and breathing space
6	Staying present (part 2): mindfulness of thoughts and sounds; full sitting meditation; deliberate awareness to distressing thoughts; mindful playing	Practice mindful playing with child and breathing space
7	Pleasant events: link between activity and mood; activity log; mastery and pleasure, scheduling pleasant events; breathing space	Schedule and record pleasant events, including at least three with child
8	Being effective; wrap-up: discussing effectiveness in the context of mindful practice; summary of program; participant feedback	Plan for continued mindfulness practice

change in their child with ASD. Content included psychoeducation, a review of evidence-based treatment, and behavioral strategies for increasing functional behavior (e.g., reinforcement, direct instruction, naturalistic teaching) and for decreasing challenging behavior (e.g., functional assessment, behavioral intervention; see Table 3 for more information on individual session content).

These techniques were presented as lecture points by the facilitators, who then encouraged participant role plays, group activities, and discussion. In addition to targeting skill acquisition, the group focused on ways for parents to implement

these strategies in their homes and communities. Each week, participants were encouraged to share successes and failures from the past week and the group discussed trouble-shooting strategies for future situations.

#### Data Analyses

Completer analyses were conducted, considering both the small sample size and the fact that there were no significant differences at T1 on the PSI-SF between completers and

**Table 3** Weekly outline of skills-based parent training manual

Week	Content	Homework
1	Introduction: psychoeducation; evidence-based treatment; intro to behavioral principles; data collection	Choose a behavior to track and observe effects of consequences on the behavior
2	Reinforcement: principles of reinforcement; reinforcer assessment; differential reinforcement; rules of reinforcement at home; role play	Practice using reinforcement at home with selected behavior and take data
3	Direct instruction: discrete trial teaching; prompting; role plays; activity schedules	Incorporate prompting for target behavior, continue data collection
4	Naturalistic teaching: incidental teaching; pivotal response training; vignettes; role plays	Practice using naturalistic teaching skills and continue data collection
5	Social skills and play: joint attention; task analysis of play skills; peer interactions and structured play dates	Work on 1–2 play skills identified in hierarchy
6	Functional assessment: functions of behavior; descriptive analysis and antecedent-behavior-consequence data; functional analysis	Choose target behavior; practice descriptive assessment at home
7	Decreasing behavior: linking assessment to treatment; antecedent (e.g., noncontingent reinforcement, functional communication training) and consequence-based intervention (e.g., time out, extinction)	Practice antecedent/consequence-based strategies with target behavior; collect data
8	Discuss punishment procedures; wrap-up: rationale for punishment; summary of program; participant feedback	Continue data collection on target behaviors; plan for continued skills practice

non-completers. Paired samples  $t$  tests were used to evaluate within-group, post-treatment differences (i.e., T1 to T2, T1 to T3) on the PSI-SF, SHQ, MAAS, and ABA questionnaire. Between-group differences were evaluated at T2 and T3, using independent samples  $t$  tests to compare mean change scores. Change scores were used because of statistically significant pre-treatment group differences on the primary outcome measures. Effect sizes were interpreted using Cohen's  $d$  for both within- and between-group comparisons, and were interpreted according to traditional conventions (i.e., .2 = small, .5 = medium, .8 = large).

## Results

### Outcome Measures

No significant pre-treatment differences occurred between the mindfulness and skills groups run in the fall, as compared to those run in the winter. In addition, within-group comparisons of the mindfulness and skills group outcomes at T2 and T3 were not significant between the fall and the winter groups. Despite randomization efforts to reduce between-group variability, at T1, there were statistically significant pre-treatment group differences on the PSI-SF ( $t[13]=2.4, p=.03$ ) and on the GHQ ( $t[13]=4.1, p=.001$ ).

### PSI-SF

Significant, within-group differences in PSI-SF scores were observed for the mindfulness group between T1 and T2,  $t(5)=4.14, p=.009, d=2.03$  (see Fig. 1 and Table 4).

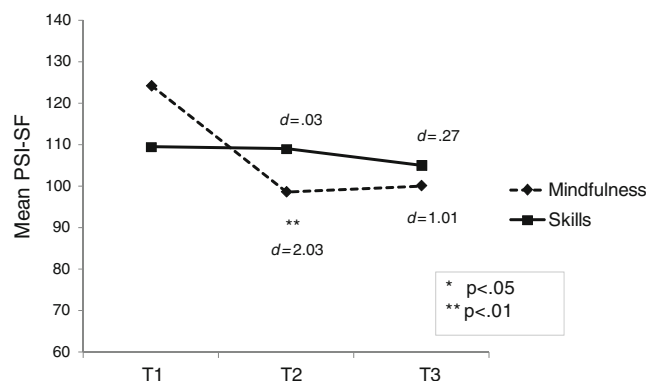
No differences were documented in the mindfulness group between T1 and T3,  $t(5)=1.24, p=.221, d=1.01$ . For the skills group, there were no significant changes from T1 to T2,  $t(8)=0.0, p=.922, d=.03$ , or from T1 to T3,  $t(8)=.94, p=.375, d=.27$ . Between-group comparisons revealed significant differences in change scores in the PSI-SF at T2 (change at T2), with the mindfulness group reporting greater change,  $t(13)=2.99, p=.011, d=1.59$  (see Fig. 2 and Table 5).

No group differences were observed at T3 (change at T3),  $t(13)=1.21, p=.212, d=.63$ .

### GHQ

On the GHQ, significant within-group differences were observed for the mindfulness group from T1 to T2,  $t(5)=2.96, p=.032, d=2.26$  (see Fig. 3) and from T1 to T3,  $t(5)=3.94, p=.011, d=1.86$ .

For the skills group, there were no significant within-group differences in GHQ scores between T1 and T2,  $t(8)=1.78, p=.114, d=.49$ , or between T1 and T3,  $t(8)=1.8, p=.11, d=.54$ . For the between-group results, the mindfulness group



**Fig. 1** PSI-SF scores at times 1, 2, and 3

demonstrated significantly greater change than the skills group, both at T2,  $t(13)=2.79, p=.015, d=1.3$ , and T3,  $t(13)=3.1, p=.008, d=1.54$  (see Fig. 4 and Table 5).

### Manipulation Check Measures

There were significant pre-treatment differences at T1 on the MAAS, with the skills group demonstrating higher scores than the mindfulness group  $t(13)=3.57, p=.003$ . On the MAAS, the mindfulness group demonstrated significant increases from T1 to T2,  $t(5)=3.42, p=.019$ , whereas the skills group did not increase on their MAAS scores,  $t(8)=1.71, p=.123$ . However, there were no significant between-group differences at T2  $t(13)=.343, p=.74$ . On the ABA questionnaire, there were no significant differences between groups at T1  $t(13)=1.06, p=.32$ . The skills group demonstrated significantly higher scores from T1 to T2,  $t(8)=4.469, p=.002$ , whereas the mindfulness group did not,  $t(5)=.927, p=.397$ . No between-group differences were found on the ABA questionnaire at T2  $t(13)=.008, p=.994$ .

### Feasibility

### Recruitment and Retention

Sixty-seven potential participants were contacted through recruitment mailings, and the 31 individuals who were assessed for eligibility represented a 46.2 % response rate of those who were directly recruited for participation. Thirty-one percent of those parents were excluded based on refusal (19 %), failure to meet inclusion criteria (6.5 %), and other reasons (6.5 %). The 21 participants who were randomized to treatment represented 67 % of the potential participant pool. With 15 treatment completers, the final attrition rate was 29 %. A pictorial representation of the participant flow is included in Fig. 5.

These remaining 15 participants attended a sufficient number of sessions (i.e., two complete sessions) to be included in the analyses. Two sessions was delineated as the cutoff to exclude those who only attended the first meeting, but to



**Table 4** Means (and standard deviations) for PSI-SF and GHQ scores at times 1, 2, and 3

Variable	Time			<i>p</i> value		<i>d</i> value	
	T1 mean (SD)	T2 mean (SD)	T3 mean (SD)	T1–T2	T1–T3	T1–T2	T1–T3
PSI-SF (mindfulness)	124.2	98.5	100.0	.009	.221	2.03	1.01
PSI-SF (skills)	109.4	108.9	105.0	.922	.375	.03	.27
GHQ (mindfulness)	47.7	17.0	23.1	.032	.011	2.26	1.86
GHQ (skills)	22.4	17.1	17.1	.114	.11	.49	.54

include participants who demonstrated an initial commitment to treatment, but were not highly adherent. Session turnout varied among participants, with most parents demonstrating perfect or near-perfect attendance. Mindfulness group members attended a mean of 6.2 meetings (range=3–8); skills group members attended a mean of 7.2 meetings (range=6–8). The most commonly cited reason for missing a session was a child care issue (e.g., difficulty coordinating a sitter, sick child). Other reasons included school-related conflicts (e.g., parent–teacher night) and the illness of family members.

#### Acceptability

Overall, parents gave high scores on a measure of treatment acceptability ( $M=52.9$ ; range=45–63). Sixty-seven percent of participants' responses indicated that they were "Highly" satisfied (i.e., total scores falling between 52–65); the remaining 33 % indicated that they were "Moderately" satisfied (i.e., total scores falling between 39–51). The items on which participants were most likely to endorse a low score on included item 2 (the content was too basic), item 3 (the content was too advanced), and item 8 (I was happy with my group assignment at the start of the group). Most parents indicated that the skills they learned were relevant to their everyday lives (item 5) and that they intended to continue using the skills in the future (item 6). On a set of open-ended questions, the greatest challenges to participation indicated by group members were (a) arranging child care, and (b) distance from

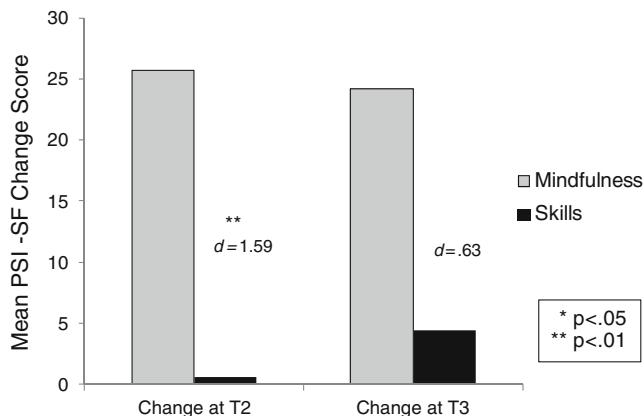
work/home. Common themes regarding what parents liked best about the group included a sense of support from other parents and the individualization of the taught skills. When asked what they liked least about the meetings, many parents indicated that they would have liked larger groups.

## Discussion

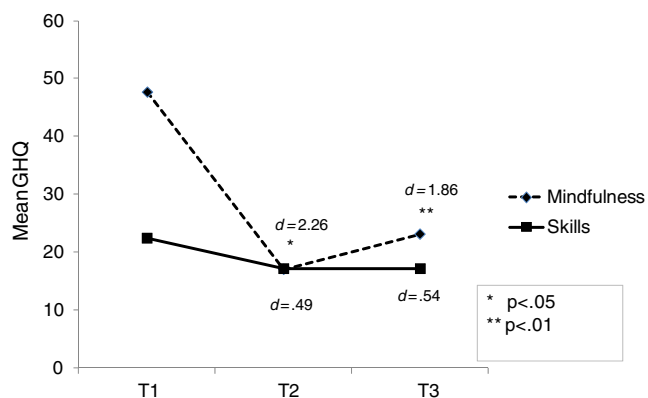
### Outcome

Overall, we found significant improvements on our primary outcome measures within the mindfulness, but not the skills group at T2. Although no within-group differences on the PSI-SF were observed for either group at T3, the mindfulness group showed a significant increase on GHQ scores at T3. In comparing the two interventions, the mindfulness group demonstrated significantly higher change scores than the skills group on the PSI-SF at T2 (change at T2) and on the GHQ at T2 and T3 (change at T2 and T3). Although no between-group differences in the manipulation check measures were observed at T2, both groups increased significantly on measures of intervention-specific skills. Considering the preliminary nature and the small sample size of the data, the results of the current study provide initial support for the efficacy of a mindfulness-based approach to parent training and replicate findings supporting the use of parent training in general for parents of children on the autism spectrum.

Within-group differences on the MAAS and ABA questionnaire further support the relationship between intervention and outcome. Statistically significant improvements on

**Fig. 2** PSI-SF change at time 2 and change at time 3 scores**Table 5** Between-group comparisons of PSI-SF and GHQ change scores at times 2 and 3

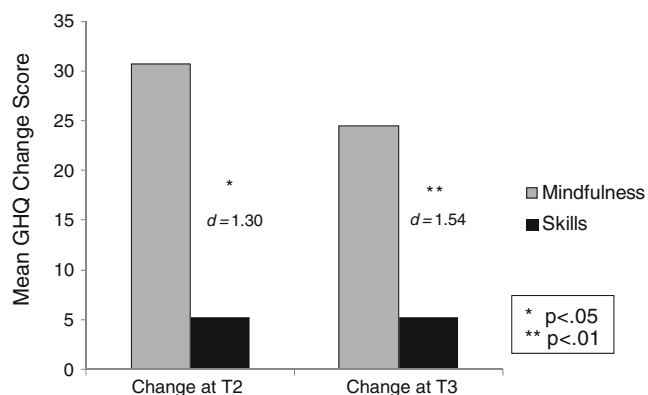
Variable	Change score		<i>p</i> value	<i>d</i> value
	Mindfulness	Skills		
PSI-SF change at T2	25.7	.56	.011	1.59
PSI-SF change at T3	24.2	4.4	.212	.63
GHQ change at T2	30.7	5.3	.015	1.3
GHQ change at T3	24.5	5.3	.008	1.54



**Fig. 3** Change scores on the PSI-SF at times 2 and 3

the MAAS for the mindfulness group and the ABA questionnaire for the skills group suggest that participants learned skills targeted by their respective programs that may have mediated improvements on the outcome measures (although this was not assessed statistically). Moreover, that neither group made significant improvements on the measure unrelated to their group assignment (i.e., MAAS for the skills group and ABA questionnaire for the mindfulness group) suggests that these improvements were likely resultant of the interventions, rather than external variables (e.g., maturation, regression toward the mean, nonspecific treatment effects). It is important to consider that the groups did not differ significantly on these measures at T2, so these results should be interpreted with caution. Additionally, pre-treatment group differences indicated that the mindfulness group started out with significantly lower MAAS scores than the skills group. This may suggest that learning mindfulness skills is most helpful for those who initially demonstrate lower levels of dispositional mindfulness, and that the mindfulness group merely “caught up” to the skills group by T2.

In contrast to the mindfulness group, no significant differences on either outcome measure were observed at T2 or T3 for the skills group. However, given the very small sample sizes of both groups, it may be more informative to consider



**Fig. 4** GHQ change at time 2 and change at time 3 scores

effect sizes at this time. The effect sizes for the mindfulness group were quite large on both measures and at both time points, suggesting that this intervention targeted both parenting-specific stress as well as more global health. For the skills group, moderate effect sizes were obtained on the GHQ at both T2 and T3. As such, it is likely that clinically relevant improvements on this measure occurred for the skills group, but the sample size was not sufficiently powered to capture the effect.

Further, the nature of the two group approaches may account for some of the observed differences. The targets of the skills group are directed toward affecting others’ behavior, and this outward-focused approach may actually increase stress in the short-term (Grindle et al. 2009; Johnson and Hastings 2002). Behavior change has also been demonstrated to occur over time (Sigman et al. 1999). Because new contingencies and adaptations to new routines may not be immediately acquired, particularly in children with ASD, it is expected that the benefits of a skills approach may only become salient in the long-term. However, one would expect that with the continued application of skills, child behavior would improve at home and parental stress levels would decrease concomitantly at follow-up. This trend appeared to be emerging for the skills group on the PSI-SF, with a small effect size at T3.

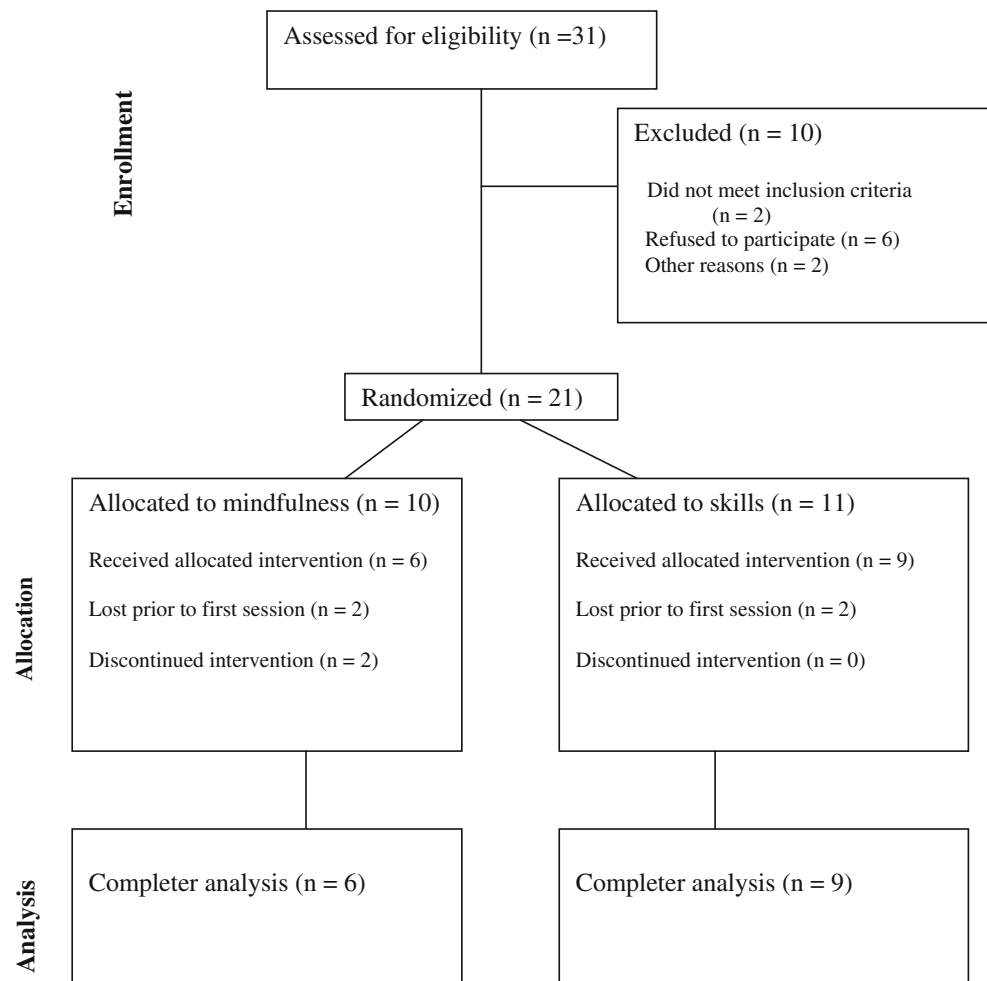
Finally, the focus on the self and the individual’s global health is unique to the mindfulness group, and this holistic approach may be more likely to garner immediate improvement. Other data trends support this argument, such as significant improvements observed on the GHQ from T1 to T2 and T3 for the mindfulness but not the skills group, as well as the change scores favoring the mindfulness group at T2 and T3.

#### Feasibility

A preliminary trial of these two parent training approaches was administered with a high response rate, adequate retention, and high acceptability ratings from participants, indicating the feasibility of running both groups concomitantly for subsequent comparison.

#### Recruitment and Retention

Potential participants were easily identified through school-based programs and statewide organizations for children with autism, although direct recruitment was by far more effective in identifying interested families. The response rate of 46.2 % in the current study was slightly higher than those reported in other parent training literature (e.g., 35 %: Garvey et al. 2006; 31 %: Heinrichs et al. 2005) and was considered satisfactory. In terms of retention, the attrition rate of 29 % was similar to or lower than those reported elsewhere (e.g., 30 %: Dumka et al. 1997; 51 %: Firestone and Witt 1982; 28 %: Forehand et al.

**Fig. 5** Participant recruitment and retention flow

1983; 23 %; Heinrichs et al. 2005). On average, completer parents attended a high percentage (85 %) of treatment sessions, as compared to other published reports (e.g., 39 %: Garvey et al. 2006; <48 %; Dumka et al. 1997). High attendance rates are not surprising considering elevated participant socioeconomic and educational status, as these characteristics have been negatively associated with early attrition and low participation (Garvey et al. 2006; Heinrichs 2006; Heinrichs et al. 2005). Although the mean number of sessions attended was higher for the skills group than the mindfulness group, the latter was significantly influenced by one member who only attended three sessions.

Attrition was notably higher for the mindfulness group (40 %) than the skills group (18 %). This was unsurprising, considering that many potential participants expressed concern regarding their group assignment during the recruitment calls, with the majority indicating that they would prefer the skills group. In particular, several participants described that they wanted to “actually learn something” (i.e., be assigned to the skills group). Interestingly, one such mother was placed in the mindfulness group and, at the end of treatment, reported being happy with her group assignment. However, others

either discontinued the intervention after one session or were lost prior to follow-up upon receiving their group assignment. This trend highlights the importance of “intervening” at the recruitment stage, to provide a sufficient rationale for each treatment approach, and to address potential barriers (Bowen et al. 2010; Kazdin et al. 1997; Mason et al. 2007). This process should again be repeated in the first treatment session. Although provision of rationale was an explicit, first-session discussion point in both intervention manuals, a more in-depth assessment of readiness would be warranted in future groups, especially for parents assigned to MBPT.

#### *Acceptability*

A questionnaire administered at T2 indicated high acceptability ratings and were similar for both groups. Parents were likely to indicate the relevance of the material to their lives and their intention to practice the target skills following the end of treatment. Most parents were satisfied with the treatment schedule and indicated that future groups should follow a similar format. A point of particular satisfaction was that meetings were held on weekday evenings, when it was easier

to coordinate jobs and child care. This is consistent with literature suggesting that accessibility of services is a primary factor in deciding whether to participate in parent training programs (Gross and Grady 2002).

### *Cost Considerations*

Overall, the parent training groups were relatively inexpensive to conduct, with the total cost approximating \$2,100, comprising both clinical and research-related materials. As such, this model appears to be feasible for dissemination, with several caveats. First, the investigator of the current study had free access to a location in which to conduct the meetings. Second, the group leaders were doctoral students with several years of relevant training and who were supervised by doctoral-level licensed psychologists. In a community-based setting it may be more difficult to secure professionals who are adequately trained in the core competencies of the treatment approaches and who are willing to work for little or no money. Third, the importance of administrative support has been highlighted as a key element of successful parent training programs (Gross and Grady 2002) and it is unclear from the current study how viable a similar approach would be in a community-based context. Overall however, this model seems reasonable and appropriate for future efficacy research in the field of parent training, where it can be supported by a university, medical, or school-based institution.

### *Limitations*

Interpretations of the presented data must be considered in light of several key limitations. First, the small sample size rendered the *t* tests underpowered. Although interpreting effect sizes provided more useful information, the effect sizes for the skills group were still small to moderate at T2 and T3. This may have reflected truly small treatment effects; alternatively, it may suggest emerging improvements in stress and global health, which may become more robust over time, especially considering the potentially increased stress period for parents after initiating a behavioral treatment. It will be important to look at more longitudinal data on parent stress to determine whether a sleeper effect is supported in the skills group, and it will also be necessary to replicate these findings with much larger samples to determine whether the results are generalizable.

Second, the use of such a small sample size makes it very difficult to draw meaningful conclusions from the data and to establish external validity of treatment effects. It is possible that the benefits observed in the current participants are unique to this sample, an issue which may be addressed by running additional groups. In addition, the lack of significant between-group differences in outcome between those run in the fall and the winter suggests that the data captured robust findings.

Third, it is difficult to draw robust conclusions from the outcome data, as the groups differed significantly on their pre-treatment PSI-SF and GHQ scores, with the mindfulness group reporting higher levels of stress and lower global health scores than the skills group. One possible explanation is that mindfulness practice is more beneficial to those who experience higher levels of distress. This theory is consistent with previous findings in the depression literature, which indicated that the benefits of participation in a mindfulness group for preventing depression relapse were positively related to the number of previous depressive episodes (Ma and Teasdale 2004). However, without better control of the between-group variability in the current sample, it is impossible to make strong statements regarding treatment efficacy at this time.

Finally, although data on treatment integrity were collected, the coding by the first author introduces a significant source of potential bias in the fidelity results. A lack of empirical support that the interventions were administered with all their components and without cross-contamination affects our ability to draw strong conclusions about the internal validity of the findings.

### *Future Directions*

In considering future group comparisons, changes to the methodology and intervention programs may have important implications for recruitment and the interpretation of treatment effects.

In addition, although the research is in its early stages, there are many future research questions that have arisen, many of which are based on observations made during treatment sessions.

### *Program Adaptations*

Although limited resources prevented their inclusion in the current study, additional program elements may make an important contribution to future groups. Firstly, recruitment and retention could likely be bolstered by the provision of child care. Most parents indicated a child care conflict as a reason for not participating or for missing sessions, and almost all parents spontaneously indicated on the acceptability questionnaire that child care would be a helpful element of future groups. These responses are consistent with literature suggesting that child care incentives are important and especially compelling for low-income families (Heinrichs 2006).

Secondly, research that has successfully measured positive parental behavior change as a result of related programs has generally included direct observational feedback and/or in-home training or support (e.g., Crockett, et al. 2007; Ingersoll and Dvortcsak 2006; McIntyre and Abbeduto 2008; Rocha et al. 2007; Smith et al. 2000). A lack of systematic checks has

been highlighted as methodologically problematic in previous controlled trial parent training research (Drew et al. 2002). Provision of regular videotape feedback, home-based checks, or in-home booster sessions could significantly contribute to the correct implementation, generalization, and maintenance of skills for both groups. As such, the efficacy of this approach and the feasibility within the current model is another area of further exploration.

### Future Research Questions

With respect to future analyses, an evaluation of process variables is a logical first step. The group leaders noticed different patterns between groups in terms of initial buy-in and willingness to participate, as well as how these factors changed over time. These observations were first made with the fall groups and then replicated with the winter groups. Continuous assessment of alliance, group participation, and homework completion would more quantifiably detect potential changes throughout the 8 weeks. Because parent perception is shown to strongly relate to stress, it would also be interesting to ask parents to complete a weekly, abbreviated acceptability questionnaire (e.g., how satisfied participants are with treatment this week, how much they think they have benefited from the program thus far). These data could be analyzed between groups, as well as in terms of participant characteristics and provide a foundation for future mediator and moderator analyses.

Although parents expressed high levels of satisfaction with their respective treatments, a few also indicated interest in the alternative treatment approach. Overall, the benefits observed within each group suggest that they both include key skills to helping parents effectively deal with stress. One potential exploration is the empirical evaluation of current modified treatment packages that incorporate core competencies from both programs. Alternatively, another approach may involve stacking both treatments (rather than integrating them) and comparing the order in which they are most beneficial. Considerable parent time constraints may favor the former approach as the logical first step. However, eventually both treatments could be applied and either component analyses or a dismantling study would indicate the necessary elements of effective intervention.

Finally, as the literature supports a dynamic relationship between parental stress and child outcomes (Greenberg et al. 2006; Orsmond et al. 2003; Robbins et al. 1991), it will be important to systematically examine potential ancillary effects of these interventions on child behavior. In particular, the differential effects of each intervention on both child skill acquisition and reductions in problem behavior should be evaluated, as well as the mediators of these gains. Direct, home-based observations will be a critical component of this line of research for supporting both the social and external validity of the results.

In summary, providing parents with mindfulness and behavioral skills treatment packages appears to help them cope with the stressors of raising a child on the autism spectrum. Although little is yet known about the critical effective elements of these treatments and regarding the experience of group members throughout the programs, continued investigation of these issues will hopefully further support this important population. By reducing individual stress we hope to make life a little easier for parents and hope that those benefits will then be extended to their children.

**Acknowledgments** This research was supported in part by generous grants from the Organization for Autism Research and the Harris Dissertation Fellowship. We are grateful for the guidance and support of Tristram Smith, Shireen Rizvi, Brian Chu, and Alan Leslie. Many thanks are also given to Dorian Hunter Reel, Amy Hansford, Laurie Zandberg, and the parents who participated in this research.

This study was conducted by Suzannah J. Ferraioli, in partial fulfillment of a Doctorate of Philosophy degree under the direction of Sandra L. Harris at Rutgers, The State University of New Jersey, USA.

### References

- Abbeduto, L., Seltzer, M. M., Shattuck, P., Krauss, M. W., Orsmond, G., & Murphy, M. M. (2004). Psychological well-being and coping in mothers of youths with autism, Down syndrome, or Fragile X syndrome. *American Journal on Mental Retardation, 109*, 237–254.
- Abidin, R. R. (1995). *Parenting stress index* (3rd ed.). Odessa: Psychological Assessment Resources.
- Blackledge, J. T., & Hayes, S. C. (2006). Using acceptance and commitment training in the support of parents of children diagnosed with autism. *Child & Family Behavior Therapy, 28*, 1–18.
- Bögels, S., Hoogstad, B., van Dun, L., de Schutter, S., & Restifo, K. (2008). Mindfulness training for adolescents with externalizing disorders and their parents. *Behavioural and Cognitive Psychotherapy, 36*, 193–209.
- Bowen, D. J., Halbert, C. H., Robinson, A., & Boehmer, U. (2010). Gender diverse recruitment to research projects. In J. C. Chrisler & D. R. McCreary (Eds.), *Handbook of gender research in psychology* (pp. 179–191). New York: Springer.
- Bristol, M. M., & Schopler, E. (1984). A development perspective on stress and coping in families of autistic children. In J. Blancher (Ed.), *Severely handicapped children and their families* (pp. 91–141). New York: Academic Press.
- Bristol, M. M., Gallagher, J. J., & Holt, K. D. (1993). Maternal depressive symptoms in autism: response to psychoeducational intervention. *Rehabilitation Psychology, 38*, 3–10.
- Brown, K. W., & Ryan, R. M. (2003). The benefits of being present: mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology, 84*, 822–848.
- Celiberti, D. A., & Harris, S. L. (1993). Behavioral intervention for siblings of children with autism: a focus on skills to enhance play. *Behavior Therapy, 24*, 573–599.
- Charlop-Christy, M. H., & Kelso, S. E. (1997). *How to treat the child with autism*. Claremont: Author.
- Crockett, J. L., Fleming, R. K., Doepke, K. J., & Stevens, J. S. (2007). Parent training: acquisition and generalization of discrete trials teaching skills with parents of children with autism. *Research in Developmental Disabilities, 28*, 23–26.

- Drew, A., Baird, G., Baron-Cohen, S., Cox, A., Slonims, V., Wheelwright, S., et al. (2002). A pilot randomized control trial of a parent training intervention for pre-school children with autism: preliminary findings and methodological challenges. *European Child & Adolescent Psychiatry, 11*, 266–272.
- Dumas, J. E., Wolf, L. C., Fisman, S. N., & Culligan, A. (1991). Parenting stress, child behavior problems, and dysphoria in parents of children with autism, down syndrome, behavior disorders, and normal development. *Exceptionality, 2*, 97–110.
- Dumka, L. E., Garza, C. A., Roosa, M. W., & Stoerzinger, H. D. (1997). Recruitment and retention of high-risk families into a preventive parent training intervention. *The Journal of Primary Prevention, 18*, 25–39.
- Dunn, M. E., Burbine, T., Bowers, C. A., & Tantleff-Dunn, S. (2001). Moderators of stress in parents of children with autism. *Community Mental Health Journal, 37*, 39–52.
- Epstein-Lubow, G., McBee, L., Darling, E., Arme, M., & Miller, I. W. (2011). A pilot investigation of mindfulness-based stress reduction for caregivers of frail elderly. *Mindfulness, 2*, 95–102.
- Firestone, P., & Witt, J. E. (1982). Characteristics of families completing and prematurely discontinuing a behavioral parent-training program. *Journal of Pediatric Psychology, 7*, 209–222.
- Forehand, R., Middlebrook, J., Rogers, T., & Steffe, M. (1983). Dropping out of parent training. *Behaviour Research and Therapy, 21*, 663–668.
- Garvey, C., Julion, W., Fogg, L., Kratovil, A., & Gross, D. (2006). Measuring participation in a prevention trial with parents of young children. *Research in Nursing & Health, 29*, 212–222.
- Gillett, J. N., & LeBlanc, L. A. (2007). Parent-implemented natural language paradigm to increase language and play in children with autism. *Research in Autism Spectrum Disorders, 1*, 247–255.
- Goldberg, D. P. (1978). *Manual of the general health questionnaire*. Windsor: NFER Publishing.
- Greenberg, J. S., Seltzer, M. M., Hong, J., & Orsmond, G. I. (2006). Bidirectional effects of expressed emotion and behavior problems and symptoms in adolescents and adults with autism. *American Journal on Mental Retardation, 111*, 229–249.
- Grindle, C. F., Kovshoff, H., Hastings, R. P., & Remington, B. (2009). Parents' experiences of home-based applied behavior analysis programs for young children with autism. *Journal of Autism and Developmental Disorders, 39*, 42–56.
- Gross, D., & Grady, J. (2002). Group-based parent training for preventing mental health disorders in children. *Issues in Mental Health Nursing, 23*, 367–383.
- Harris, S. L., Wolchik, S. A., & Milch, R. E. (1983). Changing the speech of autistic children and their parents. *Child & Family Behavior Therapy, 4*, 151–173.
- Hastings, R. P., Kovshoff, H., Brown, T., Ward, N. J., Espinosa, F. D., & Remington, B. (2005). Coping strategies in mothers and fathers of preschool and school-age children with autism. *Autism, 9*, 377–391.
- Heinrichs, N. (2006). The effects of two different incentives on recruitment rates of families not a prevention program. *The Journal of Primary Prevention, 27*, 345–365.
- Heinrichs, N., Bertram, H., Kuschel, A., & Hahlweg, K. (2005). Parent recruitment and retention in a universal prevention program for child behavior and emotional problems: barriers to research and program participation. *Prevention Science, 6*, 275–286.
- Ingersoll, B., & Dvortcsak, A. (2006). Including parent training in the early childhood special education curriculum for children with autism spectrum disorders. *Journal of Positive Behavior Interventions, 8*, 79–87.
- Johnson, E., & Hastings, R. P. (2002). Facilitating factors and barriers to the implementation of intensive home-based behavioural intervention for young children with autism. *Child: Care, Health and Development, 28*, 123–129.
- Kabat-Zinn, J. (1994). *Wherever you go, there you are: mindfulness meditation in everyday life*. New York: Hyperion.
- Kazdin, A. E., Holland, L., & Crowley, M. (1997). Family experience of barriers to treatment and premature termination from child therapy. *Journal of Consulting and Clinical Psychology, 65*, 453–463.
- Koegel, R. L., Schreibman, L., Good, A., Cerniglia, L., Murphy, C., & Koegel, L. K. (1989). *How to teach pivotal behaviors to children with autism: a training manual*. Santa Barbara: Author.
- Leaf, R., & McEachin, J. (1999). *A work in progress: behavior management strategies and a curriculum for intensive behavioral treatment of autism*. New York: Autism Partnership.
- Linehan, M. M. (1993). *Skills training manual for treating borderline personality disorder*. New York: Guilford Press.
- Ma, S. H., & Teasdale, J. D. (2004). Mindfulness-based cognitive therapy for depression: replication and exploration of differential relapse prevention effects. *Journal of Consulting and Clinical Psychology, 72*, 31–40.
- Marlatt, G. A., & Kristeller, J. L. (1999). Mindfulness and meditation. In W. R. Miller (Ed.), *Integrating spirituality into treatment* (pp. 67–84). Washington, DC: American Psychological Association.
- Mason, V. L., Shaw, A., Wiles, N. J., Mulligan, J., Peters, T. J., Sharp, D., et al. (2007). GP's experiences of primary care mental health research: a qualitative study of the barriers to recruitment. *Family Practice, 24*, 518–525.
- McIntyre, L. L., & Abbeduto, L. (2008). Parent training for young children with developmental disabilities: randomized controlled trial. *American Journal on Mental Retardation, 113*, 356–368.
- Minor, H. G., Carlson, L. E., Mackenzie, M. J., Zernicke, K., & Jones, L. (2006). Evaluation of a mindfulness-based stress reduction (MSBR) program for caregivers of children with chronic conditions. *Social Work in Health Care, 43*, 91–109.
- Orsmond, G. I., Seltzer, M. M., Krauss, M. Y., & Hong, J. (2003). Behavior problems in adults with mental retardation and maternal well-being: examination of the direction of effects. *American Journal on Mental Retardation, 108*, 257–271.
- Robbins, F. R., Dunlap, G., & Plien, A. J. (1991). Family characteristics, family training, and the progress of young children with autism. *Journal of Early Intervention, 15*, 173–184.
- Rocha, M. L., Schreibman, L., & Stahmer, A. C. (2007). Effectiveness of training parents to teach joint attention in children with autism. *Journal of Early Intervention, 29*, 154–172.
- Segal, Z. V., Williams, J. M. G., & Teasdale, J. D. (2002). *Mindfulness-based cognitive therapy for depression: a new approach to preventing relapse*. New York: The Guilford Press.
- Sheeran, T., Marvin, R. S., & Pianta, R. C. (1997). Mothers' resolution of their child's diagnosis and self-reported measures of parenting stress, marital relations, and social support. *Journal of Pediatric Psychology, 22*, 197–212.
- Sigman, M., Ruskin, E., Arbelle, S., Corona, R., Dissanayake, C., Espinosa, M., et al. (1999). Continuity and change in the social competence of children with autism, down syndrome, and developmental delays. *Monographs of the Society for Research in Child Development, 64*, 1–139.
- Singh, N. N., Lancioni, G. E., Winton, A. S. W., Fisher, B. C., Wahler, R. G., McAleavey, K., et al. (2006). Mindful parenting decreases aggression, noncompliance, and self-injury in children with autism. *Journal of Emotional and Behavioral Disorders, 14*(3), 169–177.

- Singh, N. N., Lancioni, G. E., Winton, A. S. W., Singh, J., Curtis, W. J., Wahler, R. G., et al. (2007). Mindful parenting decreases aggression and increases social behavior in children with developmental disabilities. *Behavior Modification, 31*, 749–771.
- Smith, T., Buch, G. A., & Gamby, T. E. (2000). Parent-directed, intensive early intervention for children with pervasive developmental disorder. *Research in Developmental Disabilities, 21*, 297–309.
- Smith, L., Hong, J., Seltzer, M. M., Greenberg, J. S., Almeida, D. M., & Bishop, S. L. (2010). Daily experiences among mothers of adolescents and adults with autism spectrum disorders. *Journal of Autism and Developmental Disorders, 40*, 167–178.
- Solomon, R., Necheles, J., Ferch, C., & Bruckman, D. (2007). Pilot study of a parent training program for young children with autism: the PLAY project home consultation program. *Autism, 11*, 205–224.
- Tonge, B., Brereton, A., Kiomall, M. M., Mackinnon, A., King, N., & Rinehart, N. (2006). Effects on parental mental health of an education and skills training program for parents of young children with autism: a randomized controlled trial. *Journal of the American Academy of Child and Adolescent Psychiatry, 45*, 561–569.



## Mindfulness in Maternal and Child Health Selected Literature

### **Pregnancy**

- Beddoe, A. E., & Lee, K. A. (2008). Mind-body interventions during pregnancy. *Journal of Obstetric, Gynecologic, & Neonatal Nursing, 37*(2), 165-175.
- Beddoe, A. E., Lee, K. A., Weiss, S. J. Powell Kennedy, H., & Yang, C. P. P. (2010). Effects of mindful yoga on sleep in pregnant women: A pilot study. *Biological Research for Nursing, 11*(4), 363-70.
- Carlson NS, Lowe N. (2006) Centering Pregnancy: A new approach in prenatal care. *The American Journal of Maternal Child Nursing, 31*(4): 218-23.

### **Obesity**

- Dalen, J., Smith, B. W., Shelley, B. M., Sloan, A. L., Leahigh, L., & Begay, D. (2010). Pilot study: Mindful eating and living (MEAL): Weight, eating behavior, and psychological outcomes associated with a mindfulness-based intervention for people with obesity. *Complementary Therapies in Medicine, 18*(6), 260-264.
- Ickovics J.R., Kershaw T.S., Westdahl C., Rising S.S., Klima C., Reynolds H. & Magriples U. (2003). Group prenatal care and preterm birth weight: Results from a matched cohort study at public clinics. *Obstetrics and Gynecology, 102*: 1051-1057.
- Ockene, J., Sorensen, G., Kabat-Zinn, J., Ockene, I.S., and Donnelly, G. (1988). Benefits and costs of lifestyle change to reduce risk of chronic disease. *Preventive Medicine, 17*:224-234.

### **Depression**

- Brown, K. W., & Ryan, R. M. (2003). The benefits of being present: Mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology, 84*(4), 822-848.
- Schreiner, I., Malcolm, J.P. (2008). The benefits of mindfulness meditation: Changes in emotional states of depression, anxiety, and stress. *Behaviour Change, 25*(3), 156-168.
- Westdahl C, Milan S, Magriples U, Kershaw T, Rising SS, Ickovics JR. (2007) Social Support and Social Conflict as Predictors of Prenatal Depression. *Obstetrics and Gynecology 110*:1; 134-140.

### **Youth Risk Behaviors**

- Mendelson, T., Greenberg, M. T., Dariotis, J. K., Gould, L. F., Rhoades, B. L., & Leaf, P. J. (2010). Feasibility and preliminary outcomes of a school-based mindfulness intervention for urban youth. *Journal of Abnormal Child Psychology, 38*(7), 985-994.
- Sibinga, E. M., Kerrigan, D., Stewart, M., Johnson, K., Magyar, T., & Ellen, J. M. (2011). Mindfulness-based stress reduction for urban youth. *Journal of Alternative & Complementary Medicine, 17*(3), 213-218.
- Singh, N. N., Lancioni, G. E., Joy, S. D. S., Winton, A. S. W., Sabaawi, M., Wahler, R. G., et al. (2007). Adolescents with conduct disorder can be mindful of their aggressive behavior. *Journal of Emotional and Behavioral Disorders, 15*(1), 56-63.



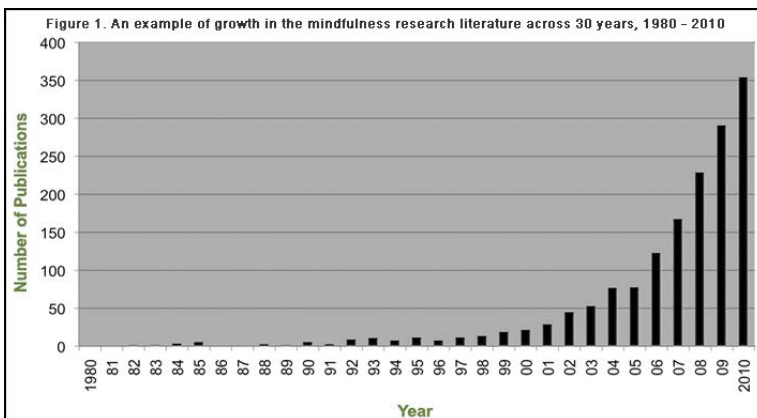
## Doctor-Patient Relationship

- Krasner, M. S., Epstein, R. M., Beckman, H., Suchman, L. A., Chapman, B., Mooney, C. J., & Quill, T. E. (2009). Association of an educational program in mindful communication with burnout, empathy, and attitudes among primary care physician. *JAMA : The Journal of the American Medical Association*, 302(12)
- Singh, N. N., Wechsler, H. A., Curtis, W. J., Sabaawi, M., Myers, R. E., & Singh, S. D. (2002). Effects of role-play and mindfulness training on enhancing the family friendliness of the admissions treatment team process. *Journal of Emotional and Behavioral Disorders*, 10(2), 90-98.
- Wong, A. (2005). Mindfulness – rediscovering satisfaction and meaning in medical education. *University of Toronto Medical Journal*, 80 (3), 265-267.

[Knowledge-Worker-Productivity-and-Self-Management-from-The-Drucker-Difference.pdf](#)

## Healthcare

- Ludwig, David S. & Kabat-Zinn, J. (2008). Mindfulness in medicine. *JAMA*, 300(11):1350-1352.
- Fodor, I. E., & Hooker, K. E. (2008). Teaching mindfulness to children. *Gestalt Review*, 12(1),75-91.
- Ruff, Kelly and Mackenzie, Elizabeth. (2009). The role of mindfulness in healthcare reform: A policy paper. *Explore: The Journal of Science & Healing*, 5(6), 313-323.



Retrieved from the mindfulness research guide (<<http://www.mindfulexperience.org/publications.php>>) 03/11/2012.

## System of Care

- Weick, K. E., & Putnam, T. (2006). Organizing for mindfulness. *Journal of Management Inquiry*, 15(3), 275-287.
- Smith, R. B., Dynan, L., Fairbrother, G., Chabi, G., & Simpson, L. (2012). Medicaid, hospital financial stress, and the incidence of adverse medical events for children. *Health Services Research*.
- Peterson, C., & Park, N. (2006). Character strengths in organizations. *Journal of Organizational Behavior*, 27, 1149-1154.
- Hunter, J, Scherer, JS Knowledge worker productivity and the practice of self management (Accessed 2\_29\_12 at <http://jeremyhunter.net/wp-content/uploads/2010/11/Hunter-Scherer->
- Arias, A. J., Steinberg, K., Banga, A., & Trestman, R. L. (2006). Systematic review of the efficacy of meditation techniques as treatments for medical illness. *Journal of Alternative and Complementary Medicine*, 12(8), 817-832.
- Brown, K. W., & Ryan, R. M. (2003). The benefits of being present: Mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology*, 84(4), 822-848.
- Greeson, J. M. (2009). Mindfulness research update: 2008. *Complementary Health Practice Review*, 14(1), 10-18.
- Holzel, BK, Lazar, SW, Gard, T, etc al. (2011) How Does Mindfulness Work? Proposing Mechanisms of Action From a Conceptual and Neural Perspective. *Perspectives on Psychological Science*. V6: p 537.
- Praissman, S. (2008). Mindfulness-based stress reduction: A literature review and clinician's guide. *Journal of the American Academy of Nurse Practitioners*, 20(4), 212-216.
- Walsh, R., & Shapiro, S. L. (2006). The meeting of meditative disciplines and western psychology: A mutually enriching dialogue. *American Psychologist*, 61(3), 227-239.