Meditation

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Table of Contents

General

A Loving-Kindness Meditation to Boost Compassion. (2016, March 31). Retrieved from https://www.mindful.org/a-loving-kindness-meditation-to-boost-compassion/

Bergland, C. (2013, February 2). The Neurobiology of Grace Under Pressure. Retrieved from https://www.psychologytoday.com/blog/the-athletes-way/201302/the-neurobiology-grace-under-pressure

Boellinghaus, I., Jones, F. W., & Hutton, J. (2013). Cultivating self-care and compassion in psychological therapists in training: The experience of practicing loving-kindness meditation. *Training and Education in Professional Psychology*, *7*(4), 267-277.

Given significant rates of psychological distress in practicing psychological therapists, including those in training, there is a need to cultivate self-care and compassion during therapy training. Emerging research has suggested that loving-kindness meditation (LKM) increases well-being and compassion, thus, making it a potential tool to foster self-care in trainee therapists (TT). However, studies have also suggested difficulties in engaging with LKM. This study aimed to explore in-depth how a sample of TT experiences a course of LKM, using interpretative phenomenological analysis. Twelve TT who had previously attended a mindfulness-based cognitive therapy course took part in a six-session LKM course and were interviewed about their experience. Five master themes were identified: (a) engaging with the practice, (b) impact on self, (c) impact on relationships, (d) bringing compassion into the therapy room, and (e) integrating LKM into life. Participants perceived LKM to have led to increased self-awareness, compassion for self and others, and therapeutic presence and skills. At the same time, LKM was experienced as emotionally challenging. The findings suggest that it may be useful to offer LKM to TT as an approach to enhancing self-care and compassion, but that it should be taught with care, given its potential emotional impact. Moreover, the findings provide a platform for future quantitative research in this area.

Boegels, S. M., Lehtonen, A., & Restifo, K. (2010). Mindful parenting in mental health care. *Mindfulness*, *1*(2), 107–120.

Mindfulness is a form of meditation based on the Buddhist tradition, which has been used over the last two decades to successfully treat a multitude of mental health problems. Bringing mindfulness into parenting (“mindful parenting”) is one of the applications of mindfulness. Mindful parenting interventions are increasingly being used to help prevent and treat mental disorders in children, parenting problems, and prevent intergenerational transmission of mental disorders from parents to children. However, to date, few studies have examined the hypothesized mechanisms of change brought about by mindful parenting. We discuss six possible mechanisms through which mindful parenting may bring about change in parent–child interactions in the context of child and parent mental health problems. These mechanisms are hypothesized to be mediated by the effects of mindfulness on parental attention by: (1) reducing parental stress

and resulting parental reactivity; (2) reducing parental preoccupation resulting from parental and/or child psychopathology; (3) improving parental executive functioning in impulsive parents; (4) breaking the cycle of intergenerational transmission of dysfunctional parenting schemas and habits; (5) increasing self-nourishing attention; and (6) improving marital functioning and co-parenting. We review research that has applied mindful parenting in mental health settings, with a focus on evidence for these six mechanisms. Finally, we discuss directions for future research into mindful parenting and the crucial questions that this research should strive to answer.

Brewer, J. A., Worhunsky, P. D., Gray, J. R., Tang, Y. Y., Weber, J., & Kober, H. (2011). Meditation experience is associated with differences in default mode network activity and connectivity. *Proceedings of the National Academy of Sciences, 108*(50), 20254-20259.

Mindfulness is a form of meditation based on the Buddhist tradition, which has been used over the last two decades to successfully treat a multitude of mental health problems. Bringing mindfulness into parenting ("mindful parenting") is one of the applications of mindfulness. Mindful parenting interventions are increasingly being used to help prevent and treat mental disorders in children, parenting problems, and prevent intergenerational transmission of mental disorders from parents to children. However, to date, few studies have examined the hypothesized mechanisms of change brought about by mindful parenting. We discuss six possible mechanisms through which mindful parenting may bring about change in parent–child interactions in the context of child and parent mental health problems. These mechanisms are hypothesized to be mediated by the effects of mindfulness on parental attention by: (1) reducing parental stress and resulting parental reactivity; (2) reducing parental preoccupation resulting from parental and/or child psychopathology; (3) improving parental executive functioning in impulsive parents; (4) breaking the cycle of intergenerational transmission of dysfunctional parenting schemas and habits; (5) increasing self-nourishing attention; and (6) improving marital functioning and co-parenting. We review research that has applied mindful parenting in mental health settings, with a focus on evidence for these six mechanisms. Finally, we discuss directions for future research into mindful parenting and the crucial questions that this research should strive to answer. increases happiness. However, the default mode of humans appears to be that of mind-wandering, which correlates with unhappiness, and with activation in a network of brain areas associated with self-referential processing. We investigated brain activity in experienced meditators and matched meditation-naive controls as they performed several different meditations (Concentration, Loving-Kindness, Choiceless Awareness). We found that the main nodes of the default-mode network (medial prefrontal and posterior cingulate cortices) were relatively deactivated in experienced meditators across all meditation types. Furthermore, functional connectivity analysis revealed stronger coupling in experienced meditators between the posterior cingulate, dorsal anterior cingulate, and dorsolateral prefrontal cortices (regions previously implicated in self-monitoring and cognitive control), both at baseline and during meditation. Our findings demonstrate differences in the default-mode network that are consistent with decreased mind-wandering. As such, these provide a unique understanding of possible neural mechanisms of meditation.

Broyd, S. J., Demanuele, C., Debener, S., Helps, S. K., James, C. J., & Sonuga-Barke, E. J. S. (2009). Default-mode brain dysfunction in mental disorders: a systematic review. *Neuroscience and Biobehavioral Reviews, 33*, 279-296.

In this review we are concerned specifically with the putative role of the default-mode network (DMN) in the pathophysiology of mental disorders. First, we define the DMN concept with regard to its neuro- anatomy, its functional organisation through low frequency neuronal oscillations, its relation to other recently discovered low frequency resting state networks, and the cognitive functions it is thought to serve. Second, we introduce methodological and analytical issues and challenges. Third, we describe putative mechanisms proposed to link DMN abnormalities and mental disorders. These include interference by network activity during task performance, altered patterns of antagonism between task specific and non-specific elements, altered connectively and integrity of the DMN, and altered psychological functions served by the network DMN. Fourth, we review the empirical literature systematically. We relate DMN dysfunction to dementia, schizophrenia, epilepsy, anxiety and depression, autism and attention deficit/hyperactivity disorder drawing out common and unique elements of the disorders. Finally, we provide an integrative overview and highlight important challenges and tasks for future research.

Buser, T. J., Buser, J. K., Peterson, C. H., & Seraydarian, D. G. (2012). Influence of Mindfulness Practice on Counseling Skills Development. *The Journal of Counselor Preparation and Supervision*, *4*(1), 1-25.

This study assessed the impact of mindfulness practice, incorporated alongside a five-week counselor skills training model, on the counseling skills development of master's-level trainees (N = 59). Three groups of counseling students were studied: those who engaged in no mindfulness practice; those who engaged in a brief amount of mindfulness practice (five mindfulness practice sessions); and those who engaged in an extended amount of mindfulness practice (11 mindfulness practice sessions). The results showed improvements in counseling skills associated with mindfulness practice, although the brief and extended intervention groups did not significantly differ from one another.

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*(4), 564-570.

OBJECTIVE: The underlying changes in biological processes that are associated with reported changes in mental and physical health in response to meditation have not been systematically explored. We performed a randomized, controlled study on the effects on brain and immune function of a well-known and widely used 8-week clinical training program in mindfulness meditation applied in a work environment with healthy employees. METHODS: We measured brain electrical activity before and immediately after, and then 4 months after an 8-week training program in mindfulness meditation. Twenty-five subjects were tested in the meditation group. A wait-list control group (N = 16) was tested at the same points in time as the meditators. At the end of the 8-week period, subjects in both groups were vaccinated with influenza vaccine. RESULTS: We report for the first time significant increases in left-sided anterior activation, a pattern previously

associated with positive affect, in the meditators compared with the nonmeditators. We also found significant increases in antibody titers to influenza vaccine among subjects in the meditation compared with those in the wait-list control group. Finally, the magnitude of increase in left-sided activation predicted the magnitude of antibody titer rise to the vaccine. CONCLUSIONS: These findings demonstrate that a short program in mindfulness meditation produces demonstrable effects on brain and immune function. These findings suggest that meditation may change brain and immune function in positive ways and underscore the need for additional research.

Davis, D. M. & Hayes, J. A. (2011). What are the benefits of mindfulness? A practice review of psychotherapy-related research. *Psychotherapy, 48*(2), 198-208.

Research suggests that mindfulness practices offer psychotherapists a way to positively affect aspects oftherapy that account for successful treatment. This paper provides psychotherapists with a synthesis ofthe empirically supported advantages of mindfulness. Definitions of mindfulness and evidence-basedinterpersonal, affective, and intrapersonal benefits of mindfulness are presented. Research on therapistswho meditate and client outcomes of therapists who meditate are reviewed. Implications for practice,research, and training are discussed.

Desbordes, G., Negi, L. T., Pace, T. W. W., Wallace, B. A., Raison, C. L., & Schwartz, E. L. (2012). Effects of mindful-attention and compassion meditation training on amygdala response to emotional stimuli in an ordinary, non-meditative state. *Frontiers in Human Neuroscience, 6,* 292.

The amygdala has been repeatedly implicated in emotional processing of both positive and negative-valence stimuli. Previous studies suggest that the amygdala response to emotional stimuli is lower when the subject is in a meditative state of mindful-attention, both in beginner meditators after an 8-week meditation intervention and in expert meditators. However, the longitudinal effects of meditation training on amygdala responses have not been reported when participants are in an ordinary, non-meditative state. In this study, we investigated how 8 weeks of training in meditation affects amygdala responses to emotional stimuli in subjects when in a non-meditative state. Healthy adults with no prior meditation experience took part in 8 weeks of either Mindful Attention Training (MAT), Cognitively-Based Compassion Training (CBCT; a program based on Tibetan Buddhist compassion meditation practices), or an active control intervention. Before and after the intervention, participants underwent an fMRI experiment during which they were presented images with positive, negative, and neutral emotional valences from the IAPS database while remaining in an ordinary, non-meditative state. Using a region-of-interest analysis, we found a longitudinal decrease in right amygdala activation in the Mindful Attention group in response to positive images, and in response to images of all valences overall. In the CBCT group, we found a trend increase in right amygdala response to negative images, which was significantly correlated with a decrease in depression score. No effects or trends were observed in the control group. This finding suggests that the effects of meditation training on emotional processing might transfer to non-meditative states. This is consistent with the hypothesis that meditation training may induce learning that is not

stimulus- or task-specific, but process-specific, and thereby may result in enduring changes in mental function.

Ditto, B., Eclache, M., & Goldman, N. (2006). Short-term autonomic and cardiovascular effects of mindfulness body scan meditation. *Annals of Behavioral Medicine*, *32*(3), 227-234.

BACKGROUND: Recent research suggests that the Mindfulness-Based Stress Reduction program has positive effects on health, but little is known about the immediate physiological effects of different components of the program. PURPOSE: To examine the short-term autonomic and cardiovascular effects of one of the techniques employed in mindfulness meditation training, a basic body scan meditation. METHODS: In Study 1, 32 healthy young adults (23 women, 9 men) were assigned randomly to either a meditation, progressive muscular relaxation or wait-list control group. Each participated in two laboratory sessions 4 weeks apart in which they practiced their assigned technique. In Study 2, using a within-subjects design, 30 healthy young adults (15 women, 15 men) participated in two laboratory sessions in which they practiced meditation or listened to an audiotape of a popular novel in counterbalanced order. Heart rate, cardiac respiratory sinus arrhythmia (RSA), and blood pressure were measured in both studies. Additional measures derived from impedance cardiography were obtained in Study 2. RESULTS: In both studies, participants displayed significantly greater increases in RSA while meditating than while engaging in other relaxing activities. A significant decrease in cardiac pre-ejection period was observed while participants meditated in Study 2. This suggests that simultaneous increases in cardiac parasympathetic and sympathetic activity may explain the lack of an effect on heart rate. Female participants in Study 2 exhibited a significantly larger decrease in diastolic blood pressure during meditation than the novel, whereas men had greater increases in cardiac output during meditation compared to the novel. CONCLUSIONS: The results indicate both similarities and differences in the physiological responses to body scan meditation and other relaxing activities.

Eisenberger, N. I., Jarcho, J. M., Lieberman, M. D., & Naliboff, B. D. (2006). An experimental study of shared sensitivity to physical pain and social rejection. *Pain, 126*(1-3), 132-138.

Recent evidence points to a possible overlap in the neural systems underlying the distressing experience that accompanies physical pain and social rejection (Eisenberger et al., 2003). The present study tested two hypotheses that stem from this suggested overlap, namely: (1) that baseline sensitivity to physical pain will predict sensitivity to social rejection and (2) that experiences that heighten social distress will heighten sensitivity to physical pain as well. In the current study, participants' baseline cutaneous heat pain unpleasantness thresholds were assessed prior to the completion of a task that manipulated feelings of social distress. During this task, participants played a virtual ball-tossing game, allegedly with two other individuals, in which they were either continuously included (social inclusion condition) or they were left out of the game by either never being included or by being overtly excluded (social rejection conditions). At the end of the game, three pain stimuli were delivered and participants rated the unpleasantness of each. Results indicated that greater baseline sensitivity to

pain (lower pain unpleasantness thresholds) was associated with greater self-reported social distress in response to the social rejection conditions. Additionally, for those in the social rejection conditions, greater reports of social distress were associated with greater reports of pain unpleasantness to the thermal stimuli delivered at the end of the game. These results provide additional support for the hypothesis that pain distress and social distress share neurocognitive substrates. Implications for clinical populations are discussed.

Eisenberger, N. I., & Lieberman, M. D. (2005). Why it hurts to be left out: The neurocognitive overlap between physical and social pain. In K. D. Williams, J. P. Forgas, & W. von Hippel (Eds.), *The Social Outcast: Ostracism, Social Exclusion, Rejection, and Bullying* (pp. 109-127). New York, NY: Cambridge University Press.

We propose that along with the evolution of mammals, a species unique in their need for early nurturance and care, came a corresponding lifelong need for social connection. Indeed, this need has proved so essential to survival that social separation, like other unmet needs, is experienced as painful. Based on the lengthy period of Why It Hurts 3 immaturity in mammalian infants and the critical need for maternal care and nurturance, we hypothesize that the pain mechanisms involved in preventing physical danger were co-opted to prevent social separation. In this chapter, we suggest that social pain and physical pain share the same underlying system and that this overlap has several consequences for the way that these types of pain are detected, experienced, and overcome. We call this theory “Social Pain / Physical Pain Overlap Theory” (SPOT) and will present evidence for four hypotheses derived from this proposed overlap.

Fjorback, L. O., Arendt, M., Ornbol, E., Fink, P., Walach, H. (2011). Mindfulness-based stress reduction and mindfulness-based cognitive therapy: a systematic review of randomized controlled trials. *Acta Psychiatrica Scandinavica, 124*(2), 102-119.

OBJECTIVE: To systematically review the evidence for MBSR and MBCT. METHOD: Systematic searches of Medline, PsycInfo and Embase were performed in October 2010. MBSR, MBCT and Mindfulness Meditation were key words. Only randomized controlled trials (RCT) using the standard MBSR/MBCT programme with a minimum of 33 participants were included. RESULTS: The search produced 72 articles, of which 21 were included. MBSR improved mental health in 11 studies compared to wait list control or treatment as usual (TAU) and was as efficacious as active control group in three studies. MBCT reduced the risk of depressive relapse in two studies compared to TAU and was equally efficacious to TAU or an active control group in two studies. Overall, studies showed medium effect sizes. Among other limitations are lack of active control group and long-term follow-up in several studies. CONCLUSION: Evidence supports that MBSR improves mental health and MBCT prevents depressive relapse. Future RCTs should apply optimal design including active treatment for comparison, properly trained instructors and at least one-year follow-up. Future research should primarily tackle the question of whether mindfulness itself is a decisive ingredient by controlling against other active control conditions or true treatments.

Garland, E. L., Fredrickson, B., Kring, A. M., Johnson, D. P., Meyer, P. S., & Penn, D. L. (2011). Upward spirals of positive emotions counter downward spirals of negativity: Insights from the broaden-and-build theory and affective neuroscience on the treatment of emotion dysfunction in psychopathology. *Clinical Psychology Review, 30*(7), 849-864.

This review integrates Fredrickson's broaden-and-build theory of positive emotions with advances in affective neuroscience regarding plasticity in the neural circuitry of emotions to inform the treatment of emotion deficits within psychopathology. We first present a body of research showing that positive emotions broaden cognition and behavioral repertoires, and in so doing, build durable biopsychosocial resources that support coping and flourishing mental health. Next, by explicating the processes through which momentary experiences of emotions may accrue into self-perpetuating emotional systems, the current review proposes an underlying architecture of state-trait interactions that engenders lasting affective dispositions. This theoretical framework is then used to elucidate the cognitive-emotional mechanisms underpinning three disorders of affect regulation, depression, anxiety, and schizophrenia. In turn, two mind training interventions, mindfulness and loving-kindness meditation, are highlighted as means of generating positive emotions that may counter the negative affective processes implicated in these disorders. We conclude with the proposition that positive emotions may exert a countervailing force on the dysphoric, fearful, or anhedonic states characteristic of persons with psychopathology typified by emotional dysfunctions.

Goldstein, M. R., Lewis, G. F., Newman, R., Brown, J. M., Bobashev, G., Kilpatrick, L., … Meleth, S. (2016). Improvements in well-being and vagal tone following a yogic breathing-based life skills workshop in young adults: Two open-trial pilot studies. *International Journal of Yoga*, *9*(1), 20-26.

Background: While efficacy of Sudarshan Kriya Yoga (SKY) has been demonstrated in a number of prior studies, little is known about the effects of SKY taught as part of the Your Enlightened Side (YES+) workshop designed for college students and other young adults. Aims: This study aimed to assess the effects of YES+, a yogic breathing-based life skills workshop, on multiple measures of well-being and physiological stress response. Materials and Methods: Two nonrandomized open-trial pilot studies were conducted with a total of 74 young adults (age 25.4 ± 6.6 years; 55% female). Study 1 collected a variety of self-report questionnaires at baseline, postworkshop, and 1-month follow-up. Study 2 collected self-report questionnaires in addition to electrocardiography with a stationary cycling challenge at baseline and 1-month follow-up. Results: Study 1: Improvements in self-reported depression (P's ≤ 0.010), perceived stress (P's ≤ 0.002), life satisfaction (P's ≤ 0.002), social connectedness (P's ≤ 0.004), and gratitude (P's ≤ 0.090) were observed at postworkshop and 1-month after workshop relative to baseline. Study 2: Improvements in self-reported emotion regulation were observed at 1-month follow-up relative to baseline (P = 0.019). Positive and Negative Affect Schedule-Expanded Form positive affect increased (P = 0.021), while fatigue and sadness decreased (P's ≤ 0.005). During the stationary cycling challenge, rate to recovery of electrocardiography inter-beat interval also increased from baseline to 1-month follow-up (P = 0.077). Conclusions: These findings suggest that a life skills

workshop integrating yogic breathing techniques may provide self-empowering tools for enhancing well-being in young adults. Future research is indicated to further explore these effects, particularly in regards to vagal tone and other aspects of stress physiology.

Goyal, M., Singh, S., & Sibinga, E. M. S. (2014). Meditation Programs for Psychological Stress and Well-being: A Systematic Review and Meta-analysis. *JAMA Internal Medicine*, *174*(3), 357-368.

Importance: Many people meditate to reduce psychological stress and stress-related health problems. To counsel people appropriately, clinicians need to know what the evidence says about the health benefits of meditation. Objective: To determine the efficacy of meditation programs in improving stress-related outcomes (anxiety, depression, stress/distress, positive mood, mental health–related quality of life, attention, substance use, eating habits, sleep, pain, and weight) in diverse adult clinical populations. Evidence Review: We identified randomized clinical trials with active controls for placebo effects through November 2012 from MEDLINE, PsycINFO, EMBASE, PsycArticles, Scopus, CINAHL, AMED, the Cochrane Library, and hand searches. Two independent reviewers screened citations and extracted data. We graded the strength of evidence using 4 domains (risk of bias, precision, directness, and consistency) and determined the magnitude and direction of effect by calculating the relative difference between groups in change from baseline. When possible, we conducted meta-analyses using standardized mean differences to obtain aggregate estimates of effect size with 95% confidence intervals. Findings: After reviewing 18 753 citations, we included 47 trials with 3515 participants. Mindfulness meditation programs had moderate evidence of improved anxiety (effect size, 0.38 [95% CI, 0.12-0.64] at 8 weeks and 0.22 [0.02-0.43] at 3-6 months), depression (0.30 [0.00-0.59] at 8 weeks and 0.23 [0.05-0.42] at 3-6 months), and pain (0.33 [0.03- 0.62]) and low evidence of improved stress/distress and mental health–related quality of life. We found low evidence of no effect or insufficient evidence of any effect of meditation programs on positive mood, attention, substance use, eating habits, sleep, and weight. We found no evidence that meditation programs were better than any active treatment (ie, drugs, exercise, and other behavioral therapies). Conclusions and Relevance: Clinicians should be aware that meditation programs can result in small to moderate reductions of multiple negative dimensions of psychological stress. Thus, clinicians should be prepared to talk with their patients about the role that a meditation program could have in addressing psychological stress. Stronger study designs are needed to determine the effects of meditation programs in improving the positive dimensions of mental health and stress-related behavior. Many people use meditation to treat stress and stress-related conditions and to promote general health.1,2 To counsel patients appropriately, clinicians need to know more about meditation programs and how they can affect health outcomes. Meditation training programs vary in several ways, including the type of mental activity promoted, the amount of training recommended, the use and qualifications of an instructor, and the degree of emphasis on religion or spirituality. Some meditative techniques are integrated into a broader alternative approach that includes dietary and/or movement therapies (eg, ayurveda or yoga). Meditative techniques are categorized as emphasizing mindfulness, concentration, and automatic self-transcendence. Popular techniques, such as

transcendental meditation, emphasize the use of a mantra in such a way that it transcends one to an effortless state where focused attention is absent.3- 5 Other popular techniques, such as mindfulness-based stress reduction, emphasize training in present-focused awareness or mindfulness. Uncertainty remains about what these distinctions mean and the extent to which these distinctions actually influence psychosocial stress outcomes.5,6 Reviews to date report a small to moderate effect of mindfulness and mantra meditation techniques in reducing emotional symptoms (eg, anxiety, depression, and stress) and improving physical symptoms (eg, pain).7- 26 These reviews have largely included uncontrolled and controlled studies, and many of the controlled studies did not adequately control for placebo effects (eg, waiting list– or usual care–controlled studies). Observational studies have a high risk of bias owing to problems such as self-selection of interventions (people who believe in the benefits of meditation or who have prior experience with meditation are more likely to enroll in a meditation program and report that they benefited from one) and use of outcome measures that can be easily biased by participants' beliefs in the benefits of meditation. Clinicians need to know whether meditation training has beneficial effects beyond self-selection biases and the nonspecific effects of time, attention, and expectations for improvement.27,28 An informative analogy is the use of placebos in pharmaceutical trials. A placebo is typically designed to match nonspecific aspects of the "active" intervention and thereby elicit the same expectations of benefit on the part of the provider and patient in the absence of the active ingredient. Office visits and patient-provider interactions, all of which influence expectations for outcome, are particularly important to control when the evaluation of outcome relies on patient reporting. In the situation when double-blinding has not been feasible, the challenge to execute studies that are not biased by these nonspecific factors is more pressing.28 To develop evidence-based guidance on the use of meditation programs, we need to examine the specific effects of meditation in randomized clinical trials (RCTs) in which the nonspecific aspects of the intervention are controlled. The objective of this systematic review is to evaluate the effects of meditation programs on negative affect (eg, anxiety, stress), positive affect (eg, well-being), the mental component of health-related quality of life, attention, health-related behaviors affected by stress (eg, substance use, sleep, eating habits), pain, and weight among persons with a clinical condition. We include only RCTs that used 1 or more control groups in which the amount of time and attention provided by the control intervention was comparable to that of the meditation program.

Hasenkamp, W., & Barsalou, L. W. (2012). Effects of meditation experience on functional connectivity of distributed brain networks. *Frontiers in Human Neuroscience, 6,* 38.

This study sought to examine the effect of meditation experience on brain networks underlying cognitive actions employed during contemplative practice. In a previous study, we proposed a basic model of naturalistic cognitive fluctuations that occur during the practice of focused attention meditation. This model specifies four intervals in a cognitive cycle: mind wandering (MW), awareness of MW, shifting of attention, and sustained attention. Using subjective input from experienced practitioners during meditation, we identified activity in salience network regions during awareness of MW and executive network regions during shifting and sustained attention. Brain regions associated with the default mode

were active during MW. In the present study, we reasoned that repeated activation of attentional brain networks over years of practice may induce lasting functional connectivity changes within relevant circuits. To investigate this possibility, we created seeds representing the networks that were active during the four phases of the earlier study, and examined functional connectivity during the resting state in the same participants. Connectivity maps were then contrasted between participants with high vs. low meditation experience. Participants with more meditation experience exhibited increased connectivity within attentional networks, as well as between attentional regions and medial frontal regions. These neural relationships may be involved in the development of cognitive skills, such as maintaining attention and disengaging from distraction, that are often reported with meditation practice. Furthermore, because altered connectivity of brain regions in experienced meditators was observed in a non-meditative (resting) state, this may represent a transference of cognitive abilities "off the cushion" into daily life.

Holzel, B. K., Carmody, J., Vangel, M., Congleton, C., Yerramsetti, S. M., Gard, T., & Lazar, S. W. (2012). Mindfulness practice leads to increases in regional brain gray matter density. *Psychiatry Research, 191*(1), 36-43.

Therapeutic interventions that incorporate training in mindfulness meditation have become increasingly popular, but to date, little is known about neural mechanisms associated with these interventions. Mindfulness-Based Stress Reduction (MBSR), one of the most widely used mindfulness training programs, has been reported to produce positive effects on psychological well-being and to ameliorate symptoms of a number of disorders. Here, we report a controlled longitudinal study to investigate pre-post changes in brain gray matter concentration attributable to participation in an MBSR program. Anatomical MRI images from sixteen healthy, meditation-naïve participants were obtained before and after they underwent the eight-week program. Changes in gray matter concentration were investigated using voxel-based morphometry, and compared to a wait-list control group of 17 individuals. Analyses in a priori regions of interest confirmed increases in gray matter concentration within the left hippocampus. Whole brain analyses identified increases in the posterior cingulate cortex, the temporo-parietal junction, and the cerebellum in the MBSR group compared to the controls. The results suggest that participation in MBSR is associated with changes in gray matter concentration in brain regions involved in learning and memory processes, emotion regulation, self-referential processing, and perspective taking.

Holzel, B. K., Lazar, S. W., & Gard, T. (2011). How Does Mindfulness Meditation Work? Proposing Mechanisms of Action From a Conceptual and Neural Perspective. *Perspectives on Psychological Science, 6*(6), 537-559.

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. 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 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.

Irving, J. A., Dobkin, P. L., & Park, J. (2009). Cultivating mindfulness in health care professionals: a review of empirical studies of mindfulness-based stress reduction (MBSR). *Complement Therapies in Clinical Practice, 15*(2), 61-66.

Demands faced by health care professionals include heavy caseloads, limited control over the work environment, long hours, as well as organizational structures and systems in transition. Such conditions have been directly linked to increased stress and symptoms of burnout, which in turn, have adverse consequences for clinicians and the quality of care that is provided to patients. Consequently, there exists an impetus for the development of curriculum aimed at fostering wellness and the necessary self-care skills for clinicians. This review will examine the potential benefits of mindfulness-based stress reduction (MBSR) programs aimed at enhancing well-being and coping with stress in this population. Empirical evidence indicates that participation in MBSR yields benefits for clinicians in the domains of physical and mental health. Conceptual and methodological limitations of the existing studies and suggestions for future research are discussed.

Kabat-Zinn, J. (2003). Mindfulness-Based Interventions in Context: Past, Present, and Future. *Clinical Psychology: Science and Practice, 10*(2), 144-156.

This commentary highlights and contextualizes (1) what exactly mindfulness is, (2) where it came from, (3) how it came to be introduced into medicine and health care, (4) issues of cross-cultural sensitivity and understanding in the study of meditative practices stemming from other cultures and in applications of them in novel settings, (5) why it is important for people who are teaching mindfulness to practice themselves, (6) results from 3 recent studies from the Center for Mindfulness in Medicine, Health Care, and Society not reviewed by Baer but which raise a number of key questions about clinical applicability, study design, and mechanism of action, and (7) current opportunities for professional training and development in mindfulness and its clinical applications.

Kok, B. E., Coffey, K. A. Cohn, M. A., Catalino, L. I., Vacharkulksemsuk, T., Algoe, S. B., … & Frederickson, B. L. (2013). ow positive emotions build physical health: perceived positive social connections account for the upward spiral between positive emotions and vagal tone. *Psychological Science*, *24*(7), 1123-1132.

The mechanisms underlying the association between positive emotions and physical health remain a mystery. We hypothesize that an upward-spiral dynamic continually reinforces the tie between positive emotions and physical health and that this spiral is mediated by people's perceptions of their positive social connections. We tested this overarching hypothesis in a longitudinal field

experiment in which participants were randomly assigned to an intervention group that self-generated positive emotions via loving-kindness meditation or to a waiting-list control group. Participants in the intervention group increased in positive emotions relative to those in the control group, an effect moderated by baseline vagal tone, a proxy index of physical health. Increased positive emotions, in turn, produced increases in vagal tone, an effect mediated by increased perceptions of social connections. This experimental evidence identifies one mechanism-perceptions of social connections-through which positive emotions build physical health, indexed as vagal tone. Results suggest that positive emotions, positive social connections, and physical health influence one another in a self-sustaining upward-spiral dynamic.

Kok, B. E., Waugh, C. E., & Fredrickson, B. L. (2013). Meditation and Health: The Search for Mechanisms of Action. *Social and Personality Psychology Compass, 7*(1), 27-39.

Psychological interest in the impact of mental states on biological functioning is growing rapidly, driving a need for new methods for inducing mental states that last long enough, and are sufficiently impactful, to have significant effects on physical health. Beginning with a brief introduction to meditation and the heterogeneity of meditative practices, we showcase research linking meditative practice to changes in immune and cardiovascular functioning and pain perception. We then discuss theoretical and empirical evidence that meditation works by inducing changes in psychological capacities such as emotion regulation and self- regulation or through repeated induction of specific mental states such as love or meta-cognitive awareness. At the frontier of the science of meditation is the need to empirically test whether meditation-driven changes in cognitive and affective processes are the cause of improvements in physical health. Meditation represents a potentially powerful tool for generating new knowledge of mind-body interactions.

Kox, M., Stoffels, M., Smeekens, S. P., van Alfen, N., Gomes, N., Eijsvogels, T. M., ... & Pickkers, P. (2012). The influence of concentration/meditation on autonomic nervous system activity and the innate immune response: a case study. *Psychosomatic Medicine, 74*(5), 489-494.

In this case study, we describe the effects of a particular individual's concentration/meditation technique on autonomic nervous system activity and the innate immune response. The study participant holds several world records with regard to tolerating extreme cold and claims that he can influence his autonomic nervous system and thereby his innate immune response. In the endotoxemia experiment, concentration/meditation resulted in increased circulating concentrations of catecholamines, and plasma cortisol concentrations were higher than in any of the previously studied participants. The individual's in vivo cytokine response and clinical symptoms after LPS administration were remarkably low compared with previously studied participants. The concentration/meditation technique used by this particular individual seems to evoke a controlled stress response. This response is characterized by sympathetic nervous system activation and subsequent catecholamine/cortisol release, which seems to attenuate the innate immune response.

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*(17), 1893-1897.

Previous research indicates that long-term meditation practice is associated with altered resting electroencephalogram patterns, suggestive of long lasting changes in brain activity. We hypothesized that meditation practice might also be associated with changes in the brain's physical structure. Magnetic resonance imaging was used to assess cortical thickness in 20 participants with extensive Insight meditation experience, which involves focused attention to internal experiences. Brain regions associated with attention, interoception and sensory processing were thicker in meditation participants than matched controls, including the prefrontal cortex and right anterior insula. Between-group differences in prefrontal cortical thickness were most pronounced in older participants, suggesting that meditation might offset age-related cortical thinning. Finally, the thickness of two regions correlated with meditation experience. These data provide the first structural evidence for experience-dependent cortical plasticity associated with meditation practice.

Lehrer, P., Sasaki, Y., & Saito, Y. (1999). Zazen and cardiac variability. *Psychosomatic Medicine*, *61*(6), 812-821.

OBJECTIVE: This study examined the effects of "tanden breathing" by Zen practitioners on cardiac variability. Tanden breathing involves slow breathing into the lower abdomen. METHODS: Eleven Zen practitioners, six Rinzai and five Soto, were each studied during 20 minutes of tanden breathing, preceded and followed by 5-minute periods of quiet sitting. During this time, we measured heart rate and respiration rate. RESULTS: For most subjects, respiration rates fell to within the frequency range of 0.05 to 0.15 Hz during tanden breathing. Heart rate variability significantly increased within this low-frequency range but decreased in the high-frequency range (0.14-0.4 Hz), reflecting a shift of respiratory sinus arrhythmia from high-frequency to slower waves. Rinzai practitioners breathed at a slower rate and showed a higher amplitude of low-frequency heart rate waves than observed among Soto Zen participants. One Rinzai master breathed approximately once per minute and showed an increase in very-low-frequency waves (<0.05 Hz). Total amplitude of heart rate oscillations (across frequency spectra) also increased. More experienced Zen practitioners had frequent heart rhythm irregularities during and after the nadir of heart rate oscillations (ie, during inhalation). CONCLUSIONS: These data are consistent with the theory that increased oscillation amplitude during slow breathing is caused by resonance between cardiac variability caused by respiration and that produced by physiological processes underlying slower rhythms. The rhythm irregularities during inhalation may be related to inhibition of vagal modulation during the cardioacceleratory phase. It is not known whether they reflect cardiopathology.

Loving-Kindness Meditation. (n.d.). Retrieved from http://www.contemplativemind.org/practices/tree/loving-kindness

Neff, K. D., & Dahm, K. A. (2015). Self-Compassion: What it is, what it does, and how it relates to mindfulness. In M. Robinson, B. Meier, & B. Ostafin, *Mindfulness and Self-Regulation*. New York, NY: Springer.

Over the past decade self-compassion has gained popularity as a related and complementary construct to mindfulness, and research on self-compassion is growing at an exponential rate. Self-compassion involves treating yourself with the same kindness, concern and support you'd show to a good friend. When faced with difficult life struggles, or confronting personal mistakes, failures, and inadequacies, self-compassion responds with kindness rather than harsh self-judgment, recognizing that imperfection is part of the shared human experience. In order to give oneself compassion, one must be able to turn toward, acknowledge, and accept that one is suffering, meaning that mindfulness is a core component of self-compassion. This chapter provides a comprehensive description of self-compassion and a review of the empirical literature supporting its psychological benefits. Similarities and distinctions between mindfulness and self-compassion are also explored, as these have important implications for research and intervention. This chapter hopes to provide a compelling argument for the use of both self-compassion and mindfulness as important means to help individuals develop emotional resilience and wellbeing.

Schwartz, B. (2011). Practical wisdom and organizations. *Organizational Behavior, 31*, 3-23.

When institutions are not working as they should, their leaders and policy makers typically reach for two tools with which to improve them—detailed rules and ''smart'' incentives. This paper argues that neither rules, no matter how detailed, nor incentives, no matter how smart, can do the job in any situation that involves human interaction. What is needed is character, and most especially the character trait that Aristotle called practical wisdom. People with practical wisdom have the moral will to do the right thing and the moral skill to figure out what the right thing is in any particular situation. The paper further argues that although they may be well intentioned, rules and incentives actually erode wisdom. Excessive reliance on rules deprives people of the opportunity to develop moral skill, and excessive reliance on incentives undermines moral will. Rules and incentives demoralize activities and the people who engage in them. Finally, the downward spiral of diminished practical wisdom created by increasing reliance on rules and incentives is taken as an example of ''ideology''—a false conception of human nature that comes increasingly to look true as institutional conditions force people to behave in ways that confirm it.

Shapiro, S. L., Carlson, L. E., Astin, J.A., & Freedman, B. (2005). Mechanisms of mindfulness. *Journal of Clinical Psychology, 62*(3), 373-386.

This line of research has led to promising data suggesting mindfulness-based interventions are effective for treatment of both psychological and physical symptoms. This theoretical paper proposes a model of mindfulness, in an effort to elucidate potential mechanisms to explain how mindfulness affects positive change.

Siegel, D. J. (2009). Mindful awareness, mindsight, and neural integration. *The Humanistic Psychologist*, *37*(2), 137-158.

Mindful awareness has been demonstrated to alter brain function, mental activity,

and interpersonal relationships toward well-being. This article hypothesizes that mindful awareness promotes these positive changes through a proposed "internal attunement" that catalyzes the fundamental process of integration. Integration—the linkage of differentiated elements of a system—leads to the flexible, adaptive, and coherent flow of energy and information in the brain, the mind, and relationships. This coherent flow enables the individual to attain an intentionally established state of mindfulness with practice in the moment and creates the experiential substrate for developing mindful traits in daily life. By freeing the individual from the top–down associations of memory, mindfulness also promotes an emergent sense of a vital and resilient self.

Stein, J. (2003, August). Just Say Om. *TIME Magazine, 162*(5), 50.

Sundquist, J., Palmer, K., Johansson, L. M., & Sundquist, K. (2017). The effect of mindfulness group therapy on a broad range of psychiatric symptoms: A randomised controlled trial in primary health care Author links open overlay panel. *European Psychiatry*, *43*, 19-27.

Background: The need for psychotherapy in primary health care is on the increase but individual-based treatment is costly. The main aim of this 15randomized controlled trial (RCT) was to compare the effect of mindfulness-based group therapy (MGT) with treatment as usual (TAU), mainly individual-based cognitive behavioural therapy (CBT), on a broad range of psychiatric symptoms in primary care patients diagnosed with depressive, anxiety and/or stress and adjustment disorders. An additional aim was to compare the effect of MGT with TAU on mindful attention awareness. Methods: This 8-week RCT took place in 2012 at 16 primary care centres in southern Sweden. The study population included both men and women, aged 20–64 years (n = 215). A broad range of psychiatric symptoms were evaluated at baseline and at the 8-week follow-up using the Symptom Checklist-90 (SCL-90). Mindful attention awareness was also evaluated using the Mindful Attention Awareness Scale (MAAS). Results: In both groups, the scores decreased significantly for all subscales and indexes in SCL-90, while the MAAS scores increased significantly. There were no significant differences in the change in psychiatric symptoms between the two groups. The mindfulness group had a somewhat larger change in scores than the control group on the MAAS (P = 0.06, non-significant). Conclusions: No significant differences between MGT and TAU, mainly individual-based CBT, were found in treatment effect. Both types of therapies could be used in primary care patients with depressive, anxiety and/or stress and adjustment disorders, where MGT has a potential to save limited resources.

Takahashi, T., Murata, T., Hamada, T., Omori, M., Kosaka, H., Kikuchi, M., ... & Wada, Y. (2005). Changes in EEG and autonomic nervous activity during meditation and their association with personality traits. *International Journal of Psychophysiology, 55*(2), 199-207.

Meditation is the attainment of a restful yet fully alert physical and mental state practiced by many as a self-regulatory approach to emotion management. We quantitatively analyzed changes in psychophysiological parameters during Zen meditation, and evaluated the results in association with personality traits. During meditation, increases were observed in fast theta power and slow alpha power

on EEG predominantly in the frontal area, whereas an increase in the normalized unit of high- frequency (nuHF) power (as a parasympathetic index) and decreases in the normalized unit of low-frequency (nuLF) power and LF/HF (as sympathetic indices) were observed through analyses of heart rate variability. The percent change in slow alpha EEG power in the frontal area, reflecting enhanced internalized attention, was negatively correlated with that in nuLF as well as in LF/HF and was positively correlated with the novelty seeking score (which has been suggested to be associated with dopaminergic activity). The percent change in fast theta power in the frontal area, reflecting enhanced mindfulness, was positively correlated with that in nuHF and also with the harm avoidance score (which has been suggested to be associated with serotonergic activity).

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(*22), 8865-8870.

Five days of integrative body–mind training (IBMT) improves attention and self-regulation in comparison with the same amount of relaxation training. We measured the physiological and brain changes at rest before, during, and after 5 days of IBMT and relaxation training. During and after training, the IBMT group showed significantly better physiological reactions in heart rate, respiratory amplitude and rate, and skin conductance response (SCR) than the relaxation control. Differences in heart rate variability (HRV) and EEG power suggested greater involvement of the autonomic nervous system (ANS) in the IBMT group during and after training. Imaging data demonstrated stronger subgenual and adjacent ventral anterior cingulate cortex (ACC) activity in the IBMT group. Frontal midline ACC theta was correlated with high-frequency HRV, suggesting control by the ACC over parasympathetic activity. These results indicate that after 5 days of training, the IBMT group shows better regulation of the ANS by a ventral midfrontal brain system than does the relaxation group.

Taylor, V. A., Grant, J., Daneault, V., Scavone, G., Breton, E., Roffe-Vidal, S., … Beauregard, M. (2011). Impact of mindfulness on the neural responses to emotion pictures in experienced and beginning meditators. *Neuroimage, 57*(4), 1524-1533.

There is mounting evidence that mindfulness meditation is beneficial for the treatment of mood and anxiety disorders, yet little is known regarding the neural mechanisms through which mindfulness modulates emotional responses. Thus, a central objective of this functional magnetic resonance imaging study was to investigate the effects of mindfulness on the neural responses to emotionally laden stimuli. Another major goal of this study was to examine the impact of the extent of mindfulness training on the brain mechanisms supporting the processing of emotional stimuli. Twelve experienced (with over 1000 h of practice) and 10 beginner meditators were scanned as they viewed negative, positive, and neutral pictures in a mindful state and a non-mindful state of awareness. Results indicated that the Mindful condition attenuated emotional intensity perceived from pictures, while brain imaging data suggested that this effect was achieved through distinct neural mechanisms for each group of

participants. For experienced meditators compared with beginners, mindfulness induced a deactivation of default mode network areas (medial prefrontal and posterior cingulate cortices) across all valence categories and did not influence responses in brain regions involved in emotional reactivity during emotional processing. On the other hand, for beginners relative to experienced meditators, mindfulness induced a down-regulation of the left amygdala during emotional processing. These findings suggest that the long-term practice of mindfulness leads to emotional stability by promoting acceptance of emotional states and enhanced present-moment awareness, rather than by eliciting control over low-level affective cerebral systems from higher-order cortical brain regions. These results have implications for affect-related psychological disorders.

Vestergaad-Poulsen, P., van Beek, M., Skewes, J., & Roepstorff, A. (2009). Long-term meditation is associated with increased gray matter density in the brain stem. *NeuroReport*, *20*(2), 1701-74.

Extensive practice involving sustained attention can lead to changes in brain structure. Here, we report evidence of structural differences in the lower brainstem of participants engaged in the long-term practice of meditation. Using magnetic resonance imaging, we observed higher gray matter density in lower brain stem regions of experienced meditators compared with age-matched nonmeditators. Our findings show that long-term practitioners of meditation have structural differences in brainstem regions concerned with cardiorespiratory control. This could account for some of the cardiorespiratory parasympathetic effects and traits, as well as the cognitive, emotional, and immunoreactive impact reported in several studies of different meditation practices.

Child Abuse

Kimbrough, E., Magyari, T., Langenberg, P., Chesney, M., & Berman, B. (2010). Mindfulness intervention for child abuse survivors. *Journal of Clinical Psychology, 66*(1), 17-33.

Twenty-seven adult survivors of childhood sexual abuse participated in a pilot study comprising an 8-week mindfulness meditation-based stress reduction (MBSR) program and daily home practice of mindfulness skills. Three refresher classes were provided through final follow-up at 24 weeks. Assessments of depressive symptoms, post-traumatic stress disorder (PTSD), anxiety, and mindfulness, were conducted at baseline, 4, 8, and 24weeks. At 8 weeks, depressive symptoms were reduced by 65%. Statistically significant improvements were observed in all outcomes post-MBSR, with effect sizes above 1.0. Improvements were largely sustained until 24 weeks. Of three PTSD symptom criteria, symptoms of avoidance/ numbing were most greatly reduced. Compliance to class attendance and home practice was high, with the intervention proving safe and acceptable to participants. These results warrant further investigation of the MBSR approach in a randomized, controlled trial in this patient population.

Anxiety

Chen, K. W., Berger, C. C., Manheimer, E., Forde, D., Magidson, J., Dachman, L., & Lejuez, C. W. (2012). Meditative therapies for reducing anxiety: A systematic review and meta-analysis of randomized controlled trials. *Depression and Anxiety, 29*(7), 545-562.

BACKGROUND: Anxiety disorders are among the most common psychiatric disorders; meditative therapies are frequently sought by patients with anxiety as a complementary therapy. Although multiple reviews exist on the general health benefits of meditation, no review has been focused on the efficacy of meditation for anxiety specifically. METHODS: Major medical databases were searched thoroughly with keywords related to various types of meditation AND anxiety. Over 1000 abstracts were screened, and 200+ full articles were reviewed. Only RCTs were included. The Boutron (2005) checklist to evaluate a report of a non-pharmaceutical trial (CLEAR-NPT) was used to assess study quality; 90% authors were contacted for additional information. Review Manager 5 was used for meta-analysis. RESULTS: A total of 36 RCTs were included in the meta-analysis (2,466 observations). Most RCTs were conducted among patients with anxiety as a secondary concern. The study quality ranged from 0.3 to 1.0 on the 0.0–1.0 scale (mean = 0.72). Standardized mean difference (SMD) was −0.52 in comparison with waiting-list control ($p < .001$; 25 RCTs), −0.59 in comparison with attention control ($p < .001$; 7 RCTs), and −0.27 in comparison with alternative treatments ($p < 0.01$; 10 RCTs). 25 studies reported statistically superior outcomes in the meditation group compared to control. No adverse effects were reported. CONCLUSIONS: This review demonstrates some efficacy of meditative therapies in reducing anxiety symptoms, which has important clinical implications for applying meditative techniques in treating anxiety. However, most studies measured only improvement in anxiety symptoms, but not anxiety disorders as clinically diagnosed.

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*(2), 169-183.

BACKGROUND: Although mindfulness-based therapy has become a popular treatment, little is known about its efficacy. OBJECTIVES: To conduct an effect size analysis of this popular intervention for anxiety and mood symptoms in clinical samples. DATA SOURCES: A literature search was conducted using PubMed, PsycInfo, the Cochrane Library, and manual searches. REVIEW METHODS: The search identified 39 studies totaling 1,140 participants receiving mindfulness-based therapy for a range of conditions, including cancer, generalized anxiety disorder, depression, and other psychiatric or medical conditions. RESULTS: Effect size estimates suggest that mindfulness-based therapy was moderately effective for improving anxiety (Hedges' g = 0.63) and mood symptoms (Hedges' g = 0.59) from pre to post-treatment in the overall sample. In patients with anxiety and mood disorders, this intervention was associated with effect sizes (Hedges' g) of 0.97 and 0.95 for improving anxiety and mood symptoms, respectively. These effect sizes were robust, unrelated to publication year or number of treatment sessions, and were maintained over follow-up. CONCLUSION: These results suggest that mindfulness-based therapy is a promising intervention for treating anxiety and mood problems in clinical populations.

Hoge, E. A., Bui, E., Marques, L., Metcalf, C. A., Morris, L. K., Robinaugh, D. J., … Simon, N. M. (2013). Randomized Controlled Trial of Mindfulness Meditation for Generalized Anxiety Disorder: Effects on Anxiety and Stress Reactivity. *Journal of Clinical Psychiatry*, *74*(8), 786-792.

Objective: Mindfulness meditation has met increasing interest as a therapeutic strategy for anxiety disorders, but prior studies have been limited by methodological concerns, including a lack of an active comparison group. This is the first randomized, controlled trial comparing the manualized Mindfulness-Based Stress Reduction (MBSR) program with an active control for Generalized Anxiety Disorder, a disorder characterized by chronic worry and physiological hyperarousal symptoms. Method: Ninety-three individuals with DSM-IV-diagnosed GAD were randomized to an 8-week group intervention with MBSR or to an attention control, Stress Management Education (SME) between 2009 and 2011. Anxiety symptoms were measured with the Hamilton Anxiety Scale (HAM-A, primary outcome measure), the Clinical Global Impression of Severity and Improvement (CGI-S and CGI-I), and the Beck Anxiety Inventory (BAI). Stress reactivity was assessed by comparing anxiety and distress during pre- and post-treatment Trier Social Stress Tests (TSST). Results: A modified intent-to-treat analysis including participants who completed at least one session of MBSR (N=48) or SME (N=41) showed that both interventions led to significant reductions in HAM-A scores at endpoint, but did not significantly differ. MBSR, however, was associated with a significantly greater reduction in anxiety as measured by the CGI-S, the CGI-I, and the BAI (all Ps<0.05). MBSR was also associated with greater reductions than SME in anxiety and distress ratings in response to the TSST stress challenge (P<0.05), and a greater increase in positive self-statements (P=0.004). Conclusions: These results suggest that MBSR may have a beneficial effect on anxiety symptoms in GAD, and may also improve stress reactivity and coping as measured in a laboratory stress challenge.

Mckim, R. D. (2008). Rumination as a mediator of the effects of mindfulness: Mindfulness-based stress reduction (MBSR) with a heterogeneous community sample experiencing anxiety, depression, and/or chronic pain. Dissertation Abstracts International: Section B: The Sciences and Engineering, 68(11-B), 7673.

This quasi-experimental psychotherapy outcome study assessed the effects of participation in an 8-week Mindfulness-Based Stress Reduction (MBSR) intervention on rumination, psychological distress, and medical symptoms. Members of ongoing MBSR groups at 3 San Francisco Bay Area hospitals volunteered to participate. A heterogeneous sample composed of 32 adults (21 women and 11 men) ages 20-71 completed pre- and post-intervention measures including the Mindful Attention Awareness Scale (MAAS) (K. W. Brown & R. M. Ryan, 2003), the Brief Symptom Inventory 18 (BSI-18) (L. R. Derogatis, 2001), the Short Response Style Questionnaire (SRSQ) (W. Treynor, R. Gonzalez, & S. Nolen-Hoeksema, 2003), and the Medical Symptom Checklist (MSCL) (J. W. Travis, 1971). This research was intended to replicate and extend aspects of J. Kabat-Zinn's work on MBSR and S. Nolen-Hoeksema's work on rumination. Results revealed significant reductions in rumination***, depression**, anxiety**,

psychological distress**, and medical symptoms*** and a significant increase in mindfulness**. Findings showed significant positive correlations between rumination and depression* and significant negative correlations between mindfulness and rumination**, anxiety***, psychological distress*, and medical symptoms**. Rumination significantly mediated the effects of mindfulness on depression*. (One asterisk* indicates p < .05, two asterisks** indicate p < .01, and three asterisks*** indicate p < .001.) Findings support S. L. Shapiro, L. E. Carlson, J. A. Astin, and B. Freedman's (2006) recent proposal that mindfulness is a central feature of MBSR and is partially responsible for the positive outcomes observed in the MBSR program. This study also provides a novel contribution to the literature by specifying and significantly demonstrating the mediational path between mindful awareness and decreases in rumination and depression in a heterogeneous community sample. The implications of this finding elucidate one of the potential therapeutic mechanisms of mindfulness.

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*(6), 1083-1089.

Generalized anxiety disorder (GAD) is a chronic anxiety disorder, associated with comorbidity and impairment in quality of life, for which improved psychosocial treatments are needed. GAD is also associated with reactivity to and avoidance of internal experiences. The current study examined the efficacy of an acceptance-based behavioral therapy, aimed at increasing acceptance of internal experiences and encouraging action in valued domains, for GAD. Clients were randomly assigned to immediate (n=15) or delayed (n=16) treatment. Acceptance-based behavior therapy led to statistically significant reductions in clinician-rated and self-reported GAD symptoms that were maintained at 3- and 9- month follow-up assessments; significant reductions in depressive symptoms were also observed. Seventy-eight percent of treated participants no longer met criteria for GAD and 77% achieved high end-state functioning at post-treatment assessment; these proportions stayed constant or increased over time. As predicted, treatment was associated with decreases in experiential avoidance and increases in mindfulness.

Rude, S. S., Maestas, K. L., & Neff, K. (2007). Paying attention to distress: What's wrong with rumination? *Cognition and Emotion*, 21(4), 843-864.

We explored the notion--derived from conceptualisations of mindfulness--that what makes attention to distress harmful is negative judgement about it. In Study 1 we examined factors of Nolen-Hoeksema's Ruminative Response Scale (RRS). A "Brooding" scale included items describing negative judgements of experience, and a "Reflection" scale, comprised items describing analysis of thoughts and feelings without obvious judgement. Correlations of Reflection with depression and thought suppression were lower than those for Brooding, but still significant, perhaps because all items implied some judgement. In Study 2, items were reworded to de-emphasise evaluative judgements (RRS-nonjudging) and compared to the original RRS. Although the factor structures of the original and RRS-nonjudging versions were essentially identical, the RRS-nonjudging Reflection scale was uncorrelated with depression and thought suppression, and

was more highly correlated with emotional processing than was the original Reflection scale.

Twohig, M. P., Hayes, S. C., Plumb, J. C., Pruitt, L. D., Collins, A. B., Hazlett-Stevens, H., & Woidneck, M. R. (2010). A randomized clinical trial of acceptance and commitment therapy versus progressive relaxation training for obsessive-compulsive disorder. *Journal of Consulting and Clinical Psychology, 78*(5), 705-716.

OBJECTIVE: Effective treatments for obsessive-compulsive disorder (OCD) exist, but additional treatment options are needed. The effectiveness of 8 sessions of acceptance and commitment therapy (ACT) for adult OCD was compared with progressive relaxation training (PRT). METHOD: Seventy-nine adults (61% female) diagnosed with OCD (mean age = 37 years; 89% Caucasian) participated in a randomized clinical trial of 8 sessions of ACT or PRT with no in-session exposure. The following assessments were completed at pretreatment, posttreatment, and 3-month follow-up by an assessor who was unaware of treatment conditions: Yale-Brown Obsessive Compulsive Scale (Y-BOCS), Beck Depression Inventory-II, Quality of Life Scale, Acceptance and Action Questionnaire, Thought Action Fusion Scale, and Thought Control Questionnaire. Treatment Evaluation Inventory was completed at posttreatment. RESULTS: ACT produced greater changes at posttreatment and follow-up over PRT on OCD severity (Y-BOCS: ACT pretreatment = 24.22, posttreatment = 12.76, follow-up = 11.79; PRT pretreatment = 25.4, posttreatment = 18.67, follow-up = 16.23) and produced greater change on depression among those reporting at least mild depression before treatment. Clinically significant change in OCD severity occurred more in the ACT condition than PRT (clinical response rates: ACT posttreatment = 46%-56%, follow-up = 46%-66%; PRT posttreatment = 13%-18%, follow-up = 16%-18%). Quality of life improved in both conditions but was marginally in favor of ACT at posttreatment. Treatment refusal (2.4% ACT, 7.8% PRT) and dropout (9.8% ACT, 13.2% PRT) were low in both conditions. CONCLUSIONS: ACT is worth exploring as a treatment for OCD.

Zeidan, F., Martucci, K., Kraft, R. A., McHaffie, J. G., & Coghill, R. C. (2014). Neural correlates of mindfulness meditation-related anxiety relief. *Social Cognitive and Affective Neuroscience*, *9*(6), 751-759.

Anxiety is the cognitive state related to the inability to control emotional responses to perceived threats. Anxiety is inversely related to brain activity associated with the cognitive regulation of emotions. Mindfulness meditation has been found to regulate anxiety. However, the brain mechanisms involved in meditation-related anxiety relief are largely unknown. We employed pulsed arterial spin labeling MRI to compare the effects of distraction in the form of attending to the breath (ATB; before meditation training) to mindfulness meditation (after meditation training) on state anxiety across the same subjects. Fifteen healthy subjects, with no prior meditation experience, participated in 4 d of mindfulness meditation training. ATB did not reduce state anxiety, but state anxiety was significantly reduced in every session that subjects meditated. Meditation-related anxiety relief was associated with activation of the anterior cingulate cortex, ventromedial prefrontal cortex and anterior insula. Meditation-related activation in these regions exhibited a strong relationship to anxiety relief

when compared to ATB. During meditation, those who exhibited greater default-related activity (i.e. posterior cingulate cortex) reported greater anxiety, possibly reflecting an inability to control self-referential thoughts. These findings provide evidence that mindfulness meditation attenuates anxiety through mechanisms involved in the regulation of self-referential thought processes.

Depression

Farb, N. A. S., Anderson, A. K., & Segal, Z. V. (2012). The mindful brain and emotion regulation in mood disorders. *The Canadian Journal of Psychiatry, 57*(2), 70-77.

Mindfulness involves nonjudgmental attention to present-moment experience. In its therapeutic forms, mindfulness interventions promote increased tolerance of negative affect and improved well being. However, the neural mechanisms underlying mindful mood regulation are poorly understood. Mindfulness training appears to enhance attentional monitoring systems in the brain, supported by the anterior cingulate and lateral prefrontal cortices. In emotion regulation, this prefrontal training seems to promote the stable recruitment of a non-conceptual sensory pathway, an alternative to conventional cognitive reappraisal strategies. In neural terms, the transition to non-conceptual awareness involves reducing habitual evaluative processing supported by midline structures of the prefrontal cortex. Instead, attentional resources are directed towards a limbic pathway for present-moment sensory awareness, involving the thalamus, insula, and primary sensory regions. In patients with affective disorders, mindfulness training acts as an alternative to cognitive efforts to control emotion, instead directing attention towards broadly monitoring fluctuations in momentary experience. Limiting cognitive elaboration in favor of momentary awareness appears to reduce automatic negative self-evaluation, increase tolerance for negative affect and pain, and help to engender self-compassion and empathy in chronically dysphoric individuals.

Geschwind, N., Peeters, F., Drukker, M., van Os, J., & Wichers, M. (2011). Mindfulness training increases momentary positive emotions and reward experience in adults vulnerable to depression: a randomized controlled trial. *Journal of Consulting and Clinical Psychology, 79*(5), 618-628.

OBJECTIVE: To examine whether mindfulness-based cognitive therapy (MBCT) increases momentary positive emotions and the ability to make use of natural rewards in daily life. METHOD: Adults with a life-time history of depression and current residual depressive symptoms (mean age = 43.9 years, SD = 9.6; 75% female; all Caucasian) were randomized to MBCT (n = 64) or waitlist control (CONTROL; n = 66) in a parallel, open-label, randomized controlled trial. The Experience Sampling Method was used to measure momentary positive emotions as well as appraisal of pleasant activities in daily life during 6 days before and after the intervention. Residual depressive symptoms were measured using the 17-item Hamilton Depression Rating Scale (Hamilton, 1960). RESULTS: MBCT compared to CONTROL was associated with significant increases in appraisals of positive emotion (b* = .39) and activity pleasantness (b* = .22) as well as enhanced ability to boost momentary positive emotions by engaging in pleasant activities (b* = .08; all ps < .005). Associations remained significant when corrected for reductions in depressive symptoms or for

reductions in negative emotion, rumination, and worry. In the MBCT condition, increases in positive emotion variables were associated with reduction of residual depressive symptoms (all ps < .05). CONCLUSIONS: MBCT is associated with increased experience of momentary positive emotions as well as greater appreciation of, and enhanced responsiveness to, pleasant daily-life activities. These changes were unlikely to be pure epiphenomena of decreased depression and, given the role of positive emotions in resilience against depression, may contribute to the protective effects of MBCT against depressive relapse.

Gilbert, B. D., & Christopher, M. S. (2010). Mindfulness-based attention as a moderator of the relationship between depressive affect and negative cognitions. *Cognitive Therapy and Research, 34,* 514-521.

In this research we investigated the role of mindfulness-based attention in mitigating possible negative consequences of experiencing depressive affect. A sample of 278 undergraduate college students completed self-report measures of depressive affect, negative cognitions, and mindfulness-based attention. As expected, depressive affect was positively related to negative cognitions, mindfulness-based attention was inversely related to negative cognitions, and the strength of the relationship between depressed affect and negative cognitions was significantly moderated by mindfulness-based attention. More specifically, a simple slope analysis revealed that individuals low in mindfulness-based attention evidenced a statistically significant relationship between depressive affect and negative cognitions, whereas individuals who are high in mindfulness-based attention did not. These findings support the extant literature suggesting that the general tendency to be mindful may be a protective factor against the development of psychopathology and enhance mental health. Mindfulness-Based Attention as a Moderator of the Relationship Between Depressive Affect and Negative Cognitions.

Godfrin, K. A., & van Heeringen, C. (2011). The effects of mindfulness-based cognitive therapy on recurrence of depressive episodes, mental health and quality of life: A randomized controlled study.

Depression is characterized by a large risk of relapse/recurrence. Mindfulness-based cognitive therapy (MBCT) is a recent non-drug psychotherapeutic intervention to prevent future depressive relapse/recurrence in remitted/recovered depressed patients. In this randomized controlled trial, the authors investigated the effects of MBCT on the relapse in depression and the time to first relapse since study participation, as well as on several mood states and the quality of life of the patients. 106 recovered depressed patients with a history of at least 3 depressive episodes continued either with their treatment as usual (TAU) or received MBCT in addition to TAU. The efficacy of MBCT was assessed over a study period of 56 weeks. At the end of the study period relapse/recurrence was significantly reduced and the time until first relapse increased in the MBCT plus TAU condition in comparison with TAU alone. The MBCT plus TAU group also showed a significant reduction in both short and longer-term depressive mood and better mood states and quality of the life. For patients with a history of at least three depressive episodes who are not acutely depressed, MBCT, added to TAU, may play an important role in the domain of relapse prevention in depression.

Jimenez, S. S., Niles, B. L., Park, C. L. (2010). A mindfulness model of affect regulation and depressive symptoms: Positive emotions, mood regulation expectancies, and self-acceptance as regulatory mechanisms. Personality and Individual Differences, 49(6), 645-650.

Mindfulness is increasingly conceptualized in terms of its regulatory function with research suggesting that mindfulness may have a salutary effect on psychological well-being. The present cross-sectional study of 514 college students (84% Caucasian and 62% females), using self-report questionnaires, tested a proposed model for understanding the relationship between dispositional mindfulness and depressive symptoms through three types of affect regulation: emotion regulation, mood regulation and self-regulation, as measured by positive emotions, mood regulation expectancies (i.e., perceived mood repair ability), and self-acceptance, respectively. Structural equation modeling revealed that the model fit the data well, with the relationship between mindfulness, as measured by the Freiburg Mindfulness Inventory, and depressive symptoms, as measured by the Center for Epidemiological Studies-Depression Scale, fully mediated by the proposed regulatory processes. Higher levels of dispositional mindfulness were associated with higher levels of positive emotions, mood regulation expectancies, and self-acceptance, which in turn, were all inversely related to depressive symptoms. Self-acceptance emerged as the strongest mediator of mindfulness and depressive symptoms. Our findings suggest that mindfulness might serve a regulatory function by targeting low positive emotionality, poor mood regulation, and negative self-concept, risk factors implicated in the onset, development, and maintenance of depressive symptoms.

Kuyken, W., Byford, S., Taylor, R. S., Watkins, E., Holden, E., White, K. … Teasdale, J. D. (2008). Mindfulness-based cognitive therapy to prevent relapse in recurrent depression. *Journal of Consulting and Clinical Psychology, 76*(6), 966-978.

For people at risk of depressive relapse, mindfulness-based cognitive therapy (MBCT) has an additive benefit to usual care (H. F. Coelho, P. H. Canter, & E. Ernst, 2007). This study asked if, among patients with recurrent depression who are treated with antidepressant medication (ADM), MBCT is comparable to treatment with maintenance ADM (m-ADM) in (a) depressive relapse prevention, (b) key secondary outcomes, and (c) cost effectiveness. The study design was a parallel 2-group randomized controlled trial comparing those on m-ADM (N = 62) with those receiving MBCT plus support to taper/discontinue antidepressants (N = 61). Relapse/recurrence rates over 15-month follow-ups in MBCT were 47%, compared with 60% in the m-ADM group (hazard ratio = 0.63; 95% confidence interval: 0.39 to 1.04). MBCT was more effective than m-ADM in reducing residual depressive symptoms and psychiatric comorbidity and in improving quality of life in the physical and psychological domains. There was no difference in average annual cost between the 2 groups. Rates of ADM usage in the MBCT group was significantly reduced, and 46 patients (75%) completely discontinued their ADM. For patients treated with ADM, MBCT may provide an alternative approach for relapse prevention.

Ramel, W., Goldin, P. R., Carmona, P. E., McQuaid, J. R. (2004). The effects of mindfulness meditation on cognitive processes and affect in patients with past depression. *Cognitive Therapy and Research, 28*(4), 433-455.

This study describes the effects of an 8-week course in Mindfulness-Based Stress Reduction (MBSR; J. Kabat-Zinn, 1982, 1990) on affective symptoms (depression and anxiety), dysfunctional attitudes, and rumination. Given the focus of mindfulness meditation (MM) in modifying cognitive processes, it was hypothesized that the primary change in MM practice involves reductions in ruminative tendencies. We studied a sample of individuals with lifetime mood disorders who were assessed prior to and upon completion of an MBSR course. We also compared a waitlist sample matched with a subset of the MBSR completers. Overall, the results suggest that MM practice primarily leads to decreases in ruminative thinking, even after controlling for reductions in affective symptoms and dysfunctional beliefs.

Segal, Z. V., Bieling, P., & Young, T. (2010). Antidepressant monotherapy vs sequential pharmacotherapy and mindfulness-based cognitive therapy, or placebo, for relapse prophylaxis in recurrent depression. *Archives of General Psychiatry, 67*(12), 1256-1264.

Context: Mindfulness-based cognitive therapy (MBCT) is a group-based psychosocial intervention designed to enhance self-management of prodromal symptoms associated with depressive relapse. Objective: To compare rates of relapse in depressed patients in remission receiving MBCT against maintenance antidepressant pharmacotherapy, the current standard of care. Design: Patients who met remission criteria after 8 months of algorithm-informed antidepressant treatment were randomized to receive maintenance antidepressant medication, MBCT, or placebo and were followed up for 18 months. Setting: Outpatient clinics at the Centre for Addiction and Mental Health, Toronto, Ontario, Canada, and St Joseph's Healthcare, Hamilton, Ontario. Participants: One hundred sixty patients aged 18 to 65 years meeting DSM-IV criteria for major depressive disorder with a minimum of 2 past episodes. Of these, 84 achieved remission (52.5%) and were assigned to 1 of the 3 study conditions. Interventions: Patients in remission discontinued their antidepressants and attended 8 weekly group sessions of MBCT, continued taking their therapeutic dose of antidepressant medication, or discontinued active medication and were switched to placebo. Main Outcome Measure: Relapse was defined as a return, for at least 2 weeks, of symptoms sufficient to meet the criteria for major depression on module A of the Structured Clinical Interview for DSM-IV. Results: Intention-to-treat analyses showed a significant interaction between the quality of acute-phase remission and subsequent prevention of relapse in randomized patients (P = .03). Among unstable remitters (1 or more Hamilton Rating Scale for Depression score >7 during remission), patients in both MBCT and maintenance treatment showed a 73% decrease in hazard compared with placebo (P = .03), whereas for stable remitters (all Hamilton Rating Scale for Depression scores ≤7 during remission) there were no group differences in survival. Conclusions: For depressed patients achieving stable or unstable clinical remission, MBCT offers protection against relapse/recurrence on a par with that of maintenance antidepressant pharmacotherapy. Our data also highlight the importance of maintaining at least 1 long-term active treatment in unstable remitters.

Chronic Pain

Garland, E. L., Gaylord, S. A., Palsson, O., Faurot, K., Douglass Mann, J., & Whitehead, W. E. (2012). Therapeutic mechanisms of a mindfulness-based treatment for IBS: effects on visceral sensitivity, catastrophizing, and affective processing of pain sensations. *The Journal of Behavioral Medicine, 65*(4), 564-570.

OBJECTIVE: The underlying changes in biological processes that are associated with reported changes in mental and physical health in response to meditation have not been systematically explored. We performed a randomized, controlled study on the effects on brain and immune function of a well-known and widely used 8-week clinical training program in mindfulness meditation applied in a work environment with healthy employees. METHODS: We measured brain electrical activity before and immediately after, and then 4 months after an 8-week training program in mindfulness meditation. Twenty-five subjects were tested in the meditation group. A wait-list control group (N = 16) was tested at the same points in time as the meditators. At the end of the 8-week period, subjects in both groups were vaccinated with influenza vaccine. RESULTS: We report for the first time significant increases in left-sided anterior activation, a pattern previously associated with positive affect, in the meditators compared with the nonmeditators. We also found significant increases in antibody titers to influenza vaccine among subjects in the meditation compared with those in the wait-list control group. Finally, the magnitude of increase in left-sided activation predicted the magnitude of antibody titer rise to the vaccine. CONCLUSIONS: These findings demonstrate that a short program in mindfulness meditation produces demonstrable effects on brain and immune function. These findings suggest that meditation may change brain and immune function in positive ways and underscore the need for additional research.

Kaplan, K. H., Goldenberg, D. L., & Galvin-Nadeau, M. (1993). The impact of a meditation-based stress reduction program on fibromyalgia. *General Hospital Psychiatry, 15*(5), 284-289.

Fibromyalgia is a chronic illness characterized by widespread pain, fatigue, sleep disturbance, and resistance to treatment. The purpose of this study was to evaluate the effectiveness of a meditation-based stress reduction program on fibromyalgia. Seventy-seven patients meeting the 1990 criteria of the American College of Rheumatology for fibromyalgia took part in a 10-week group outpatient program. Therapists followed a carefully defined treatment approach and met weekly to further promote uniformity. Patients were evaluated before and after the program. Initial evaluation included a psychiatric structured clinical interview (SCID). Outcome measures included visual analog scales to measure global well-being, pain, sleep, fatigue, and feeling refreshed in the morning. Patients also completed a medical symptom checklist, SCL-90-R, Coping Strategies Questionnaire, Fibromyalgia Impact Questionnaire, and the Fibromyalgia Attitude Index. Although the mean scores of all the patients completing the program showed improvement, 51% showed moderate to marked improvement and only they were counted as "responders." These preliminary findings suggest that a meditation-based stress reduction program is effective for patients with fibromyalgia.

Morone, N. E., Rollman, B. L., Moore, C. G., Li, Q., & Weiner, D. K. (2009). A mind-body program for older adults with chronic low back pain. *Pain Medicine, 10*(8), 1395-1407.

OBJECTIVES: Determine the impact of an 8-week mindfulness meditation program on disability, psychological function, and pain severity in community-dwelling older adults with chronic low back pain, and to test the education control program for feasibility. DESIGN: Randomized controlled trial. Participants. Forty community-dwelling older adults with moderate low back pain or greater for at least the previous 3 months. Intervention. Participants were randomized to an 8-week meditation program or an 8-week education control program. OUTCOME MEASURES: Disability, psychological function, and pain severity were assessed. The same measures were obtained for both groups at baseline, at the end of the program, and 4 months after program completion. RESULTS: Sixteen participants (80%) completed the meditation program and 19 (95%) completed the education program. Both the meditation and control group improved on measures of disability, pain, and psychological function, both at program completion and 4-month follow-up. The differences between the two groups did not reach statistical significance. The meditation group practiced mindfulness meditation a mean of 5 days/week (range 1-7) and mean of 31 minutes/session (range 22-48). At 4 months follow-up 14/16 (88%) participants continued to meditate. CONCLUSION: Both the intervention group and the education control group improved on outcome measures suggesting both programs had a beneficial effect. Participants continued to meditate on 4-month follow-up. The control program was feasible but not inert. Piloting the control program in mind-body research can inform the design of larger clinical trials.

Rimes, K. A., & Wingrove, J. (2013). Mindfulness-based cognitive therapy for people with chronic fatigue syndrome still experiencing excessive fatigue after cognitive behaviour therapy: a pilot randomized study.

Cognitive behaviour therapy (CBT) is an effective treatment for chronic fatigue syndrome (CFS; sometimes known as myalgic encephalomyelitis). However, only a minority of patients fully recover after CBT; thus, methods for improving treatment outcomes are required. This pilot study concerned a mindfulness-based cognitive therapy (MBCT) intervention adapted for people with CFS who were still experiencing excessive fatigue after CBT. The study aimed to investigate the acceptability of this new intervention and the feasibility of conducting a larger-scale randomized trial in the future. Preliminary efficacy analyses were also undertaken. Participants were randomly allocated to MBCT or waiting list. Sixteen MBCT participants and 19 waiting-list participants completed the study, with the intervention being delivered in two separate groups. Acceptability, engagement and participant-rated helpfulness of the intervention were high. Analysis of covariance controlling for pre-treatment scores indicated that, at post-treatment, MBCT participants reported lower levels of fatigue (the primary clinical outcome) than the waiting-list group. Similarly, there were significant group differences in fatigue at 2-month follow-up, and when the MBCT group was followed up to 6 months post-treatment, these improvements were maintained. The MBCT group also had superior outcomes on measures of impairment, depressed mood, catastrophic thinking about

fatigue, all-or-nothing behavioural responses, unhelpful beliefs about emotions, mindfulness and self-compassion. In conclusion, MBCT is a promising and acceptable additional intervention for people still experiencing excessive fatigue after CBT for CFS, which should be investigated in a larger randomized controlled trial.

Tonelli, M. E., & Wachholtz, A. B. (2014). Meditation-based treatment yielding immediate relief for meditation-naïve migraineurs. *Pain Management Nursing, 15*(1), 36-40.

Meditation is gaining popularity as an effective means of managing and attenuating pain and has been particularly effective for migraines. Meditation additionally addresses the negative emotional states known to exist with migraines. The purpose of this study was to evaluate the effectiveness of meditation as an immediate intervention for reducing migraine pain as well as alleviating emotional tension, examined herein as a negative affect hypothesized to be correlated with pain. Twenty-seven migraineurs, with two to ten migraines per month, reported migraine-related pain and emotional tension ratings on a Likert scale (ranging from 0 to 10) before and after exposure to a brief meditation-based treatment. All participants were meditation- naïve, and attended one 20-minute guided meditation session based on the Buddhist "loving kindness" approach. After the session, participants reported a 33% decrease in pain and a 43% decrease in emotional tension. The data suggest that a single exposure to a brief meditative technique can significantly reduce pain and tension, as well as offer several clinical implications. It can be concluded that single exposure to a meditative technique can significantly reduce pain and tension. The effectiveness and immediacy of this intervention offers several implications for nurses.

Zeidan, F., Gordon, N. S., Merchant, J., & Goolkasian, P. (2010). The effects of brief mindfulness meditation training on experimentally induced pain. *The Journal of Pain, 11*(3), 199-209.

This study investigated the effects of brief mindfulness meditation training on ratings of painful electrical stimulation. In Experiment 1, we used a 3-day (20 min/d) mindfulness meditation intervention and measured pain ratings before and after the intervention. Participants' numerical ratings of pain to "low" and "high" electrical stimulation significantly decreased after meditation training. Pain sensitivity, measured by change in stimulus intensity thresholds, also decreased after training. We investigated, in Experiment 2, how well relaxation and a math distraction task attenuated experimental pain. Math distraction but not relaxation reduced high pain ratings. There was no reduction in pain sensitivity in these participants. In Experiment 3, we directly compared the effects of meditation with math distraction and relaxation conditions. Our findings indicated significant effects of both meditation and math distraction. Consistent with what was observed in Experiment 1, these participants also demonstrated a decrease in pain sensitivity after meditation training. Changes in the mindfulness and anxiety assessments suggest that meditation's analgesic effects are related to reduced anxiety and the enhanced ability to focus on the present moment.

Stress

Coffey, K. A., & Hartman, M. (2008). Mechanisms of Action in the Inverse Relationship Between Mindfulness and Psychological Distress. *Journal of Evidence-Based Complementary and Alternative Medicine, 13*(2), 79-91.

Both dispositional mindfulness and mindfulness-based interventions have been found to be associated with less psychological distress. Results confirmed an inverse relationship between mindfulness and psychological distress. Furthermore, emotion regulation, nonattachment, and rumination significantly mediated this relationship.

Cohen-Katz, J., Wiley, S. D., Capuano, T., Baker, D. M., Kimmel, S., & Shapiro, S. (2005). The effects of mindfulness-based stress reduction on nurse stress and burnout, part II: A quantitative and qualitative study. *Holistic Nursing Practice, 19*(1), 26-35.

This article is the second in a series reporting on research exploring the effects of Mindfulness-based Stress Reduction on nurses and describes the quantitative data. The third article describes qualitative data. Treatment group participants reduced scores on 2 of 3 subscales of the Maslach Burnout Inventory significantly more than wait-list controls; within-group comparisons for both groups pretreatment and posttreatment revealed similar findings. Changes were maintained as long as 3-month posttreatment. Implications of these findings are discussed.

Creswell, J. D., Pacilio, L. E., Lindsay, E. K., & Brown, K. W. (2014). Brief mindfulness meditation training alters psychological and neuroendocrine responses to social evaluative stress. *Psychoneuroendocrinology, 44*, 1-12.

Objective: To test whether a brief mindfulness meditation training intervention buffers self-reported psychological and neuroendocrine responses to the Trier Social Stress Test (TSST) in young adult volunteers. A second objective evaluates whether pre-existing levels of dispositional mindfulness moderate the effects of brief mindfulness meditation training on stress reactivity. Methods: Sixty-six (N = 66) participants were randomly assigned to either a brief 3-day (25-min per day) mindfulness meditation training or an analytic cognitive training control program. All participants completed a standardized laboratory social-evaluative stress challenge task (the TSST) following the third mindfulness meditation or cognitive training session. Measures of psychological (stress perceptions) and biological (salivary cortisol, blood pressure) stress reactivity were collected during the social evaluative stress-challenge session. Results: Brief mindfulness meditation training reduced self-reported psychological stress reactivity but increased salivary cortisol reactivity to the TSST, relative to the cognitive training comparison program. Participants who were low in pre-existing levels of dispositional mindfulness and then received mindfulness meditation training had the greatest cortisol reactivity to the TSST. No significant main or interactive effects were observed for systolic or diastolic blood pressure reactivity to the TSST. Conclusions: The present study provides an initial indication that brief mindfulness meditation training buffers self-reported psychological stress reactivity, but also increases cortisol reactivity to social evaluative stress. This pattern may indicate that initially brief mindfulness meditation training fosters

greater active coping efforts, resulting in reduced psychological stress appraisals and greater cortisol reactivity during social evaluative stressors.

Krasner, M. S., Epstein, R. M., Beckman, H., Suchman, A. L., 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 physicians. *The Journal of the American Medical Association, 302*(12), 1284-1293.

CONTEXT: Primary care physicians report high levels of distress, which is linked to burnout, attrition, and poorer quality of care. Programs to reduce burnout before it results in impairment are rare; data on these programs are scarce. OBJECTIVE: To determine whether an intensive educational program in mindfulness, communication, and self-awareness is associated with improvement in primary care physicians' well-being, psychological distress, burnout, and capacity for relating to patients. DESIGN, SETTING, AND PARTICIPANTS: Before-and-after study of 70 primary care physicians in Rochester, New York, in a continuing medical education (CME) course in 2007-2008. The course included mindfulness meditation, self-awareness exercises, narratives about meaningful clinical experiences, appreciative interviews, didactic material, and discussion. An 8-week intensive phase (2.5 h/wk, 7-hour retreat) was followed by a 10-month maintenance phase (2.5 h/mo). MAIN OUTCOME MEASURES: Mindfulness (2 subscales), burnout (3 subscales), empathy (3 subscales), psychosocial orientation, personality (5 factors), and mood (6 subscales) measured at baseline and at 2, 12, and 15 months. RESULTS: Over the course of the program and follow-up, participants demonstrated improvements in mindfulness (raw score, 45.2 to 54.1; raw score change [Delta], 8.9; 95% confidence interval [CI], 7.0 to 10.8); burnout (emotional exhaustion, 26.8 to 20.0; Delta = -6.8; 95% CI, -4.8 to -8.8; depersonalization, 8.4 to 5.9; Delta = -2.5; 95% CI, -1.4 to -3.6; and personal accomplishment, 40.2 to 42.6; Delta = 2.4; 95% CI, 1.2 to 3.6); empathy (116.6 to 121.2; Delta = 4.6; 95% CI, 2.2 to 7.0); physician belief scale (76.7 to 72.6; Delta = -4.1; 95% CI, -1.8 to -6.4); total mood disturbance (33.2 to 16.1; Delta = -17.1; 95% CI, -11 to -23.2), and personality (conscientiousness, 6.5 to 6.8; Delta = 0.3; 95% CI, 0.1 to 5 and emotional stability, 6.1 to 6.6; Delta = 0.5; 95% CI, 0.3 to 0.7). Improvements in mindfulness were correlated with improvements in total mood disturbance ($r = -0.39$, $P < .001$), perspective taking subscale of physician empathy ($r = 0.31$, $P < .001$), burnout (emotional exhaustion and personal accomplishment subscales, $r = -0.32$ and 0.33, respectively; $P < .001$), and personality factors (conscientiousness and emotional stability, $r = 0.29$ and 0.25, respectively; $P < .001$). CONCLUSIONS: Participation in a mindful communication program was associated with short-term and sustained improvements in well-being and attitudes associated with patient-centered care. Because before-and-after designs limit inferences about intervention effects, these findings warrant randomized trials involving a variety of practicing physicians.

Pace, T. W. W., Negi, L. T., Adame, D. D., Cole, S. P., Sivilli, T. I., Brown, T. D., … Raison, C. L. (2009). Effect of compassion meditation on neuroendocrine, innate immune and behavioral responses to psychosocial stress. *Psychoneuroendocrinology, 34*(1), 87-98.

Meditation practices may impact physiological pathways that are modulated by stress and relevant to disease. While much attention has been paid to meditation practices that emphasize calming the mind, improving focused attention, or developing mindfulness, less is known about meditation practices that foster compassion. Accordingly, the current study examined the effect of compassion meditation on innate immune, neuroendocrine and behavioral responses to psychosocial stress and evaluated the degree to which engagement in meditation practice influenced stress-reactivity. Sixty-one healthy adults were randomized to 6 weeks of training in compassion meditation (n=33) or participation in a health discussion control group (n=28) followed by exposure to a standardized laboratory stressor (Trier Social Stress Test [TSST]). Physiologic and behavioral responses to the TSST were determined by repeated assessments of plasma concentrations of interleukin (IL)-6 and cortisol as well as total distress scores on the Profile of Mood States (POMS). No main effect of group assignment on TSST responses was found for IL-6, cortisol or POMS scores. However, within the meditation group, increased meditation practice was correlated with decreased TSST-induced IL-6 (rp =-0.46, p=0.008) and POMS distress scores (rp =-0.43, p=0.014). Moreover, individuals with meditation practice times above the median exhibited lower TSST-induced IL-6 and POMS distress scores compared to individuals below the median, who did not differ from controls. These data suggest that engagement in compassion meditation may reduce stress-induced immune and behavioral responses, although future studies are required to determine whether individuals who engage in compassion meditation techniques are more likely to exhibit reduced stress reactivity.

Rosenkranz, M. A., Lutz, A., Perlman, D. M., Bachhuber, D. R., Schuyler, B. S., MacCoon, D. G., & Davidson, R. J. (2016). Reduced stress and inflammatory responsiveness in experienced meditators compared to a matched healthy control group. *Psychoneuroendocrinology, 68*, 117-125.

Psychological stress is a major contributor to symptom exacerbation across many chronic inflammatory conditions and can acutely provoke increases in inflammation in healthy individuals. With the rise in rates of inflammation-related medical conditions, evidence for behavioral approaches that reduce stress reactivity is of value. Here, we compare 31 experienced meditators, with an average of approximately 9000 lifetime hours of meditation practice (M age=51years) to an age- and sex-matched control group (n=37; M age=48years) on measures of stress- and inflammatory responsivity, and measures of psychological health. The Trier Social Stress Test (TSST) was used to induce psychological stress and a neurogenic inflammatory response was produced using topical application of capsaicin cream to forearm skin. Size of the capsaicin-induced flare response and increase in salivary cortisol and alpha amylase were used to quantify the magnitude of inflammatory and stress responses, respectively. Results show that experienced meditators have lower TSST-evoked cortisol (62.62±2.52 vs. 70.38±2.33; p<.05) and perceived stress (4.18±.41 vs. 5.56±.30; p<.01), as well as a smaller neurogenic inflammatory response (81.55±4.6 vs. 96.76±4.26; p<.05), compared to the control group. Moreover, experienced meditators reported higher levels of psychological factors associated with wellbeing and resilience. These results suggest that the long-term practice of meditation may reduce stress reactivity and could be of

therapeutic benefit in chronic inflammatory conditions characterized by neurogenic inflammation.

Rosenzweig, S., Reibel, D. K., Greeson, J. M., Brainard, G. C., & Hojat, M. (2003). Mindfulness-based stress reduction lowers psychological distress in medical students. *Teaching and Learning in Medicine, 15*(2), 88-92.

BACKGROUND: Medical students confront significant academic, psychosocial, and existential stressors throughout their training. Mindfulness-based stress reduction (MBSR) is an educational intervention designed to improve coping skills and reduce emotional distress. PURPOSE: The purpose of this study was to examine the effectiveness of the MBSR intervention in a prospective, nonrandomized, cohort-controlled study. METHODS: Second-year students (n = 140) elected to participate in a 10-week MBSR seminar. Controls (n = 162) participated in a didactic seminar on complementary medicine. Profile of Mood States (POMS) was administered preintervention and postintervention. RESULTS: Baseline total mood disturbance (TMD) was greater in the MBSR group compared with controls (38.7 +/- 33.3 vs. 28.0 +/- 31.2; $p < .01$). Despite this initial difference, the MBSR group scored significantly lower in TMD at the completion of the intervention period (31.8 +/- 33.8 vs. 38.6 +/- 32.8; $p < .05$). Significant effects were also observed on Tension-Anxiety, Confusion-Bewilderment, Fatigue-Inertia, and Vigor-Activity subscales. CONCLUSION: MBSR may be an effective stress management intervention for medical students.

Cognitive Functioning

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*(27), 11483-11488.

Meditation refers to a family of mental training practices that are designed to familiarize the practitioner with specific types of mental processes. One of the most basic forms of meditation is concentration meditation, in which sustained attention is focused on an object such as a small visual stimulus or the breath. In age-matched participants, using functional MRI, we found that activation in a network of brain regions typically involved in sustained attention showed an inverted u-shaped curve in which expert meditators (EMs) with an average of 19,000 h of practice had more activation than novices, but EMs with an average of 44,000 h had less activation. In response to distracter sounds used to probe the meditation, EMs vs. novices had less brain activation in regions related to discursive thoughts and emotions and more activation in regions related to response inhibition and attention. Correlation with hours of practice suggests possible plasticity in these mechanisms.

Chiesa, A., Calati, R., & Serretti, A. (2011). Does mindfulness training improve cognitive abilities? A systematic review of neuropsychological findings. *Clinical Psychology Review, 31*(3), 449-464.

Mindfulness meditation practices (MMPs) are a subgroup of meditation practices which are receiving growing attention. The present paper reviews current

evidence about the effects of MMPs on objective measures of cognitive functions. Five databases were searched. Twenty three studies providing measures of attention, memory, executive functions and further miscellaneous measures of cognition were included. Fifteen were controlled or randomized controlled studies and 8 were case-control studies. Overall, reviewed studies suggested that early phases of mindfulness training, which are more concerned with the development of focused attention, could be associated with significant improvements in selective and executive attention whereas the following phases, which are characterized by an open monitoring of internal and external stimuli, could be mainly associated with improved unfocused sustained attention abilities. Additionally, MMPs could enhance working memory capacity and some executive functions. However, many of the included studies show methodological limitations and negative results have been reported as well, plausibly reflecting differences in study design, study duration and patients' populations. Accordingly, even though findings here reviewed provided preliminary evidence suggesting that MMPs could enhance cognitive functions, available evidence should be considered with caution and further high quality studies investigating more standardized mindfulness meditation programs are needed.

Tang, 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*(43), 17152-17156.

Recent studies suggest that months to years of intensive and systematic meditation training can improve attention. However, the lengthy training required has made it difficult to use random assignment of participants to conditions to confirm these findings. This article shows that a group randomly assigned to 5 days of meditation practice with the integrative body–mind training method shows significantly better attention and control of stress than a similarly chosen control group given relaxation training. The training method comes from traditional Chinese medicine and incorporates aspects of other meditation and mindfulness training. Compared with the control group, the experimental group of 40 undergraduate Chinese students given 5 days of 20-min integrative training showed greater improvement in conflict scores on the Attention Network Test, lower anxiety, depression, anger, and fatigue, and higher vigor on the Profile of Mood States scale, a significant decrease in stress-related cortisol, and an increase in immunoreactivity. These results provide a convenient method for studying the influence of meditation training by using experimental and control methods similar to those used to test drugs or other interventions.

Teper, R., Segal, Z. V., & Inzlicht, M. (2013). Inside the Mindful Mind: How Mindfulness Enhances Emotion Regulation Through Improvements in Executive Control. *Current Directions in Psychological Science, 22*(6), 449-454.

Although the psychological benefits of mindfulness training on emotion regulation are well-documented, the precise mechanisms underlying these effects remain unclear. In the present account, we propose a new linkage between mindfulness and improved emotion regulation—one that highlights the role played by executive control. Specifically, we suggest that the present-moment awareness

and nonjudgmental acceptance that is cultivated by mindfulness training is crucial in promoting executive control because it increases sensitivity to affective cues in the experiential field. This, in turn, enhances emotion regulation.

Sleep Disorders

Gross, C. R., Kreitzer, M. J., Reilly-Spong, M., Wall, M., Winbush, N. Y., Patterson, R., … Cramer-Bornemann, M. (2011). Mindfulness-based stress reduction versus pharmacotherapy for chronic primary insomnia: a randomized controlled clinical trial. *Explore: The Journal of Science and Healing, 7*(2), 76-87.

OBJECTIVE: The aim of this study was to investigate the potential of mindfulness-based stress reduction (MBSR) as a treatment for chronic primary insomnia. DESIGN: A randomized controlled trial was conducted. SETTING: The study was conducted at a university health center. PATIENTS: Thirty adults with primary chronic insomnia based on criteria of the Diagnostic and Statistical Manual of Mental Disorders, Text Revision, 4th Edition were randomized 2:1 to MBSR or pharmacotherapy (PCT). INTERVENTIONS: Mindfulness-based stress reduction, a program of mindfulness meditation training consisting of eight weekly 2.5 hour classes and a daylong retreat, was provided, with ongoing home meditation practice expectations during three-month follow-up; PCT, consisting of three milligrams of eszopiclone (LUNESTA) nightly for eight weeks, followed by three months of use as needed. A 10-minute sleep hygiene presentation was included in both interventions. MAIN OUTCOMES: The Insomnia Severity Index (ISI), Pittsburgh Sleep Quality Index (PSQI), sleep diaries, and wrist actigraphy were collected pretreatment, posttreatment (eight weeks), and at five months (self-reports only). RESULTS: Between baseline and eight weeks, sleep onset latency (SOL) measured by actigraphy decreased 8.9 minutes in the MBSR arm ($P < .05$). Large, significant improvements were found on the ISI, PSQI, and diary-measured total sleep time, SOL, and sleep efficiency ($P < .01$, all) from baseline to five-month follow-up in the MBSR arm. Changes of comparable magnitude were found in the PCT arm. Twenty-seven of 30 patients completed their assigned treatment. This study provides initial evidence for the efficacy of MBSR as a viable treatment for chronic insomnia as measured by sleep diary, actigraphy, well-validated sleep scales, and measures of remission and clinical recovery.

Substance Abuse

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.

Background: Stress is important in substance use disorders (SUDs). Mindfulness training (MT) has shown promise for stress-related maladies. No studies have compared MT to empirically-validated treatments for SUDs. Goals: To assess MT compared to cognitive behavioral therapy (CBT) in substance use and treatment acceptability, and specificity of MT compared to CBT in targeting stress reactivity. Methods: 36 individuals with alcohol and/or cocaine use disorders were randomly assigned to receive group MT or CBT in an outpatient setting. Drug use was assessed weekly. After treatment, responses to personalized stress provocation

were measured. Results: Fourteen individuals completed treatment. There were no differences in treatment satisfaction, or drug use between groups. The laboratory paradigm suggested reduced psychological and physiological indices of stress during provocation in MT compared to CBT. Conclusions: This pilot study provides evidence of the feasibility of MT in treating SUDs and suggests that MT may be efficacious in targeting stress.

Posttraumatic Stress Disorder

Rosenthal, J. Z., Grosswald, S., Ross, R. & Rosenthal, N. (2011). Effects of transcendental meditation in veterans of Operation Enduring Freedom and Operation Iraqi Freedom with posttraumatic stress disorder: a pilot study.

We conducted an uncontrolled pilot study to determine whether transcendental meditation (TM) might be helpful in treating veterans from Operation Enduring Freedom or Operation Iraqi Freedom with combat-related posttraumatic stress disorder (PTSD). Five veterans were trained in the technique and followed for 12 weeks. All subjects improved on the primary outcome measure, the Clinician Administered PTSD Scale (mean change score, 31.4; $p = 0.02$; $df = 4$). Significant improvements were also observed for 3 secondary outcome measures: Clinician's Global Inventory-Severity (mean change score, 1.60; $p < 0.04$; $df = 4$), Quality of Life Enjoyment and Satisfaction Questionnaire (mean change score, -13.00; $p < 0.01$; $df = 4$), and the PTSD Checklist-Military Version (mean change score, 24.00; $p < 0.02$; $df = 4$). TM may have helped to alleviate symptoms of PTSD and improve quality of life in this small group of veterans. Larger, placebo-controlled studies should be undertaken to further determine the efficacy of TM in this population.

Attention Deficit Hyperactivity Disorder

van de Weijer-Bergsma, E., Formsma, A. R., de Bruin, E. I., & Bogels, S. M. (2011). The Effectiveness of Mindfulness Training on Behavioral Problems and Attentional Functioning in Adolescents with ADHD. *Journal of Child and Family Studies, 21*(5), 775-787.

The effectiveness of an 8-week mindfulness training for adolescents aged 11–15 years with ADHD and parallel Mindful Parenting training for their parents was evaluated. Adolescent, their parents and tutors completed measurements before, immediately after, 8 weeks after and 16 weeks after training. Adolescents reported on their attention and behavioral problems and mindful awareness. After mindfulness training, adolescents' attention and behavior problems reduced, while their executive functioning improved, as indicated by self- report measures as well as by father and teacher report. Second, improvements in adolescent' actual performance on attention tests were found after mindfulness training. Moreover, fathers, but not mothers, reported reduced parenting stress. Mothers reported reduced overreactive parenting, whereas fathers reported an increase. No effect on mindful awareness of adolescents or parents was found. Effects of mindfulness training became stronger at 8-week follow-up, but waned at 16-week follow-up.

Developmental Disability

Hwang, Y. S., & Kearney, P. (2013). A systematic review of mindfulness intervention for individuals with developmental disabilities: Long-term practice and long lasting effects. *Research in Developmental Disabilities, 34*(1), 314-326.

A systematic literature review identified 12 studies that taught mindfulness practice to individuals with mild to severe developmental disabilities, demonstrating that mindfulness intervention could significantly reduce the behavioural and/or psychological problems of this population. The majority of these mindfulness intervention studies were longitudinal, featuring long intervention periods and long lasting intervention effects. This paper analyses the characteristics and objectives of mindfulness interventions, along with their effects, focusing on the adjustments made to intervention content and instruction strategies to meet the specific requirements of individuals with developmental disabilities.

Kiep, M., Spek, A. A., & Hoeben, L. (2015). Mindfulness-Based Therapy in Adults with an Autism Spectrum Disorder: Do Treatment Effects Last? *Mindfulness, 6*(3), 637-644.

Individuals with autism spectrum disorders (ASD) have a higher incidence of comorbid disorders in comparison with other patient groups. Earlier research showed that mindfulness-based therapy for individuals on the autism spectrum (MBT-AS) is effective in reducing symptoms of depression, anxiety, and rumination. In the current study, it was examined whether MBT-AS is effective in alleviating a variety of psychosomatic symptoms and whether these effects were still evident after 9 weeks. Self-reported symptoms were evaluated at three intervals: (1) before the first session, (2) after the last session, and (3) 9 weeks after the last session. Results showed that symptoms of anxiety, depression, agoraphobia, somatization, inadequacy in thinking and acting, distrust and interpersonal sensitivity, sleeping problems, and general psychological and physical well-being declined significantly during intervention. Positive affect increased, and rumination declined significantly during treatment. Hostility symptoms did not decline significantly during treatment. All symptoms remained stable between post intervention and follow-up. In conclusion, MBT-AS appears to be an effective method for reducing a variety of symptoms, and treatment gains remain stable over the longer term.

Sequeira, S., & Ahmed, M. (2012). Meditation as a Potential Therapy for Autism: A Review. *Autism Research and Treatment*, 1-11.

In autism, the brain is unable to process sensory information normally. Instead, simple stimuli from the outside world are experienced as overwhelmingly intense and strain the emotional centers of the brain. A stress response to the incoming information is initiated that destabilizes cognitive networks and short-circuits adequate behavioral output. As a result, the child is unable to respond adequately to stimulation and initiate social behavior towards family, friends, and peers. In addition, these children typically face immune-digestive disorders that heighten social fears, anxieties, and internal conflicts. While it is critical to treat the physical symptoms, it is equally vital to offer an evidence-based holistic solution that harmonizes both their emotional and physical well-being as they move from childhood into adult life. Here, we summarize evidence from clinical

studies and neuroscience research that suggests that an approach built on yogic principles and meditative tools is worth pursuing. Desired outcomes include relief of clinical symptoms of the disease, greater relaxation, and facilitated expression of feelings and skills, as well as improved family and social quality of life.]

Singh, N. N., Lancioni, G. E., Manikam, R., Winton, A. S. W., Singh, A. N. A., Singh, J., & Singh, A. D. A. (2011). A mindfulness-based strategy for self- management of aggressive behavior in adolescents with autism. *Research in Autism Spectrum Disorders, 5*(3), 1153-1158.

Children and adolescents with Asperger syndrome occasionally exhibit aggressive behavior against peers and parents. In a multiple baseline design across subjects, three adolescents with Asperger syndrome were taught to use a mindfulness-based procedure called Meditation on the Soles of the Feet to control their physical aggression in the family home and during outings in the community. They were taught to shift the focus of their attention from the negative emotions that triggered their aggressive behavior to a neutral stimulus, the soles of their feet. Prior to training in the mindfulness-based procedure the adolescents had moderate rates of aggression. During mindfulness practice, which lasted between 17 and 24 weeks, their mean rates of aggression per week decreased from 2.7, 2.5 and 3.2 to 0.9, 1.1, and 0.9, respectively, with no instances observed during the last 3 weeks of mindfulness practice. No episodes of physical aggression occurred during a 4-year follow-up.

Spek, A. A., van Ham, N. C., & Nyklicek, I. (2013). Mindfulness-based therapy in adults with autism spectrum disorder: A randomized controlled trial. *Research in Developmental Disabilities, 34*(1), 246-253.

Research shows that depression and anxiety disorders are the most common psychiatric concern in autism spectrum disorders (ASD). Mindfulness-based therapy (MBT) has been found effective in reducing anxiety and depression symptoms, however research in autism is limited.Therefore, we examined the effects of a modified MBT protocol (MBT-AS) in high-functioning adults with ASD. Results showed a significant reduction in depression, anxiety and rumination in the intervention group, as opposed to the control group. Furthermore, positive affect increased in the intervention group, but not in the control group. Concluding, the present study is the first controlled trial to demonstrate that adults with ASD can benefit from MBT-AS.

Spek, A., & van Ham, N. C. (2011). Mindfulness-Based Stress Reduction in Adults with ASD. Presented at the International Meeting for Autism Research 2011.

MBSR is a patient-friendly method that appears valuable in the treatment of comorbid depression and rumination in high functioning adults with ASD. Apparently, high-functioning adults with ASD are able to acquire meditation skills and apply those in there home environment in a manner that diminishes their symptoms of depression and rumination.