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National University of Natural Medicine (A. Senders, PI). **MBSR for multiple sclerosis: Feasibility, durability, and clinical outcomes**. NIH/NCCIH project #5K23AT008211-05. [link]

Northwestern University (B. Yanez, PI). **Mindfulness-based e-health intervention to improve medication adherence among breast cancer survivors**. NIH/NCCIH project #5R34AT009447-02. [link]

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HIGHLIGHTS

A summary of select studies from the issue, providing a snapshot of some of the latest research

While people with chronic illnesses can benefit from modifications in diet, exercise, and stress management, initiating and maintaining behavioral changes can be difficult. People with mental health problems can find it even harder to self-manage healthy lifestyle changes. Health care providers are interested in behavioral interventions that can be delivered directly in primary care settings to help patients better manage their illnesses.

Gawande et al. [*Journal of General Internal Medicine*] studied whether a primary care mindfulness-based intervention could promote improved patient self-management of behaviors that might favorably impact their health. They compared the effectiveness of an intensive in-house mindfulness training to a brief orientation to mindfulness coupled with referral to potential community and online mindfulness resources.

The researchers randomly assigned 136 primary care patients with depressive, anxiety, stress, adjustment, or traumatic stress diagnoses (65% female; 77% Caucasian; average age = 41 years) to either a Mindfulness Training for Primary Care (MTPC) group or a low dose comparator control. Participants who were already receiving mental health treatment were encouraged to continue it during the study. MTPC was delivered in 8 weekly 2-hour group sessions along with a 7-hour retreat. The program was based on Mindfulness-Based Stress Reduction and Mindfulness-Based Cognitive Therapy. It included instruction on self-compassion, illness self-management, values clarification, communication, and mindful action planning.

Prior to randomization, all participants attended a one-hour orientation to mindfulness that included didactic and practice elements. Following randomization, participants in the low dose comparator control were encouraged to practice mindfulness on their own, advised to seek out mindfulness resources, and placed on a 6-month MTPC waiting list. Both MTPC and control participants received biweekly phone calls encouraging continued home practice.

In the seventh week of the study, all participants were asked to develop a short-term action plan to self-manage chronic illness and promote wellness. In weeks 8 and 9, they self-rated the degree to which they had successfully initiated their action plans. Participants also completed questionnaires at baseline, 8 weeks, and 24 weeks assessing anxiety, depression, stress, emotion regulation, self-compassion, mindfulness (Five Facet Mindfulness Questionnaire), awareness of body sensations, and measures of self-efficacy and perceived control in managing their illnesses.

MTPC attendance was fair to good, with 74% of participants attending 6 or more group sessions. MTPC participants engaged in an average of 191 minutes a week of home mindfulness practice compared to 53 minutes a week for controls. MTPC participants showed significant improvements at 8 weeks on anxiety (d=0.80), depression (0.59), perceived stress (0.77), mindfulness (0.92), self-compassion (0.85), emotion regulation (0.71), awareness of body sensations (1.0), self-efficacy in managing illness (0.30), and perceived control in managing illness (0.41). Controls showed similar changes in anxiety, depression, perceived stress, and self-compassion, but experienced no improvement on the other measures. All of these improvements persisted at 24 weeks.

MTPC participants showed significantly larger improvements in mindfulness (d=0.57), self-compassion (0.41), emotion regulation (.58), and awareness of body sensations (0.75) than did controls. MTPC participants were also significantly more likely to report successfully initiating and

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implementing their illness self-management plans (58% vs. 32%). These plans typically involved changes in mindful self-care, physical activity level, and/or diet.

The study shows that intensive mindfulness training can be successfully integrated into a primary care setting, while improving mindfulness, self-compassion, body awareness, and emotional self-regulation better than a low dose comparator. MTPC also increases the likelihood of patients implementing short-term health care self-management plans. Participants improved on a variety of mental health measures, although not more than those in the low dose comparator. The study is limited by its reliance on self-report to assess patient implementation of self-management plans, and by the absence of a treatment-as-usual control.

Between 30-70% of physicians suffer from work-related burnout. Physician burnout is associated with higher medical error rates, poorer physician-patient communication, and increased physician substance abuse and suicide. Medical professionals are interested in developing ways to reduce burnout, including the implementation resilience curricula in medical schools. **Kemper et al. [*Academic Medicine*]** surveyed pediatric residents to assess the rate of burnout during residency, and determine whether the traits of mindfulness and self-compassion served as protection against burnout.

A cohort of 872 pediatric residents serving at 31 different residency sites (72% female; 73% Caucasian; average age = 29 years) completed an online questionnaire in the spring of 2016 and again in the spring of 2017. The questionnaires measured burnout, perceived stress, confidence in their ability to provide compassionate care, mindfulness (the Cognitive and Affective Mindfulness Scale-Revised), and self-compassion. The burnout measure assessed emotional exhaustion (e.g., "I feel emotionally drained from my work") and compassion fatigue (e.g., "I feel I treat some patients as if they were impersonal objects"). The researchers looked at the stability of measures over time, the cross-sectional correlations between measures within each year, and the ability of 2016 mindfulness and self-compassion scores to predict 2017 burnout, stress, and confidence in being able to deliver compassionate care.

The results showed that 48% of the residents suffered from burnout in the spring of 2016 and again in the spring of 2017. In 2016, mindfulness significantly correlated positively with self-compassion (.61) and confidence in providing compassionate care (.37) and negatively with perceived stress (-.59) and burnout (-.44). Self-Compassion significantly correlated positively with confidence in providing compassionate care (.29) and negatively with perceived stress (-.49) and burnout (-.38). Correlation magnitudes were essentially the same in 2017.

After controlling for 2016 burnout, self-compassion significantly predicted reduced 2017 burnout. Each additional point on the 2016 self-compassion scale was associated with a 6% decrease in the 2017 likelihood of burning out. Controlling for 2016 perceived stress, mindfulness and self-compassion both significantly predicted lower 2017 stress levels. Controlling for 2016 confidence in providing compassionate care, mindfulness and self-compassion both significantly predicted higher 2017 levels in confidence in providing compassionate care.

The results demonstrate that nearly half of all pediatric residents suffer from burnout. Self-compassion and mindfulness promote resilience by reducing stress and burnout, and increasing confidence in treating patients compassionately. The study provides a rationale for including mindfulness and self-compassion training in medical school curricula. The study's strengths include its large and representative sample and its predictive use of mindfulness measures.

Lesley University is accepting applications for an Associate/Full Professor, Mindfulness Studies Program Director through January 30, 2019. To view the full position description and to apply online please use the link below to be redirected to our website.

https://lesley.interviewexchange.com/jobofferdetails.jsp?JOBID=104929&CNTRNO=9&TSTMP=1545233558135

The Mindfulness Studies Program:

Lesley University's 36-credit Master's in Mindfulness Studies is the first graduate program of its kind in the United States, as is the 15-credit Certificate Program in Mindfulness studies. The Programs, comprised of approximately 90 students, are low-residency; courses are online with the exception of an in-person component at the weeklong on campus summer residency for first-year students. In this academically and experientially rigorous program, students are immersed in the theory and practice of mindfulness, mindful communications (insight dialog), mindful leadership and social change, and the roots of mindfulness in Buddhist traditions, as well as research in the emerging field of contemplative neuroscience. The Master's Degree Program culminates with a capstone project/Master's thesis. A number of electives are also offered.

Graduates will be versed in the history of mindfulness in the west, and its origins in classical mindfulness, as well as in ongoing conversations about secular Buddhism and the early teachings of the Buddha. Students in the Master's and Certificate programs complete a one-week silent retreat at a Vipassana (or other approved) retreat center. Those in the Master's program complete a semester-long internship during which they provide mindful service in their home communities. Graduates will emerge from the program grounded in mindfulness, familiar with Buddhist traditions and thought, and knowledgeable of the applications of mindfulness across a wide variety of fields.

The M.A. in Mindfulness Studies is especially suitable for those aspiring to be mindful citizens, prepared to promote social good, and to apply their training in their professional endeavors, including health and wellness, education, business and leadership, and other forms of social entrepreneurship. The program is excellent preparation for students seeking to pursue professional certification training in Mindfulness Based Interventions (MBIs), or as complementary training for those already engaged in MBI certification programs.

Job Description:

This is a full time 12-month Associate/Full Professor position in the Master's Degree program in Mindfulness Studies. Rank is commensurate with experience. The Director reports to the Dean of the Graduate School and oversees the 36-credit Master's Degree Program, as well as the 15-credit Certificate Program in Mindfulness Studies. He/she/they teaches online courses across the curriculum, supervises core faculty, hires and mentors adjunct faculty, advises students, develops new curricula and program initiatives, and fosters collaborations with other mainstream mindfulness and Buddhist entities. The Director works with university departments on marketing, admissions, budgeting, and alumni relations; and serves as a liaison between the program and the University. He/she/they serves on the Graduate School academic leadership team and on school and university faculty committees. The director oversees and leads the planning and delivery of the once yearly, week-long summer on-campus residency session for first year students. The director is responsible for developing new Program initiatives and planning Program events, and for developing collaborations and co-sponsored events with other mainstream mindfulness and Buddhist entities. He/she/they must actively embrace and foster the relationship between social justice, reflective practice, and individual well-being; and address issues of privilege, exclusion, and marginalization in all aspects of the Director role.

Lesley University is an Affirmative Action/Equal Opportunity Employer and is committed to promoting diversity, inclusion and social justice in all aspects of the educational experience. Candidates who believe they can contribute to this goal are encouraged to apply.

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HIGHLIGHTS

A summary of select studies from the issue, providing a snapshot of some of the latest research

Nearly half of all 15-19 year-olds drink alcohol, at least on occasion, despite laws prohibiting its use by minors. Increased alcohol consumption by teenagers is linked to problems with attention, memory, and cognition. Impulsive teenagers are at higher risk for alcohol use, and interventions that reduce impulsivity may also reduce their likelihood of drinking. Public schools can serve as important venues for health programs aimed at lessening alcohol-related harm.

Patton et al. [*Journal of Consulting and Clinical Psychology*] tested whether including mindfulness meditation in a school-based cognitive behavioral therapy intervention adds to its effectiveness in decreasing teenage alcohol use.

The researchers randomly assigned 404 Australian 9th and 10th graders (62% female; average age = 15 years) to either a cognitive behavioral therapy intervention combined with mindful breathing (CBT+MM), a cognitive behavioral therapy intervention combined with progressive muscle relaxation (CBT+PMR), or an assessment-only control. The interventions were delivered in three group-based sessions lasting an average of 58 minutes each, and were taught by graduate-level psychology students.

Mindfulness training consisted of one session that included an introduction to mindfulness, a mindful eating exercise, and a mindfulness of the body and breath exercise, and a second session that included an exercise involving mindfulness of thoughts. Cognitive behavioral training consisted of one session that included an introduction to the cognitive model and identifying cognitive distortions, and a second session in which the cognitive model was applied to thoughts about alcohol. All students were assessed before the intervention, at post-intervention, and at 3- and 6-month follow-up on self-report measures of alcohol use, impulsivity, mindfulness (using the Mindful Attention Awareness Scale), positive and negative beliefs about the effects of alcohol, and confidence in being able to refuse alcohol in a variety of circumstances.

Students in both active interventions reported significantly lower levels of increased drinking behavior over time compared to controls (Cohen's d = -0.14). Intervention groups did not differ from one another in their drinking behavior. There were no differences between the three groups in terms of impulsivity, mindfulness, or confidence in being able to refuse alcohol. Students in the two active interventions had increased levels of both positive and negative beliefs about how alcohol might affect them compared to controls.

The results suggest that brief CBT-based interventions, including either mindfulness or progressive muscle relaxation, reduce the increase in student drinking behavior over the course of six months. It is not clear whether mindfulness or progressive muscle relaxation contributed to this effect. There is also no evidence that the CBT+MM intervention improved self-reported levels of mindfulness.

The main limitations of the study include the brevity of the intervention, the absence of a CBT-only control to determine if mindfulness and muscle relaxation contributed to the effect on alcohol, and its reliance on minimally-trained mindfulness instructors.

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The death of a loved one is a powerful stressor. Bereavement is not only painful and distressing, but can also trigger the onset of a variety of mental and medical disorders. Bereaved individuals may experience difficulty regulating their emotions and intrusive unpleasant thoughts and feelings that can disrupt cognitive functioning. **Huang et al. [*Frontiers in Human Neuroscience*]** tested whether Mindfulness-Based Cognitive Therapy (MBCT) can improve emotional regulation and executive cognitive functioning in bereaved individuals.

The researchers recruited 23 participants reporting unresolved grief (91% female; average age = 48) who had lost at least one significant relative in the previous four years. All the participants attended an 8-week MBCT program. Self-report measures of grief, anxiety, depression, emotional regulation difficulty, and mindfulness (using the Five Facet Mindfulness Questionnaire) were obtained pre- and post-intervention.

Neurocognitive functioning was assessed before and after the intervention by having participants perform a Stroop task while monitoring their brain activity with functional magnetic resonance imaging. The Stroop task required participants to judge which of two visually presented digits was numerically larger. In each presentation, the relative physical sizes of the digits were either congruent or incongruent with their relative numerical size. People usually take longer to correctly respond on incongruous Stroop trials. Their reaction time on those trials was used as a measure of executive cognitive function—the ability to make judgments in the presence of conflicting information.

After MBCT, participants reported significantly reduced grief (Cohen's d = -0.89), anxiety (d = -0.65), depression (d = -1.17), and emotional regulation difficulty (d = -0.76), as well as increased mindfulness (d = 0.80). Post-MBCT mindfulness scores were significantly associated with lower post-MBCT grief (r = -.52), anxiety (r = -.70), depression (r = -.59) and emotional regulation difficulty (r = -.91). The participants' average reaction times to incongruous Stroop task presentations also significantly decreased from 624 milliseconds before MBCT to 608 milliseconds after MBCT.

There were significant reductions in posterior cingulate cortex (PCC) and precuneus activity during post-intervention incongruous Stroop trials, suggesting that the trials now required less cognitive effort. Higher levels of PCC activity were significantly associated with higher levels of grief (r = .34), as were higher levels of thalamic activity (r = .33). PCC activity was also significantly correlated with anxiety (r = .36). To summarize, the greater a participant's negative emotions, the higher the level of dorsal attentional system neurological activation required to successfully perform the Stroop.

The study demonstrates large within-group decreases in grief and emotional regulation difficulty, large increases in mindfulness, and significantly improved executive functioning in bereaved participants following MBCT. Improved executive functioning was accompanied by a decrease in the level of dorsal attentional network activation needed to perform accurately on incongruous Stroop trials. The lack of a control group makes it hard to determine if treatment effects would be similar for any group-based type of intervention or if they were simply due to the passage of time. Nonetheless, it is important to note that prior research with the grief scale used in this study suggests that changes of this order of magnitude usually take place over a matter of years rather than a matter of weeks.

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University of Illinois at Chicago (A. Friend-Kendall, PI). **Reducing HIV/STI risk behaviors among juvenile offenders on probation: a mobile mindfulness-based intervention.** NIH/NIDA project #1K99DA047890-01. [link]

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HIGHLIGHTS

A summary of select studies from the issue, providing a snapshot of some of the latest research

Loneliness and social isolation are major risk factors for poor health and increased mortality. Additionally, U.S. loneliness ratings have steadily risen in recent decades. Mindfulness could potentially mitigate this problem by enhancing emotional regulation, thereby improving social relationships.

Lindsay et al. [*Proceedings of the National Academy of Science*] conducted a randomized controlled study to see if training in mindful attention to sensory and mental experience, both with and without instructions to adopt an accepting attitude towards experience, helps to reduce feelings of loneliness and increase the frequency of social interactions.

The researchers randomly assigned 153 adults reporting higher than average stress levels (67% female; 52% Caucasian; average age = 32) to one of three groups. Participants in each group agreed to watch and listen to fourteen 20-minute lessons delivered via smartphone over the course of two weeks. The lessons all contained a combination of didactic instruction and guided exercises.

Participants in the Monitoring + Acceptance (M+A) group received training in present moment awareness plus training in accepting experience with openness, receptivity, and equanimity. Participants in the Monitoring Only (MO) group received training in present moment awareness without training in acceptance. Those in a third Coping control group received instruction on how to reflect on, analyze, and solve problems.

Participants rated how lonely they felt and recorded their daily social contacts and how many different people they interacted with in diaries completed three days before and three days after the intervention. Participants also reported their immediate feelings of loneliness and real-time social interactions multiple times a day via cellphone (a procedure called "ecological momentary assessment"). Finally, participants completed standardized retrospective self-report measures of loneliness, social isolation, and social support prior to and 6 weeks after the start of the intervention.

Participants completed an average of 13.5 of the 14 lessons. The M+A group's diary ratings of loneliness significantly declined from pre- to post-assessment (d = 0.44), while the MO and control groups' ratings did not. The M+A group also significantly increased their number of daily social interactions, whether measured by diary (d = 0.47) or momentary assessment (d = 0.31). The other groups' social interactions remained unchanged. The M+A group reported a 22% decrease in loneliness and increased their social interactions by two interactions per day. M+A participants also reported a significant increase in the number of different people they interacted with each day (d = 0.39), while the other groups did not. In all cases, the outcomes for the M+A group were significantly better than those of the other two groups.

The standardized retrospective self-report measures of loneliness, social isolation, and social support failed to show the same between-group changes as the diary and momentary assessment measures. On these measures, loneliness declined and perceived social support increased for all groups to an equal extent, while perceived social isolation remained unchanged.

This study shows that mindfulness training can decrease daily ratings of loneliness and increase daily social interactions, but only when acceptance training is included in the intervention. This suggests that heightened attention to the present moment alone is not sufficient to reduce loneliness. The authors speculate that mindful acceptance diminishes the perception of social threat, allowing people to lower their internal barriers to social engagement.

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First responders such as firefighters, police, and EMTs are regularly exposed to stressful and traumatic experiences. These experiences put them at increased risk for depression, anxiety disorders, PTSD, and alcoholism. There is a considerable interest in developing workplace programs that can increase first responders' resilience to and recovery from stressful experiences.

Joyce et al. [*Journal of Medical internet Research*] tested the efficacy of an online Resilience-at-Work (RAW) Mindfulness Program on firefighter resilience and wellbeing.

The researchers randomly selected 12 Australian fire stations as workplaces where firefighters could receive RAW training and 12 additional stations as attention-matched controls. A total of 143 firefighters (96% male, average age = 42) volunteered to participate, 79 of whom were available for post-treatment assessment, and 69 for a 6-month follow-up. Controls had a higher 6-week drop-out rate (54%) than RAW participants (32%).

RAW training consisted of six self-paced 20-25 minute iPad lessons that were to be completed over a period of up to 6 weeks. The lessons included aspects of Mindfulness-Based Cognitive Therapy and Acceptance and Commitment Therapy with additional training in self-compassion. The control condition completed six 20-minute Healthy Living lessons covering a range of topics such as skin health, maintaining a healthy home, and using cell phones wisely.

Self-reports were completed at baseline, post-intervention, and 6-month follow-up on measures of resilience (adaptation to stressful life events), bounce-back resilience, and other psychological measures.

RAW participants completed an average of 3.5 of the six trainings with only 37% completing the entire program. RAW participants increased their resilience scores more than controls. This difference approached significance at immediate post-testing and reached significance by the 6-month follow-up (a moderate-to-large effect). There were no group differences in bounce-back resilience.

In secondary analyses, positive changes in resilience were significantly greater for those who completed the greatest number of sessions. Change scores on a 10-point resilience scale ranged from -1.78 points for controls to +2.6 for RAW participants who completed the program. RAW participants were significantly more optimistic at post-testing, and significantly more likely to seek advice and emotional support from others. These differences were no longer significant at 6 months.

At the 6-month follow-up, RAW participants had higher levels of active coping than controls. RAW participants who completed 5-6 lessons were significantly more mindful than controls at both 6 weeks and 6 months, whereas participants who completed 4 or fewer sessions were not.

The study demonstrates that a targeted mindfulness training program increases some aspects of firefighter resilience (distress tolerance, positive adjustment, and perseverance), but not bounce-back resilience. The more lessons firefighters completed, the greater their improvements in both mindfulness and resilience.

RAW is a promising, inexpensive workplace program that can potentially improve first responder resilience. The study's weaknesses include its high dropout rate, low level of compliance with the intervention, and reliance on only self-report measures.

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Barney, J. L., Murray, H. B., Manasse, S. M.,...Juarascio, A. S. (2019). **Mechanisms and moderators in mindfulness-and acceptance-based treatments for binge eating spectrum disorders: A systematic review**. European Eating Disorders Review. [link]

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HIGHLIGHTS

A summary of select studies from the issue, providing a snapshot of some of the latest research

Most patients with mild-to-moderate psychological problems are diagnosed and treated in primary care rather than mental health settings. Many of these patients also suffer from physical disorders, or from physical symptoms caused or made worse by psychological factors. Mindfulness-based programs that reduce anxiety and depression and promote self-care are useful supplements to primary care treatments; however, existing barriers hinder their successful implementation. These barriers include limitations on staff time and training, staff unfamiliarity with mindfulness, and problems with insurance reimbursement.

Gawande et al [*Mindfulness*] studied the feasibility, acceptability, and effectiveness of a mindfulness-based primary care program in reducing symptoms and improving self-care for patients with mild-to-moderate psychological problems.

The researchers randomly assigned 81 primary care patients (69% female; average age = 44; 78% Caucasian; 44% meditation naive) with anxiety, depressive, stress- or trauma-related disorders to either a Mindfulness Training for Primary Care (MTPC) program or a low-dose comparison group. If participants were already receiving psychological help in the primary care setting, they continued to receive it as usual.

MTPC is an 8-week group program based on Mindfulness-Based Cognitive Therapy that incorporates elements of self-compassion training, values clarification, and relapse prevention. MTPC and low dose comparison group participants were asked to develop a self-care plan together with their primary care providers during the sixth week of the program. MTPC group leaders were either appropriately trained mental health clinicians or primary care physicians, with the groups being tailored to meet the insurance requirements of each discipline.

The low dose comparison control consisted of a one-hour didactic/experiential introduction to mindfulness with information on how to access community and digital mindfulness resources. Low dose comparison participants were also placed on a 6-month MTPC waiting list. All participants were assessed at baseline and again at 8-weeks on self-report measures of anxiety, depression, perceived stress, self-efficacy, self-control, mindfulness (Five Facet Mindfulness Questionnaire), and self-compassion.

MTPC participants showed significant pre-post decreases in anxiety (d = -0.72), stress (d = - 0.81), and depression (d = -0.40), as well as significant pre-post increases in self-efficacy (d = 0.43), self-compassion (d = 1.01), and mindfulness (d = 0.93). The low dose comparison participants showed a significant decrease in stress (d = -0.50). Three between-group differences reached statistical significance, with the MTPC group showing a greater decrease in anxiety and a greater increase in self-compassion and mindfulness than the controls. Based on self-ratings, MTPC participants were significantly more likely to have taken steps towards implementing their six-week self-care plan than low dose comparison participants (35% compared to 11%).

Over the course of 14 months, primary care physicians made 344 referrals to the program, with about a quarter of referred individuals actually enrolling. Most visits were paid for by insurance, although some patients were upset at unexpected out-of-pocket costs and copays. 65% of MTPC participants attended at least 6 of the 9 group sessions with 67% of MTPC participants and 70% of low dose comparison participants completing post-intervention assessments. The majority of MTPC participants (92%) who completed the final assessments said they would recommend the program to a friend. The only adverse event attributable to MTPC was a panic attack experienced by one participant during the 7-hour retreat.

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This study provides evidence for the initial efficacy of delivering an insurance-reimbursable mindfulness program within a primary care setting. MTPC patients demonstrated a greater decrease in anxiety and larger increases in mindfulness and self-compassion than controls. The study is limited by its reliance on self-report measures, its lack of an attention-matched control, and its relatively high final questionnaire non-completion rate.

Little is known about the impact of many years of mindfulness practice on the body's response to stress. **Robb et al. [*Complementary Medicine Research*]** conducted a pilot study that measured salivary cortisol levels in a group of long-term mindfulness practitioners. Salivary cortisol is a biological measure that is highly reactive to stress. The researchers predicted that morning cortisol levels would be lowest for meditators with the most meditative experience.

Salivary cortisol levels typically peak during the first hour after waking up, and then decline throughout the rest of the day. Morning cortisol levels tend to be higher when under acute stress, and tend to be lower in states of exhaustion and burnout following long-term stress.

The authors recruited 83 certified Mindfulness-Based Stress Reduction (MBSR) teachers (73% female; 96% Caucasian; average age = 58; 92% with graduate degrees) to participate in the study. The participants completed an online questionnaire assessing a variety of health and lifestyle variables, perceived stress, and the extent of their meditation practice. They were then asked to produce a saliva sample upon first waking up, followed by 3 additional samples collected at 15-minute intervals. The total amount of cortisol produced during the first 45 minutes after awakening was then estimated using area under the curve (AUC) calculations.

The results showed that participants in the upper quartile of meditative experience (>26 years) had significantly higher (48%) total estimated morning cortisol amounts than those in the lowest (<10 years) quartile. The relationship between years of meditative experience and total morning cortisol remained significant when meditation experience was treated as a continuous variable.

In a closer examination of the data, this difference between participants in the upper and lower quartiles of meditative experience only remained significant when comparing the early risers (those who woke up before 6:30 AM). Highest-quartile early-risers' cortisol levels were 202% higher than their lowest-quartile early-riser compatriots. In comparison, the highest-quartile late-risers' cortisol levels were 40% lower than their lowest-quartile late-rising compatriots. This interaction effect between years of meditative experience and the hour participants woke up on cortisol levels fell short of statistical significance. Cortisol awakening response levels were unrelated to self-reported levels of perceived stress.

These results show that mindfulness meditators with the greatest number of practice years who wake up early have the highest total morning cortisol levels, thus contradicting the researchers' expectations. Still, the meaning of these results is not clear. Cortisol levels are notoriously affected by many variables. It is not always evident whether higher cortisol levels indicate being more highly stressed, being less burned out, having a better adaptive response to stress, being more prepared to meet the demands of the day, or some other factor.

The researchers conclude that the results are intriguing enough to warrant further investigation. The study is limited by only measuring the cortisol awakening response and not looking at the slope of cortisol levels throughout the day. A complete daily slope might differentiate whether higher morning levels are due to increased stress or decreased burnout. Cortisol samples were obtained at home by participants which increases the possibility of collection error.

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TRIALS

Research studies newly funded by the National Institutes of Health (APR 2019)

Pennsylvania State University (N. Raja-Khan, PI). **RCT of a six-month mindfulness-based intervention for type 2 diabetes**. NIH/NIDDKD project #1R01DK119379-01. [link]

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Highlights

A summary of select studies from the issue, providing a snapshot of some of the latest research

There are certain similarities between the increased awareness associated with the practice of mindfulness and the expanded consciousness associated with the use of psychedelic substances. Both are capable of promoting states of self-transcendence in which the boundary between one's self and the world is erased, leading to a boundless sense of connection with the universe.

Smigielski et al. [*Neuroimage*] experimentally tested the effects of psilocybin, a psychedelic mushroom plant derivative, on self-reported, neurological, and behavioral outcomes among experienced meditators attending a meditation retreat.

The researchers randomly assigned 38 experienced meditators (average meditation experience = 5,000 hours; 61% male; average age = 52 years) on a five-day Zen meditation retreat to a psilocybin or placebo control condition. On the morning of the fourth retreat day, participants were administered either psilocybin (315 µgs/kg) or a placebo (lactose), and continued on with the regular retreat schedule. The research participants and assessors were blinded to the study group assignment. Six hours after psilocybin or placebo administration, participants completed a questionnaire measuring psychological factors such as "oceanic self-boundlessness," "dread of ego dissolution," visual and auditory hallucinations, synesthesia, and "vigilance reduction."

On the day before and after the retreat, participants underwent brain imaging (fMRI) to measure functional connectivity in the Default Mode Network (DMN) while resting, while engaging in focused attention meditation, and while engaging in open awareness meditation. The DMN is a network of brain regions that operates collectively when a person is simply resting and "doing nothing." DMN activity has been implicated in self-referential thinking, maintaining a unitary sense of identity, and maintaining the self-other boundary. Functional connectivity is a measure of the degree to which different brain regions are operationally integrated and display similar patterns of activation. Four months after the retreat, participants completed a self-report measure of changes in attitudes towards self and the world, as well as changes in mood, social functioning, behavior, and spirituality.

The fMRI results showed that the psilocybin group displayed a significantly greater decrease in functional connectivity between two parts of the DMN—the medial prefrontal cortex (mPFC) and the posterior cingulate cortex (PCC)—from pre- to post-test while engaging in open awareness meditation than did the placebo group. Greater decreases in functional connectivity between these brain structures were strongly associated with more profound experiences of oceanic self-boundlessness during drug administration ($r = -.60$).

Four months later, the psilocybin group reported significantly more positive changes in attitude, mood, and behavior (2.58 points on a 6-point global positive effects scale) than did controls (0.65 points). These persisting positive effects correlated with the magnitude of oceanic self-boundlessness experienced during drug administration ($r = .66$). Positive changes in attitude, mood, social functioning, behavior, and spirituality were associated with pre-to-post increases in connectivity between the mPFC and PCC while at rest, as well as with decreases between the mPFC and the right angular gyrus during focused attention. There were no adverse effects reported in either group.

This study shows that experienced meditators' psilocybin-induced self-transcendent experiences are associated with a persistent improvement in their psychological sense of well-being. These self-transcendent experiences are also associated with

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functional changes in the brain which point to the DMN's critical role in both self-reference and self-transcendence. The study is limited by its small sample size. The researchers caution that the results may only apply to experienced meditators, a cohort that has engaged in extensive mental training. The study did not track the persistence of DMN functional connectivity changes in the follow-up period.

Newly diagnosed breast cancer patients often experience significant psychological distress including symptoms of depression, sleep disturbance, and fatigue. They can also exhibit stress-induced immune system compromises that have the potential to accelerate tumor growth and metastasis. Interventions that restore psycho-immunological balance may also help improve cancer treatment outcomes.

Janusek et al. [*Brain, Behavior, and Immunity*] tested the effect of Mindfulness-Based Stress Reduction (MBSR) on psychological and immunological functioning in newly diagnosed breast cancer patients in an experimental trial.

The researchers randomly assigned 164 women (average age = 55 years; 77% Caucasian) recently diagnosed with early stage breast cancer who had undergone surgery to either a standard MBSR or an active control condition. The active control consisted of eight 2.5 hour group sessions providing information on breast cancer, cancer treatment, communication with health providers, and other health-related topics. Attendance in both programs was fairly good, with 68% of MBSR and 78% of control participants attending at least 7 of the group sessions. Each participant's psychological status was assessed pre-intervention, mid-intervention, post-intervention, and at 1- and 6-month follow-ups for perceived stress, depression, sleep quality, fatigue, and mindfulness (Five Facet Mindfulness Questionnaire).

The researchers also measured natural killer cell anti-tumor activity (NKCA), monocyte production of Interleukin-6 (IL-6) and Interferon-gamma (INF-ɣ), and the amount of IL-6 and Tumor Necrosis Factor-alpha (TNF-α) present in blood plasma. NKCA prevents tumor growth and metastasis, and is thus associated with longer cancer-free periods. NK cells produce INF-ɣ, an anti-tumor cytokine which is a key immune system activator. IL-6 and TNF-α are pro-inflammatory cytokines that promote tumor progression and aggressiveness.

The results showed that the MBSR group had significantly greater increases in two protective immunological factors (NKCA and INF-ɣ) and significantly lower levels of two pro-inflammatory factors (IL-6 production and TNF-α plasma levels) than the control group. These differences remained significant at the 6-month follow-up. For example, MBSR INF-ɣ levels increased by 2,547 pg/ml from pretesting to 6-month follow-up, while control group INF-ɣ levels increased 973 pg/ml. Similarly, MBSR NKCA increased by 30 lytic units over the same time period, while the control group increased by 0.17 lytic units.

The MBSR group showed significantly more rapid improvements in perceived stress, fatigue, and sleep disturbance. Correspondingly, mindfulness was associated with significantly lower levels of stress, fatigue, and sleep disturbance. Greater improvements in sleep disturbance and fatigue were in turn significantly associated with faster increases in NKCA.

This study shows that MBSR is more useful in improving psychological and immune function in newly diagnosed breast cancer patients than an active control focused on cancer survivor education. It is possible that this experimental intervention may lead to longer cancer-free periods for these patients, although this end outcome was not evaluated. The study also suggests a crucial link between improved sleep and immune system recovery. The study is important because it focuses on recently diagnosed patients who are at a vulnerable point when psychological distress has a significant impact on immune function and the possible progression of disease.

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Articles reviewing content areas of mindfulness or conducting meta-analyses of published research

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Ghielen, I., Rutten, S., Boeschoten, R. E.,...Cuijpers, P. (2019). **The effects of cognitive behavioral and mindfulness-based therapies on psychological distress in patients with multiple sclerosis, Parkinson's disease and Huntington's disease: Two meta-analyses**. *Journal of Psychosomatic Research.* [link]

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Wharton, E., Kanas, N. (2019). **MBSR for the treatment of anxiety disorders**. *International Journal of Group Psychotherapy.* [link]

TRIALS

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Medical University of South Carolina (B. Froeliger, PI). **Neural mechanisms mediating appetitive regulation and smoking in nicotine addiction**. NIH/NIDA project #1R01DA048094-01. [link]

University of California, Irvine (D. Garfin, PI). **Mindfulness intervention to address PTSD in trauma exposed homeless women**. NIH/NIMHHD project #1K01MD013910-01. [link]

Yale University (K Garrison, PI). **Smartband/Smartphone-based automatic smoking detection and real time mindfulness intervention**. NIH/NCCIH project #1R34AT010365-01. [link]

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HIGHLIGHTS

A summary of select studies from the issue, providing a snapshot of some of the latest research

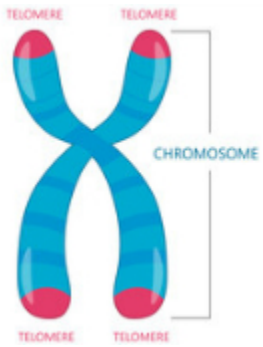
Telomeres are repetitive nucleotide sequences at the end of chromosomes that protect coding regions of DNA from deteriorating during cell division. Telomeres shorten not only as we age, but also when we are under stress. Shorter telomeres are linked to an increased incidence of age-related diseases such as cardiovascular disease, and to an increased risk of death. The enzyme telomerase lengthens telomeres through the addition of nucleotide repeats.

Preliminary studies show that meditation can have a protective effect on telomeres, most likely by increasing telomerase activity. Specific types of meditation may be more effective than others in maintaining telomere length. **Nuygen et al. [*Psychoneuroimmunology*]** tested whether specific types of meditation practice have a protective effect on telomere length.

The researchers randomly assigned recruits to mindfulness meditation (MM), loving-kindness meditation (LKM), or a wait-list control. Their final sample (excluding dropouts and participants with inadequate DNA samples) consisted of 142 meditation-naive recruits (average age = 49; 70% female; 81% Caucasian). MM and LKM participants attended six, hour-long, group meditation training workshops held once per week. They also received 20-minute audio-recorded guided meditations to assist in daily home practice.

MM training focused on developing open, non-judgmental attention towards breath, bodily sensations, thoughts, and feelings, as well as choiceless awareness. LKM training focused on cultivating warm feelings towards oneself, a loved one, an acquaintance, a difficult person, and all beings. Two weeks prior to the workshops (and three weeks after) participants donated a blood sample that was used to assess white blood cell (monocyte and lymphocyte) telomere length. Participant moods and extent of meditation practice were assessed by daily diary.

All groups showed a decrease in telomere length over the course of the study. The mean decrease in telomere length was significantly less for LKM (-0.03) than for the control group (-0.08). The MM group decrease (-0.06) was midway between the other two groups, and not significantly different from either. The average telomere length decrease for all participants combined was equivalent to a loss of 115 DNA base pairs, which is larger than one might expect over a 12-week period. Other studies suggest white blood cell telomeres shorten by an average of 15-50 base pairs per year. Changes in telomere length were unrelated to participants' moods or home practice.



This study provides evidence that, in a sample of middle-aged adults, only loving-kindness meditation significantly decreased the degree of telomere shortening over time compared to a control group. The positive emotions associated with loving-kindness meditation may have a protective function in reducing cellular aging and maintaining wellness. Other factors, however, cannot be ruled out. The fact that this effect was unrelated to mood or home meditation practice makes it hard to specify what it is about LKM training that helped.

The study could not rule out changes in the relative proportion of different white blood cell types present in the blood samples over time that could potentially lead to spurious measures of telomere change. The unexpectedly large magnitude of overall telomere shortening over a relatively brief time span also raises the possibility of unknown collection or assay discrepancies between this study and prior studies.

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Although most cigarette smokers want to quit, only 5% succeed in doing so each year. One reason for this low success rate is that smoking-related cues stimulate strong urges to smoke. Cues include observing someone else smoking, or engaging in activities previously associated with smoking (e.g., work breaks, meals, a cup of coffee, sex). Finding ways to reduce cue-induced urges may help more people quit.

Research shows that a brain area called the posterior cingulate cortex (PCC) becomes activated whenever cigarette smokers are exposed to smoking-related cues. Research also indicates that mindfulness meditation as an intervention reduces PCC activity. **Janes et al. [*Neuropsychopharmacology*]** tested whether a smartphone mindfulness app reduced smokers' PCC reactivity to smoking-related cues and their smoking behavior.

The researchers recruited 83 adult smokers who were interested in quitting, 67 of whom completed the study and were included in the final data analysis (average age = 44; 67% female; 91% Caucasian). PCC-reactivity to smoking cues was assessed by functional magnetic resonance imaging (fMRI) and participants were then randomly assigned to either mindfulness training or a control condition. Both conditions used smartphone apps for 4 weeks to help quit smoking. Participants' PCC reactivity to smoking-related cues was re-assessed via fMRI after the intervention.

The mindfulness app consisted of 22 modules that offered daily training videos and on-demand exercises to teach the core elements of mindfulness. The app also helped participants identity triggers, monitor smoking habits, increase awareness of urges, and use mindfulness as a coping mechanism. The control group used the National Cancer Institute's QuitGuide App to help monitor motivation and triggers, as well as offer inspirational messages and tips for dealing with cravings and moods without mindfulness training.

PCC reactivity was measured by having participants view smoking-related and neutral images while undergoing fMRI scanning. The fMRI scans were analyzed for differences in average PCC activation between smoking-related and neutral images.

Results showed that the mindfulness training group decreased average cigarette use by 11 cigarettes (d = 2.5) per day, and the control group decreased average use by 9 cigarettes (d = 1.28) per day. There was no significant difference in the amount of between-group change on this measure. The mindfulness app group showed a significant correlation (r=.49) between cigarette reduction and the number of app modules completed, but the control group (r=.20) did not.

Both groups showed high levels of PCC reactivity to smoking-related cues on the fMRI scans at baseline. There were no significant group differences in PCC reactivity change scores over time. Within the mindfulness app group, there was a significant association between decreased PCC cue-related activation (r=.39) and decreased smoking. There was no such association between changes in PCC activation and smoking in the control group (r=.08).

On further examination, the correlation between PCC change scores and smoking change was significant for females in the mindfulness app group (r=.49) but not males (r=.08). Not all participants showed heightened PCC activation in response to smoking-related cues. Mindfulness participants who showed the greatest reduction in cue-related PCC activity also showed the greatest reduction in smoking (d=0.79), yet there was no such association in the control group. At the end of the study, participants in the mindfulness app group were more likely to recommend their app to a friend (d=1.5) as compared to those in the control group.

This study suggests that a mindfulness app can reduce smoking through decreased cue sensitivity and decreased PCC reactivity. However, this effect was dependent on the number of app modules completed, and only significant for female smokers. While the National Cancer Institute's QuitGuide App also reduced smoking, its effect wasn't associated with changes in PCC reactivity. Some smokers may benefit more from a mindfulness app than others; specifically, women who show strong PCC activation in response to smoking-related cues.

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Interventions

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Carvalho, A. F., Fernandes, B. S., Brunoni, A. R. (2019). **MBSR for fibromyalgia: A step closer to precision psychiatry?** *Brain, Behavior, and Immunity.* [link]

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HIGHLIGHTS

A summary of select studies from the issue, providing a snapshot of some of the latest research

Emergency medical dispatchers (EMDs) face stressful job demands. In addition to dispatching emergency medical personnel, EMDs provide emergency advice over the phone and may be the last person to speak to an injured party alive. They are also subject to rotating shifts and mandatory overtime.

While EMDs might benefit from stress reduction interventions, the nature of their workplaces makes it difficult to implement time-intensive group-based trainings. **Lily et al. [*Occupational and Environmental Medicine]*** conducted a randomized controlled study to discover whether an on-line mindfulness-based intervention could successfully reduce stress among EMDs.

The researchers randomly assigned 323 North American EMDs (82% female; 90% Caucasian; modal age = 25-55 years) to either a mindfulness-based intervention or a wait list control. The mindfulness program (Destress 9-1-1) was delivered once per week for seven weeks in 20-30 minute online modules. Each module included a brief video introduction to the theme of the week, an audio-guided mindfulness exercise, and suggestions for mindfulness activities to engage in during the week. The program was modeled after mindfulness-based stress reduction (MBSR), but required less time in terms of coursework, meditation length, and suggested weekly practice. Participants were assessed on measures of stress and mindfulness (using the Mindful Attention Awareness Scale, or MAAS) at baseline, post-intervention, and 3-month follow-up.

Attrition was fairly high with 32% of mindfulness assignees and 18% of controls failing to complete the post-intervention assessment, and 47% of mindfulness assignees and 38% of controls failing to complete the 3-month follow-up. Of those assigned to the mindfulness intervention, 25% completed 0 modules, 20% completed 1-5 modules, and 55% completed 6-7 modules over the seven weeks. Mindfulness assignees engaged in practice an average of twice per week. The relatively high attrition rate may reflect the fact that many EMDs weren't permitted to participate in the intervention during work hours.

Results showed the mindfulness group displayed a significantly greater reduction in stress than the control group. While stress scores in the mindfulness group decreased by an average of 8 points from baseline to post-intervention (Cohen's d = 0.34), control group scores increased by an average of 2 points. At the 3-month follow-up, the mindfulness group retained its improvement and the control group showed no change from baseline. There were no significant post-intervention group differences in mindfulness.

While there were no significant differences between the groups in post-intervention mindfulness, baseline levels of mindfulness for the total sample were associated with lower stress (r=-.71). Individuals who showed the largest increases in mindfulness from baseline to post-intervention (regardless of group) showed the greatest decreases in stress (r=-.53).

The study shows decreased levels of stress in EMDs who were assigned to an on-line mindfulness intervention. This decrease in stress occurred in the absence of measurable changes in mindfulness. Nevertheless, there were associations between higher baseline levels of mindfulness and increases in mindfulness over time and lower levels of stress. The study is limited by its relatively high attrition rate.

Overcoming irrational fears involves recognizing when stimuli previously associated with danger have ceased their association with that danger. This means "extinguishing" a learned connection between a stimulus and its previously feared negative consequences.

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Mindfulness can help with fear extinction by enabling individuals to approach previously feared stimuli with an attitude of non-reactive acceptance. **Sevinc et al. [*Biological Psychiatry*]** studied whether a mindfulness-based intervention affects the brain activity underlying the fear extinction process.

The researchers assigned 94 meditation-naive adults (average age = 32 years; 64% female) to either an 8-week mindfulness-based stress reduction (MBSR) program or an 8-week exercise-based stress management education program. Stress education consisted of 8 weekly 2 hour group sessions that included 40 minutes of light aerobic exercise and didactic presentations on coping with stress through exercise, nutrition, humor, and sleep hygiene. Two weeks before and after intervention, participants underwent a two-day classical fear conditioning and fear extinction paradigm while being monitored by brain imaging (fMRI).

In the fear conditioning paradigm, participants were presented with images of rooms with either red, blue, or yellow lights. An annoying electric shock immediately followed the images of the rooms with the red or blue lights, but not the yellow lights. Fear was considered "conditioned" to the red or blue lights when exposure to those images led to an increase in skin conductance. After the conditioned skin conductance response (SCR) was acquired, participants were then repeatedly exposed to the image with the red light without a consequent shock in order to extinguish the skin conductance response to that image while maintaining the conditioned skin conductance response to the blue light.

The next day, participant SCRs to the images were reassessed in a "recall" session. The researchers were testing if the SCR to the red light remained extinguished while those to the blue light remained intact. The researchers were interested in the role of the hippocampus during these trials and how it functionally related to other brain regions. The hippocampus is a brain region that is critically involved in the contextual encoding and retrieval of fear extinction memories. Participants were also administered measures of perceived stress, anxiety, emotional regulation difficulties, and mindfulness before and after the intervention.

The results showed that both MBSR (Cohen's d=0.56) and stress education (d=0.57) significantly reduced perceived stress. There was also a marginal advantage (p=.05; partial η^2=0.63) for MBSR for anxiety reduction.

Significant relationships were found between a number of brain structures and the retention of extinction learning. Higher baseline hippocampal activity was associated with better retention of extinction learning (r=.79). While there was no significant difference in extinction retention between groups, only MBSR participants significantly improved their extinction retention at post-intervention.

MBSR participants also showed significantly increased supramarginal gyrus activity while recalling extinguished stimuli, and this increased activity was positively correlated with MBSR home practice (r=.38). MBSR participants also displayed increased functional connectivity between the left hippocampus and the right supramarginal gyrus, while stress education participants did not. The supramarginal gyrus is part of the brain's memory retrieval network.

MBSR resulted in increased functional coupling between the hippocampus and the portion of the sensory cortex associated with the hand that had been administered the shocks. Post-MBSR increases in hippocampal gray matter were associated with increased connectivity between the hippocampus and the left dorsolateral prefrontal and retrosplenial cortices, two regions previously implicated in the recall of fear extinction.

The results show that while MBSR and stress education both reduce stress, MBSR has unique effects on how the brain processes fear extinction. MBSR induces changes in hippocampal structure and functional connectivity that enhance the retention of fear extinction. These changes highlight one way in which mindfulness helps to regulate emotions and reduce stress and anxiety.

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Highlights

A summary of select studies from the issue, providing a snapshot of some of the latest research

Many women attending residential substance use disorder treatment fail to successfully complete their program. These women often have complex social histories, multiple psychiatric and medical diagnoses, and histories of incarceration. They may also have trouble adjusting to the programs due to conflicts with staff and peers, substance withdrawal and cravings, and difficulty abiding by program rules and structure. Mindfulness may help women negotiate these difficulties by reducing their automatic reactivity to cravings, interpersonal conflicts, and other emotional triggers.

Black et al. [*Behaviour Research and Therapy*] studied whether a mindfulness-based intervention specifically designed for women in residential substance use disorder treatment settings could reduce the likelihood of prematurely leaving the program in unimproved condition.

The researchers randomly assigned 200 women in residential substance use disorder treatment (average age = 33 years; 58% Hispanic; 62% with incarceration history; 76% with amphetamine/methamphetamine abuse) to either the Moment-by-Moment Women's Recovery (MMWR) program or a time-matched psycho-educational control. Both were add-on interventions with participants continuing to receive all of the services ordinarily provided by the residential treatment program. In both of the interventions, the participants met twice weekly for 80-minute group sessions over the course of six weeks.

The MMWR program was based on Mindfulness-Based Stress Reduction, but specifically designed for ethnoracially diverse women in residential substance use treatment. The program addressed the role of mindfulness in dealing with cravings and relapse, trauma, parenting, conflicts with staff and peers, and other issues likely to arise in treatment. The psycho-educational control consisted of didactic material regarding brain structure, function, and biochemical changes pertaining to substance abuse. Attendance in both groups averaged 9 out of 12 classes, and participants rated both groups highly in terms of satisfaction.

Upon patient discharge, residential program clinical staff rated participants as to whether they were still in residence, had successfully completed the treatment, had dropped out of treatment but were clinically improved, or had dropped out of treatment and were clinically unimproved. The follow period was 150 days after the start of the study intervention. The researchers were interested in whether MMWR could reduce the likelihood of being in the "non-completing and unimproved" category. They also assessed participants at baseline and post-intervention on measures of mindfulness (using the Five Facet Mindfulness Questionnaire), perceived stress, distress tolerance, emotional regulation, subjective distress, mood, and substance cravings.

The results showed that the risk of non-completion without improvement was lower for the MMWR group than controls (Hazard Ratio=0.46; medium-to-large effect). There were positive trends for both groups to improve on various psychological measures over time, but between-group differences were not significant. Notably, there were significant correlations between class attendance and various psychological measures for the MMWR group but not the control group. In particular, only the MMWR group had large and significant correlations between days of class attendance and mindfulness (r=.61), distress tolerance (r=.55), and positive mood scores (r=.52).

The study shows that MMWR participants are less likely to leave residential treatment without satisfactory improvement. It supports the utility of adjunctive MMWR for residential drug treatment programs that provide services to ethnoracially diverse women. Improvement on a number of psychological variables was dose dependent on MMWR class attendance, meaning the more classes attended the greater the improvement. Study shortcomings include the possibility that the six-week MBSR intervention may have been shorter than optimal length, and the outcome judges were not blind to condition.

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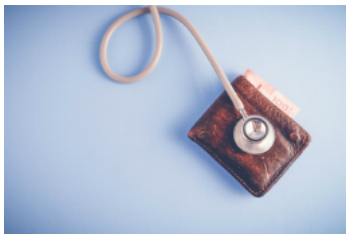
Fibromyalgia is a chronic disorder affecting approximately 10,000,000 Americans. The disorder presents with symptoms of widespread musculoskeletal pain, fatigue, and mood, sleep, and cognitive difficulties. The cause of fibromyalgia is unknown, and its treatment is largely palliative, consisting of medication to reduce pain and inflammation, graded physical exercise and/or cognitive-behavioral therapy. The disorder incurs a wide variety of costs including high rates of unemployment, sick leave, disability claims, and direct medical care utilization.

Perez-Aranda et al. [*Journal of Clinical Medicine*] compared the cost-effectiveness and clinical utility of adjunctive Mindfulness-Based Stress Reduction (MBSR) to a previously validated comparator intervention and treatment-as-usual in the treatment of fibromyalgia.

The researchers randomly assigned 225 fibromyalgia patients recruited from a Spanish hospital to one of three treatment interventions: 1) MBSR + treatment-as-usual, 2) FibroQoL + treatment-as-usual, and 3) treatment-as-usual alone. MBSR was delivered using the standard 8-week group protocol with minimal adaptations. FibroQoL is a fibromyalgia intervention with previously demonstrated superiority to treatment-as-usual. It consists of 8 weekly 2-hour group sessions that include fibromyalgia psycho-education, relaxation, and self-hypnosis to help patients control pain and visualize a future pain-free life. Treatment-as-usual involved prescription medications for pain, inflammation, depression, and anxiety, along with recommendations for daily exercise.

Cost-utility data was only available for a final sample of 204 participants (98% female; average age = 53 years). Analyses were performed separately for the full intention-to-treat sample and for 107 patients who attended at least 6 of the 8 intervention sessions and their 12-month follow-up appointments.

Self-ratings of quality-of-life were obtained at baseline and 12 months using the EuroQol EQ-5D to assess disease impingement on mobility, self-care, and activities of daily living, as well as pain, anxiety, and depression. A EuroQol EQ-5D score of "0" indicates a quality of life "as bad as death" and a score of "1.0" indicates "perfect health." Direct and indirect costs of fibromyalgia treatment were calculated based on patient medication prescription receipts, patient medication logs, and patient reports of primary care and specialist visits, hospital stays, diagnostic procedures, and sick leave/disability over the past 12 months. MBSR and FibroQoL costs were included in the analyses.



At the 12-month follow-up, average direct and indirect healthcare costs were significantly lower for MBSR ($2,133 USD) than FibroQoL ($2,761 USD) or treatment-as-usual ($3,464 USD) participants. MBSR costs were significantly lower than those of the comparator and control groups primarily due to lower primary care costs and fewer lost workdays. At 12 months, MBSR participants had the best average quality of life scores (0.57), followed by FibroQoL participants (0.53) and treatment-as-usual participants (0.45). These group differences achieved overall significance.

A cost-utility analysis showed that MBSR was both significantly cheaper and significantly more effective than treatment-as-usual. MBSR was also cheaper than FibroQoL due to fewer sick days, but there was no significant difference between the two in terms of incremental improvement in quality of life.

The results support the cost-utility of add-on MBSR treatment of fibromyalgia compared to an active comparator or treatment-as-usual alone. MBSR led to a savings of $628 per patient compared to the active comparator, and $1331 per patient compared to treatment-as-usual alone. A significant amount of missing healthcare and follow-up data made the sample size smaller than originally intended. The study's limitations include reduced sample size due to follow-up loss and direct and indirect costs established by retrospective participant recall rather than healthcare records.

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Bernstein, A., Vago, D. R., Barnhofer, T. (2019). **Understanding mindfulness, one moment at a time: An introduction to the special issue**. *Curr Opin Psychol.* [link]

Cass, A. R., Abara, N. O., Bueso, F. J.,...Linebarger, C. A. (2019**). Is MBCT effective in the treatment of anxiety?** *Evidence-Based Practice.* [link]

Cooley, C. (2019). **Escaping the prison of mind: Meditation as violence prevention for the incarcerated**. *Health Promotion Practice.* [link]

Cousineau, T. M., Hobbs, L. M., Arthur, K. C. (2019). **The role of compassion and mindfulness in building parental resilience when caring for children with chronic conditions: A conceptual model**. *Frontiers in Psychology.* [link]

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Lyzwinski, L. N., Edirippulige, S., Caffery, L., Bambling, M. (2019). **Mindful eating mobile health apps: Review and appraisal**. *JMIR Mental Health*. [link]

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Sabe, M., Sentissi, O., Kaiser, S. (2019). **Meditation-based mind-body therapies for negative symptoms of schizophrenia: Systematic review of RCTs and meta-analysis**. *Schizophrenia Research.* [link]

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Zeidan, F., Baumgartner, J. N., Coghill, R. C. (2019). **The neural mechanisms of mindfulness-based pain relief: A functional magnetic resonance imaging-based review and primer**. *Pain Reports*. [link]

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Drexel University (E. Forman, PI). **Mindfulness and acceptance-based intervention for obesity**. NIH/NIDDKD project #1R01DK119658-01A1. [link]

ICAHN Mount Sinai (R. Goldstein, PI). **Neuroimaging response inhibition and salience attribution changes during mindfulness-based treatment of human heroin addiction**. NIH/NCCIH project #1R01AT010627-01. [link]

University of Alabama (C. Chapman-Lambert, PI). **Feasibility of the MBSR intervention for Black women living with HIV**. NIH/NCCIH project # 1K23AT010567-01. [link]

University of California, San Diego (F. Zeidan, PI). **The role of endogenous opioids in mindfulness-based chronic pain relief**. NIH/NCCIH project #1R21AT010352-01. [link]

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Highlights

A summary of select studies from the issue, providing a snapshot of some of the latest research

Total hip and knee replacements are among the highest volume elective surgical procedures performed today. The vast majority of joint replacement patients report significant post-operative reductions in pain and disability. Nonetheless, about 15% of patients report poor surgical outcomes marked by continuing pain, disability, and dissatisfaction. Pre-surgical levels of distress related to depression and anxiety are the best predictors of which patients are likely to fare poorly after surgery.

Medical professionals are interested in psychological interventions that could improve post-surgical outcomes. **Dowsey et al. [*Complementary Therapies in Medicine*]** tested whether pre-surgical Mindfulness-Based Stress Reduction (MBSR) could improve physical and psychological wellbeing outcomes after joint replacement surgery.

The researchers randomly assigned 127 Australian arthritis patients (average age = 65 years; female = 72%) with moderate-to-severe psychological distress (based on a psychological assessment cut-off score) who were surgically approved for knee or hip replacement to either surgery and post-operative care as usual, or a standard 8-week MBSR program followed by surgery and post-operative care as usual. Out of this sample, 45 MBSR assignees and 56 treatment-as-usual assignees eventually underwent surgery. Surgical patients were seen by their treating surgeons during 12-month surgical follow-up appointments.

Patients completed a self-report osteoarthritis measure that included subscales assessing pain, stiffness, and functional disability, as well as a total overall score that can serve as a single measure of global symptom severity. They also completed measures of general physical and psychological wellbeing, pain-management self-efficacy, and mindfulness (using the Five Facet Mindfulness Questionnaire). Assessments were completed at baseline, 3 months, and 12 months.

MBSR participants reported significantly less pain at 12 months than controls. They also reported significantly greater improvement on the global measure of overall osteoarthritis pain, stiffness, and functional disability. A significantly larger proportion of MBSR participants (91%) were rated as having made clinically meaningful improvements (≥10% improvement) in pain than controls (75%). Additionally, a significantly greater proportion of MBSR participants (91%) showed clinically meaningful improvement (≥9 % improvement) in functional disability than did controls (66%). In an unexpected finding a greater proportion of MBSR patients (31%) than control patients (10%) never proceeded to surgery at all, many of them citing symptom improvement as their reason for not electing surgery.

The study shows that MBSR improves pain and functional outcomes for psychologically distressed arthritis patients undergoing joint replacement surgery. The study is limited by the loss of follow-up information on patients who did not proceed with surgery, and the absence of a time-and-attention placebo control. Moreover, recruitment for the study proved difficult, with many patients declining to participate due to lack of interest, poor health, or logistical concerns.

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The stress response is associated with brain activity in the amygdala and the prefrontal cortex. The amygdala initiates the fight, flight, or freeze response to fear-inducing stimuli, while the prefrontal cortex helps modulate this response. A higher degree of connectivity between these brain regions is thought to enhance emotional regulation. These conclusions are based on research with adults. Little is known about the neural basis for children's responses to stress, however, and whether it can be beneficially modified by mindfulness-based interventions.

Bauer et al. [*Behavioral Neuroscience*] tested whether mindfulness training reduces stress levels in middle school children, and if so, whether it is done by inducing changes in the amygdala and its connectivity to a region of the prefrontal cortex. This is the first study investigating the effects of a mindfulness-based intervention on children's brain activity.

All 6th graders in a Boston charter school were randomly assigned to an 8-week mindfulness training program or an 8-week computer coding training program. The researchers requested the 6th graders' families to permit their children to participate in the functional magnetic imaging (fMRI) portion of the study. Forty children received permission (average age = 12 years; 70% female; 53% Caucasian; Average WASI IQ = 98), and 33 of their fMRI protocols were usable.

Mindfulness and computer coding groups met four times a week for 45 minutes during the last class of the school day. Each mindfulness session included 15 minutes of mindfulness exercises involving focused attention on the present moment and related didactic instruction and group discussion. Exercises included focused breath meditations, attention to the senses, open monitoring, and practice in noticing thoughts. Control group sessions involved teaching the SCRATCH programming language using didactic instruction, collaborative learning, and group discussion. The SCRATCH program was developed by MIT Media Labs and is used around the world to introduce children to computer programming. All children completed self-report measures of perceived stress and positive and negative affect at baseline and post-intervention.

The children participating in the fMRI portion of the study were shown images of happy, fearful, and neutral facial expressions while undergoing scanning. They were scanned at baseline and post-intervention. Scans were analyzed for right amygdala reactivity to fearful facial expressions and amygdala functional connectivity with the ventromedial prefrontal cortex.

At baseline, stress level was associated with greater negative affect (r=.47) and less positive affect (r=-.37). As hypothesized by the researchers, baseline stress level (r=.41) and negative affect (r=.45) were significantly correlated with higher amygdala activation to fearful facial expressions.

At post-intervention, mindfulness participants had significantly greater reductions in stress levels (Cohen's d=0.56) and a trend towards reduced negative affect (d=0.36) compared to controls. Right amygdala activation in response to fearful facial expressions decreased to a significantly greater degree (d=0.48) for mindfulness participants than controls. Stress change scores and amygdala activity change scores (r=.31) were significantly correlated in the mindfulness group only. Functional connectivity between the amygdala and ventromedial prefrontal cortex while viewing fearful facial expressions significantly declined over time for the control group but not for the mindfulness group (Cohen's f^2=.27). At post-intervention, amygdala-prefrontal cortex functional connectivity was significantly greater for mindfulness participants than controls.

The study demonstrates the efficacy of a school-based mindfulness program in reducing middle-school children's stress levels and amygdala activation to fear-related stimuli. This is the first mindfulness intervention study with children to use a brain-based marker to assess outcome. Mindfulness programs that reduce childhood stress may have an important role to play in reducing the incidence of mental health problems in adolescence and adulthood.

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Alizadehgoradel, J., Imani, S., Nejati, V., Fathabadi, J. (2019). **Mindfulness-based substance abuse treatment (MBSAT) improves executive functions in adolescents with substance use disorders**. *Neurology, Psychiatry and Brain Research*. [link]

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Daubenmier, J., Epel, E. S., Moran, P. J.,...Mendes, W. B. (2019). **A RCT of a mindfulness-based weight loss intervention on cardiovascular reactivity to social-evaluative threat among adults with obesity**. *Mindfulness.* [link]

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Articles examining the correlates and mechanisms of mindfulness

Colaianne, B. A., Galla, B. M., Roeser, R. W. (2019). **Perceptions of mindful teaching are associated with longitudinal change in adolescents' mindfulness and compassion**. *International J Behavioral Development.* [link]

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Beer, O. W., Phillips, R., Stepney, L., Quinn, C. R. (2019). **The feasibility of mindfulness training to reduce stress among social workers: A conceptual paper**. *The British Journal of Social Work.* [link]

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Boston Medical Center (N. Morone, PI). **Group-based mindfulness for patients with chronic low back pain in teh primary care setting**. NIH/NCCIH project #1UG3AT010621-01. [link]

Kaiser Foundation Research Institute (A. Beck, PI). **Digital MBCT for perinatal depression**. NIH/NIMH project #1U19MH121738-01. [link]

New York University (D. Charytan, PI). **Pain, opioids, and ESRD risk reduction with mindfulness and buprenorphine**. NIH/NIDDKD project #1U01DK123814-01. [link]

University of Alabama (M. Mumba, PI). **Mindfulness and peer mentoring program to improve adherence to MAT for opioid use disorders**. NIH/NCCIH project #1R61AT010802-01. [link]

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Highlights

A summary of select studies from the issue, providing a snapshot of some of the latest research

Episodic and chronic migraines affect approximately one billion people worldwide. Symptoms including migraine aura, headache, nausea, and light sensitivity can significantly impair functioning at work, home, and in social situations. Existing behavioral treatments including biofeedback, relaxation and cognitive therapy, and pharmacological treatments have limited efficacy, but no treatment works for everyone.

Seng et al. [*Headache*] evaluated the efficacy of Mindfulness-Based Cognitive Therapy for Migraine (MBCT-M) compared to a control in reducing migraine-related disability.

The authors randomly assigned 60 migraine patients (average age=40 years; 82% Caucasian; 92% female; average headache days per month=16) to MBCT-M or a treatment-as-usual waitlist control. Thirty-six percent of MBCT-M participants and 62% of control participants came to the study on prescribed prophylactic migraine medication that was continued throughout the study. The groups did not differ on headache frequency, intensity, or disability at baseline. All participants kept a 30-day headache diary both before and after intervention. In addition, participants were assessed on two measures of headache disability: the Headache Disability Inventory (HDI) and Migraine Disability Assessment (MIDAS) at baseline, and 1, 2, and 4 months.

MBCT-M consisted of once weekly 75-minute individual training sessions for 8 weeks. Sessions included didactic training, cognitive exercises, mindfulness meditation practice and homework review. Most sessions were conducted in person; however, participants were allowed up to 3 telephone-delivered sessions when headaches prevented in-person attendance. The trainers were clinical psychology graduate students with 12 hours of MBCT training. The trainers received continuous supervision from licensed psychologists with expertise in headaches, and sessions were monitored to assure treatment fidelity. The control group continued whatever treatment they were getting prior to the onset of the study and were placed on an MBCT-M waiting list.

Mindfulness participants reported a significantly greater average decrease in disability (-14.3 points) on the HDI than did controls (-0.2 points). Group differences on the MIDAS trended toward significance in the same direction. Mindfulness participants reported a significantly greater decrease in average daily disability ratings in their headache diaries (-0.6 points) than did controls who reported an average increase (+0.3). The groups did not differ in headache frequency or intensity.

There were two adverse events in the MBCT-M group: one person re-experienced a traumatic memory, and another reported a dramatic increase in headache frequency and intensity. There were no adverse events in the control group. Two thirds of MBCT-M participants gave exit interviews, and of those, 86% stated they derived benefit from the treatment and would recommend it to others.

The results support the use of MBCT-M for migraine-related disability reduction. MBCT-M may be most useful when significant disability remains, and other treatments have achieved maximum benefit in decreasing headache frequency and intensity. The researchers hypothesize that MBCT-M works by changing one's relationship to headache-related pain and thinking rather than by reducing headache frequency and intensity. The study was limited by its failure to reach its recruitment goal, thereby lowering its power to detect study group differences. It also did not measure mindfulness or headache-related catastrophizing and rumination.

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The United States Veterans Health Administration (VHA) provides healthcare for 9 million military veterans across its 1,243 healthcare facilities. While half of all military veterans currently use or are interested in using complementary and integrative approaches to healthcare, little is known about their specific use of mindfulness meditation.

Goldberg et al. [*Mindfulness*] analyzed VHA survey data assessing veteran utilization of complementary and integrative healthcare techniques to help guide VHA decision-making about expanding mindfulness training opportunities within their healthcare system.

The VHA Survey asked 1,230 military veterans (85% male; 90% Caucasian; age range = 18-65+ years; modal age= 65+ years) who volunteered to complete the survey about their utilization of 22 different complementary and integrative health approaches. Veterans responded to questions about their use of the approaches, why they used them, their perceived effectiveness, and any barriers encountered in accessing them.

The results showed that 18% of the veteran sample had used mindfulness meditation in the past year. Utilization was highest for female and Hispanic veterans, divorced, widowed, or separated veterans, and for those 35-49 years of age. Mindfulness meditation use was lowest for veterans 65 years of age or older or married.

Mindfulness meditation was the third most frequently used of the 22 approaches, exceeded only by massage and chiropractic care. It was used significantly more often than 19 other approaches, including acupuncture, relaxation, movement therapy, reflexology, imagery, biofeedback, hypnosis, tai chi, and qi gong.

Of those who used mindfulness meditation, 28% reported using it every day, 18% a few times a week, 20% a few times a month, 11% once a month, and 22% a few times a year. Most veterans reported using it for purposes of stress reduction (73%), and/or symptoms of anxiety and depression (51%). Other reasons for use included PTSD, sleep problems, relationships issues, pain, and blood pressure control.

Respondents' average ratings for perceived effectiveness of mindfulness meditation was 3.2 on a 5-point scale, where "3" meant "somewhat helpful" and "4" meant "moderately helpful." These ratings did not differ significantly from the veteran ratings for the other complementary and integrative approaches.

Only 22% of the mindfulness meditators received mindfulness training through the VHA. The majority of veterans (59%) who received mindfulness training outside the VHA said they did not know whether or not the VHA offered it. It was unclear whether the VHA actually offered training that the veterans were unaware of, or whether the service was in fact not offered by their local VHA facility.

The results show that a significant number of veterans engage in mindfulness meditation, and that veteran utilization (18%) appears higher than an estimate of general population use (2.5%). Veteran meditators find mindfulness to be at least somewhat helpful, and most veterans (66%) who engage in it do so at least a few times a month.

These results lend support to VHA efforts to increase the availability of mindfulness training for veterans and to better publicize existing programs. The study is limited by a volunteer sample that may not be representative of the entire veteran population.

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Highlights

A summary of select studies from the issue, providing a snapshot of some of the latest research

Over 15 million Americans report having an opioid use disorder, and opioid-related deaths currently exceed 45,000 per year. As people become addicted to opioids, they become more emotionally responsive to drug-related cues and less emotionally responsive to cues signaling the availability of naturally occurring rewards. Naturally occurring rewards include those that come from relationships, accomplishments, and aesthetic appreciation.

It is possible to measure this shift in cue responsiveness using an electro-encephalogram (EEG). The Late Positive Potential (LPP) is an EEG wave that arises 400-800 milliseconds after a stimulus is presented. LPPs originate in the emotional processing centers of the brain and are down-regulated by the cognitive processing centers. Opiate users show larger LPPs to drug-related cues than to natural reward cues. Moreover, larger LPPs in response to drug-related cues are associated with stronger drug-related cravings and an increased likelihood of opioid misuse. Interventions that reduce the salience of drug-related cues and restore the salience of natural reward cues can help in opioid abuse recovery.

Garland et al. [*Science Advances*] conducted four experiments to assess whether Mindfulness-Oriented Recovery Enhancement (MORE) could help opioid users reduce their emotional responsiveness to drug-related images (e.g., pills and pill bottles) and restore their responsiveness to images of naturally occurring rewards (e.g., social affiliation, natural beauty, sports victories). Emotional responsiveness was assessed using LPP magnitudes and participants' subjective ratings of craving and positive affect.

The researchers randomly assigned three samples of middle-aged chronic prescription opioid users (total number of participants = 135; average opioid use duration = 10 years; 51% female; 84% Caucasian) to an 8-week Mindfulness-Oriented Recovery Enhancement (MORE) program or an 8-week support group control. The MORE program included training in mindfulness, savoring, and reappraisal skills to help shift attention from drug-related to natural reward cues and to interrupt the automaticity of the craving-drug misuse cycle. The support group was based on Rogerian non-directive empathic listening.

Participants were shown images on a computer screen of drug-related and neutral cues (experiments 1 and 2) or natural reward cues (experiments 3 and 4) before and after intervention. In experiments 1-3, EEGs were recorded while images were presented. EEGs were not recorded in experiment 4. Participants were first asked to view the images passively. Then, in experiments 1 and 2, they were asked to try to decrease their reactivity to drug-related cues using mindfulness (non-reactive metacognitive awareness of thoughts, feelings, and sensations). In experiments 3 and 4, participants were asked to try to increase their responsiveness to natural reward cues by savoring pleasant aspects of the presented images.

In experiment 1, MORE participants decreased LPP reactivity to drug-related cues to a significantly greater degree than controls ($\eta_{partial}^2$=0.12) under passive and mindful viewing conditions. Mindful viewing did not enhance this effect. In experiment 2, MORE participants were more effective in using mindfulness to down-regulate their LPPs to drug-related cues than were controls ($\eta_{partial}^2$=0.26). In experiment 3, MORE participants showed larger LPP increases to natural reward cues than controls ($\eta_{partial}^2$=0.16). In experiment 4, MORE participants reported a greater decrease in cravings in response to drug-related cues ($\eta_{partial}^2$=0.15) and greater positive affect in response to natural reward cues ($\eta_{partial}^2$=0.09) than controls. Decreased craving to drug cues was significantly associated with increased positive affect in response to natural reward cues (r=-.41) for all participants. There

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were significant correlations between the amount of time participants spent practicing mindfulness skills and decreased LPP opioid cue reactivity (r=-.73), the capacity to increase LPPs to natural reward cues through mindfulness (r-.63), and reduced cravings while savoring natural reward cues (r=-.49).

The results show that MORE decreases responsiveness to drug-related stimuli while restoring responsiveness to natural rewards. This shift in cue responsiveness reduces cravings and has the potential to decrease opioid misuse. The study's limitations include small sample sizes and a limited number of stimulus block presentations.

National health care spending for mental disorders in the United States exceeds $200 billion a year. Public health promotion programs that aim to reduce the incidence of mental disorders have the potential to reduce the direct and indirect social and health care costs involved in mental health care. A previous study showed that a mindfulness-based universal health promotion program called the Life Balance program prevented the emergence of new psychological symptoms in 1 of every 16 people treated at one year follow up. While these results were promising, this study did not address whether the program was cost-effective. **Müller et al. [*BMC Public Health*]** used insurance fund cost data and a measure of anxiety and depressive symptoms to analyze the program's cost-effectiveness over the course of a year.

The Life Balance program, a mindfulness-based health promotion program implemented in the German state of Baden-Wüerttemberg in 2014, trained 240 health coaches to deliver preventative mental health services at 80 different health care centers. The Life Balance program consisted of 6 weekly 90-minute group sessions drawing on strategies from Acceptance and Commitment Therapy, Dialectical Behavioral Therapy, and Compassion-Focused Therapy.

A total of 583 Life Balance participants who were associated with a statutorily mandated health insurance fund (average age = 50 years; 85% female) agreed to participate in the study. They were compared to a group of 583 controls drawn from the same insurance fund pool and matched on Hospital Anxiety and Depression Scale (HADS) scores, age, sex, health status, activity level, and prior health care costs. HADS scores were collected at baseline, post-intervention, and 6- and 12-month follow-up. Costs for medications, hospital stays, outpatient and rehabilitation visits, and lost work days were obtained from insurance fund records.

At baseline, the intervention and control groups did not differ on either HADS scores or health care costs. At 12-month follow-up, direct medical costs for Life Balance were $200.91 USD higher than for controls, half of which was due to the $103.52 developmental and operating costs of the intervention itself. Average HADS post-intervention scores were significantly lower for the intervention group (12.4) than controls (14.4). HADS scores of 11-15 indicate moderate levels of anxiety and depression. Considering direct healthcare costs as well as the cost of lost workdays, the intervention saved an average of $63.27 per participant relative to controls, translating into an incremental cost effectiveness ratio of -$32.19 for each one-point improvement on the HADS.

The results show that a mindfulness-based public health promotion program can lower symptoms of anxiety and depression in a general population in a cost-effective manner. There is a 95% chance that the cost effectiveness ratios found in the study fall within estimates of society's "willingness-to-pay" for degrees of improvement. This is the first cost effectiveness study of a mindfulness-based universal program. Universal programs have certain advantages over targeted programs in that they do not incur screening costs, require highly trained professionals, or stigmatize program users. The study's limitations include a lack of randomization and reliance on a single outcome measure.

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Highlights

A summary of select studies from the issue, providing a snapshot of some of the latest research

The human genome is the sum total of genes encoded in our DNA. Epigenetics is the study of how these genes get turned on and off to produce physiological effects. For example, epigenetic changes in the immune system play a central role in disease onset and aging. We may be able to alter our epigenetic activity through behavioral changes in exercise, diet, and stress reduction. While stress reduction practices have previously been found to down-regulate the immune system and inflammation, little is known about how such practices affect immune system epigenetics.

DNA strands are wrapped around protein complexes called histones. Genes can be turned on or off through methylation (the addition of carbon atoms bonded to four hydrogen atoms) of the histones adjacent to DNA gene segments. **Chaix et al. [*Brain, Behavior and Immunity*]** studied the effect of intensive mindfulness meditation on the methylation of immune cell (lymphocyte and monocyte) genes in experienced meditators after one day of intensive meditation.

The researchers recruited 19 experienced meditators (average age = 50; 58% female; 84% Caucasian) and 21 meditation-naïve controls (average age = 50; 57% female; 84% Caucasian). Meditators had a minimum of 3 years of meditating at least 30 minutes a day and attended at least 3 intensive meditation retreats. The meditators had their blood drawn before and after an 8-hour period of intensive mindfulness meditation similar to a Mindfulness-Based Stress Reduction all-day retreat. Controls had their blood drawn before and after 8 hours of leisure activities such as reading, playing computer games, watching documentaries, and walking. Blood draw immune (mononuclear) cell DNA was analyzed for methylation levels at over 400,000 separate DNA sites. After quality filtering, usable data were obtained for 17 meditators and 17 controls.

Meditators and controls had similar methylation levels at baseline. After the 8-hour intervention period, meditators had 61 DNA sites with significantly changed methylation levels, while DNA sites of leisure activity controls showed no significant changes. Of the 61 altered sites in the meditators, 57 sites showed increased methylation levels. Sites were mainly associated with genes regulating fatty acid metabolism, DNA repair, RNA metabolism, protein translation, telomerase regulation, telomere maintenance, and cell adhesion. These genes also affect immune and inflammatory response by regulating vascular inflammation, the anti-inflammatory cytokine IL-10, and the pro-inflammatory COX-2 molecule.

The study demonstrates that a single 8-hour mindfulness meditation retreat can rapidly alter methylation levels that affect epigenetic expression in genes among experienced meditators. Involved genes include those that regulate inflammation, immune cell metabolism, DNA repair, cellular aging, RNA metabolism, protein translation, cell adhesion, and neurotransmission. These findings align with other studies showing that mindfulness meditation practice has immune system benefits relevant to health and aging. The study is limited by its small sample size and variability in the control group leisure activities. Moreover, the analysis cannot decipher whether individual genes were turned off or on by methylation, whether these changes up-regulated or down-regulated immune function, or whether epigenetic expression was also altered by biochemical pathways other than methylation.

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Women diagnosed with epilepsy often report diminished sexual interest and arousal. This is due to a variety of factors including the side-effects of anti-epileptic medication and fear of triggering seizures during sexual activity. Mindfulness-based interventions have previously been shown to improve sexual functioning in women with difficulties in sexual interest and arousal, women with gynecological cancer, and men with erectile dysfunction.

Lin et al. [*Seizure*] conducted a randomized controlled study to assess the efficacy of Mindfulness-Based Cognitive Therapy for Sexuality (MBCT-S) in improving sexual functioning and quality of life in women with epilepsy and their partners.

The researchers randomly assigned 660 women aged 65 or older with epilepsy (average age = 71 years) drawn from 15 Iranian neurology clinics to one of three experimental conditions: 1) MBCT-S for women and their sexual partners, 2) MBCT-S for women and their sexual partners plus a 3-session sexual counseling training program provided to their neurology health care provider, and 3) treatment-as-usual for epilepsy. MBCT-S was offered in an 8-week small-group format delivered in 90-minute weekly sessions. The intervention was similar to standard MBCT, but included psychoeducation about sexual desire, arousal, and intimate relationships, cognitive therapy regarding sexual beliefs, and sensate focus.

The women and their partners were assessed at baseline, 1-month post-intervention, and 6-months post-intervention. The primary outcome measure was the women's self-report of desire, arousal, lubrication, orgasm, satisfaction, and pain. Secondary measures included self-report measures of emotional and sexual intimacy, sexual distress, mindfulness during sex (using the Five-Facet Mindfulness Scale adapted for sexual behaviors), quality of life, and others.

Both MBCT-S groups showed significant improvement in sexual mindfulness, women's sexual functioning and sexual distress, women's and partners' emotional and sexual intimacy, and partners' erectile function compared to controls, both at 1-and 6-months post-intervention. Both MBCT-S groups also showed significantly greater improvements in anxiety and depression than controls at 1 and 6 months, and improved quality of life at 6 months. Only the MBCT-S group that included health care providers showed significantly larger improvements in sexual attitudes and beliefs and quality of the patient-doctor relationship than controls.

The MBCT-S group that included health care providers improved significantly more at 1-month post-intervention than both comparison groups on women and partner ratings of sexual mindfulness, sexual intimacy, and partner ratings of emotional intimacy. This superiority over both comparison groups persisted at 6-months, with the addition of a significant difference in improved women's sexual functioning. Improvements in sexual functioning and distress were significantly mediated by improvements in mindfulness during sex and in sexual and emotional intimacy.

This study shows that MBCT-S improves sexual functioning and sexual and emotional intimacy in older Iranian women with epilepsy and their partners, that these improvements persist over time, and that these improvements are mediated by increased mindfulness during sex. It also shows a potential added benefit of educating epilepsy health care providers about sexual counseling. The study is limited by its reliance on a treatment-as-usual control.

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