



the  
SCIENCE  
behind  
MEDITATION

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What is meditation? What is mindfulness?

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||||| What is |||||

*MEDITATION*

||||| What is |||||

*MINDFULNESS*



 At Headspace, we define *mindfulness* as the intention to be present in the here and now, fully engaged in whatever is happening, free from distraction or judgment, with a soft and open mind.

*Meditation* is a simple exercise of familiarisation with the qualities of mindfulness. It helps optimise conditions for training the mind to be calmer, clearer and kinder.

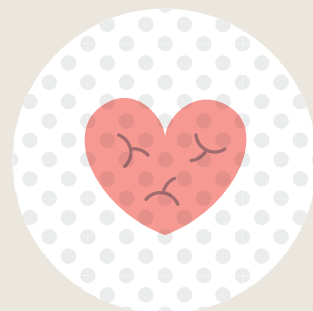
 Scientific interest in mindfulness has exploded recently, with the number of academic papers published on the topic **increasing by nearly 300%** over the past five years.

Research has shown how the brain can change in response to training and experience such as meditation.

—— This is known as **neuroplasticity**.



BEFORE



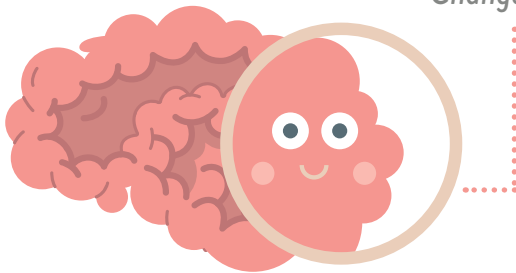
AFTER

It's early days for the cognitive neuroscience of mindfulness, but studies point to some very exciting outcomes.

One of the scientists we're working with at Headspace, Dr Judson Brewer at Yale's Therapeutic Neuroscience Clinic, has found that meditation decreases activity in areas of the brain associated with mind-wandering.<sup>1</sup> Another, Dr Amishi Jha has discovered increased activity in the areas of the brain associated with cognitive control.<sup>2</sup>

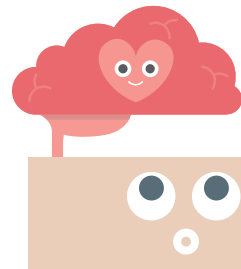
Other researchers have also found that meditation training boosts the left frontal activity of the brain, which is associated with positive mood, and decreased activity in the amygdala, which is related to stress and anxiety.<sup>3</sup>

#### *Changes associated with positive mood*



One theory proposes that the change in brain function represents the development of an 'approach state'; characterized by a moving towards, rather than away from, challenging external situations or internal experience.<sup>4</sup>

This is seen as the neural basis for resilience, and a number of **other positive outcomes...**



*Studies have even shown that meditation can cause parts of the brain associated with learning and memory to grow in size and those connected with stress and anxiety to shrink.<sup>3</sup>*

# QUANTIFIABLE POSITIVE OUTCOMES OF MINDFULNESS TRAINING

## 1. STRESS & ANXIETY REDUCTION .....

Helps change the way you think about and respond to difficult experience

## 2. DEPRESSION PREVENTION .....

Helps you interrupt cycles of ruminative thought that can lead to depression

## 3. COGNITIVE SKILLS .....

Improves your attention, memory and other everyday skills

## 4. IMMUNE FUNCTION .....

Improves your body's ability to fight infection

## 5. COMPASSION .....

Helps us feel kindness for others, and ourselves too

## 6. RELATIONSHIPS .....

Boosts empathy and makes us less judgmental, positively affecting how we relate to others





..... **7. CREATIVITY**

Boosts innovative problem solving

..... **8. PAIN CONTROL**

Helps you relate differently to unpleasant feelings and provides an effective tool in pain management

..... **9. SLEEP**

Helps you fall asleep quicker and stay asleep for longer

..... **10. SMOKING CESSATION**

Affects the link between cravings and behaviour, helping you to change habits

..... **11. EATING**

Helps treat binge eating and other eating disorders

..... **12. HEART HEALTH**

Has a significant and positive effect on heart health

*Continue to read about some of our favourite pieces of research in these areas...*



## 1. STRESS & ANXIETY

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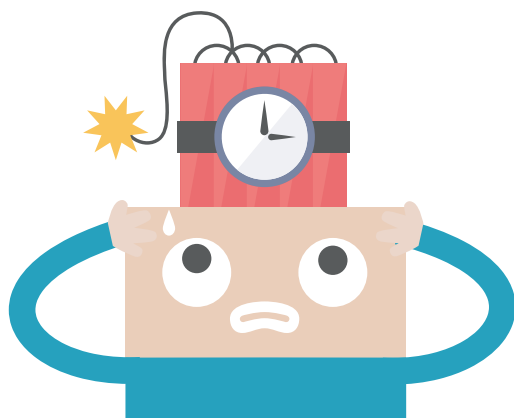
Over 160 studies have found that mindfulness practice had a positive and substantial effect on factors of wellbeing, including stress, negative mood and anxiety.<sup>5</sup>



David says

Some pressure can be beneficial for our everyday functioning, but when this becomes unmanageable it causes stress, which can be seriously detrimental to our mental and physical health.

A strong body of research now shows us that mindfulness can help manage the demands upon us and reduce reported levels of stress.



### KEY STUDY

*Research on mindfulness practice in the workplace found a 36% decrease in stress levels.*

*Mindfulness has also been linked to reduced absence from work.<sup>6</sup>*



Dr Amishi Jha says

Our research continues to show how mindfulness can help manage job and academic stress – particularly when there is an expectation and need to maintain peak performance under great pressure. From relief workers and trauma surgeons, to professional and Olympic athletes, building mental fitness with mindfulness training can be a key to handling stress

**University of Miami**

## 2. DEPRESSION

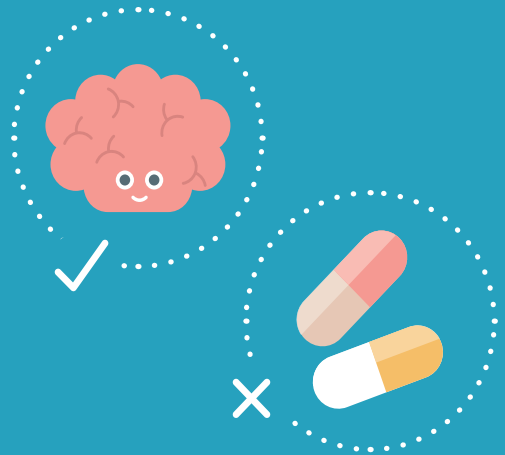
Over 40 studies have found that mindfulness based therapies are effective in alleviating depression and anxiety over a wide range of populations.

They found that meditation had a significant effect for those clinically diagnosed, as well as those with everyday anxiety and mood problems.<sup>7</sup>



David says

Depression is one of the most common mental health conditions globally.<sup>8</sup> Research suggests that mindfulness-based meditation can be more effective in treating depression than pharmaceutical interventions.<sup>9</sup>



Andy says

We are not what we think. Thoughts come and go. Only with a sense of headspace can we truly understand this process, watching with confidence, wonder and a sense of ease.



### KEY STUDY

*Research has found that mindfulness practitioners were 3 times more likely to avoid depression the following year after starting their practice.<sup>10</sup>*

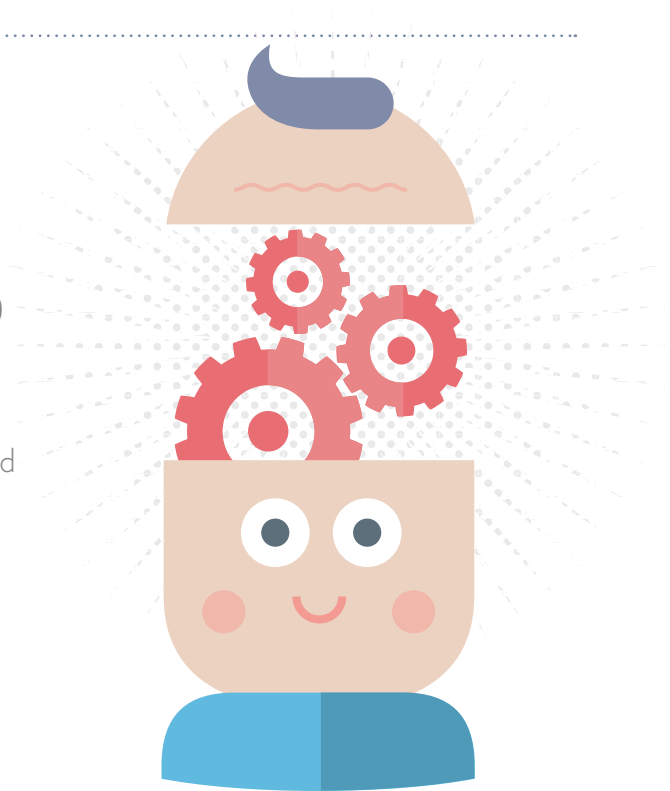
### 3. COGNITIVE SKILLS

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Research has found mindfulness practice leads to significant improvements in critical cognitive skills after only 4 days of training for 20 minutes per day.

In particular, improvements were found regarding sustained attention, visuo-spatial processing and working memory; the type of memory associated with immediate everyday processing and reasoning.

This study is one of the first to show how even brief mindfulness training can lead to significant improvements in cognitive skills.<sup>11</sup>



Dr Amishi Jha says



Working memory is a key cognitive system – important to reasoning and learning, and often a better predictor of academic success than IQ. Our research on mindfulness for US marines found that those practicing for just 12 minutes a day saw improved attention and working memory over an 8 week period.

**University of Miami**

## 4. IMMUNE FUNCTION

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Researchers measured electrical activity in the brain before and immediately after 8 weeks of mindfulness-based meditation practice.

After 8 weeks, all subjects were treated with influenza vaccine. Participants who practiced mindfulness displayed increased activity in parts of the left- frontal brain; the area of the brain associated with positive emotions. Crucially, they also produced significantly more antibodies than the control group.

Results highlighting the link between mind and physical health found that a greater increase in left-sided brain activation predicted the degree of the increase in antibodies from the vaccine.<sup>13</sup>



David says

Research in this area is particularly interesting as it highlights the relationship between mental and physical health.



### KEY STUDY

*Preliminary research has even shown mindfulness practice can have a powerful effect on psoriasis; a skin disease that has a strong relationship with psychological stress.*

*The study found that the meditators' skin cleared around 4 times faster than the non-meditators.<sup>14</sup>*

## 5. COMPASSION

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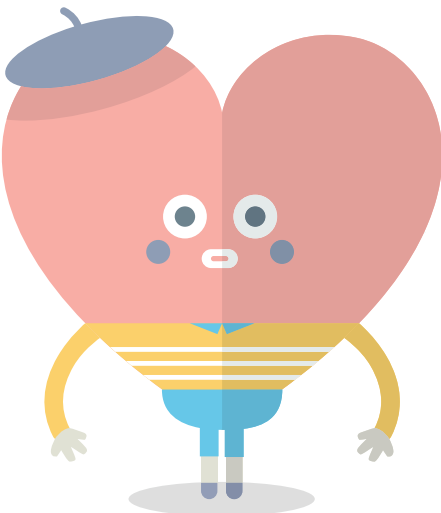
A growing amount of research illustrates the effects of meditation has on our interpersonal relationships.

Researchers recently found that people who practiced mindfulness based meditation over just 8 weeks displayed a 50% increase in compassionate behaviours in real life settings compared to those who did not.<sup>15</sup>

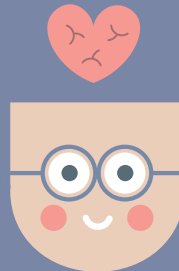


Andy says

Relationships are often one of the most important aspects of our life - and indeed of being human. They provide us with so much, that it only seems right to learn how we can train the mind to give a little back.



### KEY STUDY

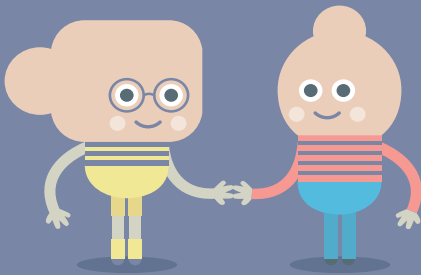


Recent research has also suggested how practicing relationship-focused mindfulness meditation can affect your body as well as your brain. In particular, the vagus nerve; or the branch of the nervous system responsible at a subconscious level for helping you relax, rest and digest.<sup>16</sup>

## 6. RELATIONSHIPS

Mindfulness has been shown to help us express ourselves across a range of social situations, and also increases empathy.

What's more, increased self-awareness and non-judgmental acceptance associated with mindfulness leads to the better communication of feelings and also reduced social anxiety.<sup>17</sup>



David says

Researchers have also found mindfulness practice to positively affect romantic relationships; often leading to greater relationship satisfaction and a positive ability to respond constructively to relationship stress.<sup>18</sup>



Andy says

Training the mind makes us less judgmental and less opinionated.

At the very least, it makes us more aware of our tendency to judge, to criticize, to be self-righteous or opinionated, and thereby gives us the opportunity to let go of these habits.

## 7. CREATIVITY

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Though still in its infancy, exciting research in this area already shows how time spent in meditation can have a positive effect on our day-to-day approach to problems and tasks.



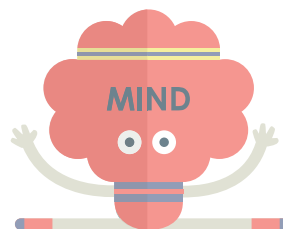
### KEY STUDY

Research has shown mindfulness practice can enable us to respond with greater flexibility to situations where we might otherwise be 'blinded' by past experience; reducing the 'cognitive rigidity' which can cause us to overlook novel and adaptive ways of responding.<sup>19</sup>



Andy says

Creativity is as boundless, spacious and limitless as the sky. We are born with it. It cannot be lost and it cannot be destroyed. It can only be forgotten, obscured in some way. Just as the sky is a canvas for the clouds, so creativity is a canvas for our thoughts. We need only step out of the clouds, let go of everyday thoughts, to experience the creative expanse.



David says

Interestingly, early research also suggests that 'cognitive rigidity' may be related to mental health conditions such as depression, obsessions and eating disorders.

## 8. PAIN

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Research observing the effects of mindfulness practice on chronic pain management suggests positive physical and psychological improvements, as well as reductions in depression and pain-related grief.<sup>20</sup>



David says

A growing amount of research investigating the role of mindfulness in pain management has found positive effects compared to relaxation techniques.

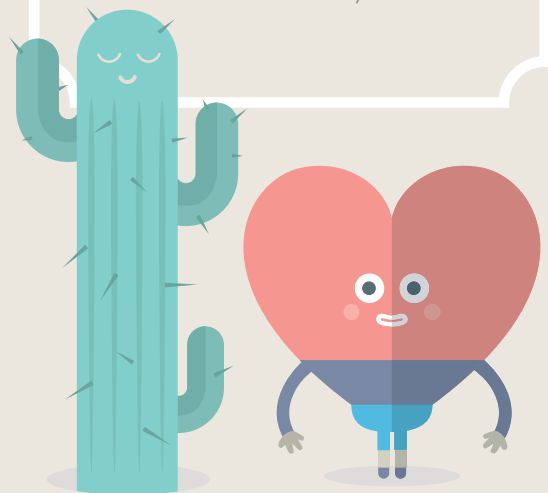
What's more, these were maintained for long periods after training, suggesting that mindfulness remains a lasting tool in pain management.



Andy says

Whatever the type of pain, it's useful to remember that as a general rule the more aware you are of pain, and the more welcoming you are towards it, the easier it is to manage and the more likely you are to understand it.

It sounds counter-intuitive to welcome pain in this way, but you'll find it much easier to work with it if you do.



## 9. SLEEP

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Research assessing the effects of mindfulness techniques on sleep, has found a decrease in the time it took practitioners to fall asleep, as well as improvements in total sleep time and sleep efficiency.<sup>21</sup>



Andy says

When you're lying awake at night, trying to fall asleep, do you 'react', getting frustrated, worried or downhearted? Or do you 'respond' with a sense of ease, awareness and acceptance?

Your familiarity with mindfulness and your ability to step back and observe the thoughts and emotions a little more clearly will be critical in turning a 'reaction' in to a 'response'. This is exactly what you are training your mind to do when you sit and meditate.



David says

Research suggests that poor sleep can increase the likelihood of mind health conditions such as depression and anxiety.

Furthermore, as well as diminishing concentration and energy, poor sleep has been related to an increased risk of developing cardiovascular disease.<sup>22</sup>



### KEY STUDY

Research observing the effects of mindfulness-based meditation techniques on sleep found that 58% of diagnosed insomniacs reported significant improvements and 91% of those using medication either reduced or stopped their usage completely.<sup>23</sup>

## 10. SMOKING

Mindfulness practice has led to a significant and greater reduction in smoking behaviours compared to a standard smoking reduction treatment program.<sup>24</sup> These reductions were still displayed at a later follow-up.



### KEY STUDY

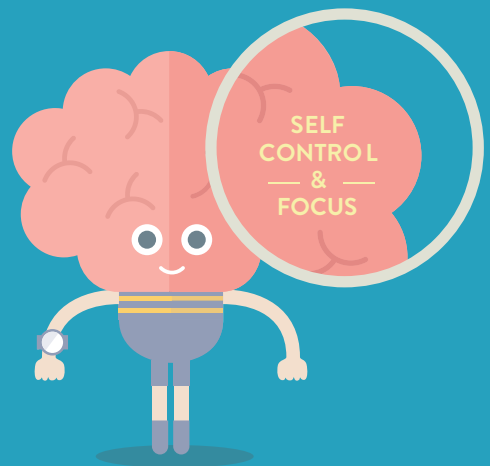
New research suggests that just 5 hours of mindfulness-meditation practice led to a 60% reduction in smoking. What's more, changes in brain activity associated with self-control were also observed.<sup>25</sup>



Dr Judson Brewer says

For the past several decades, behavioral treatments have struggled to help people quit smoking. Emerging treatments such as mindfulness directly target key psychological habit loops that get set up and perpetuated each time someone smokes. They help people recognize cravings as physical sensations that can be noticed and even explored, rather than moral imperatives that have to be acted on by smoking. These targeted treatments are showing early promise in helping people quit smoking, and quit for good.

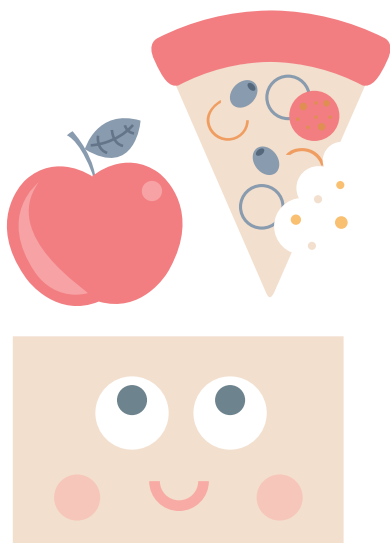
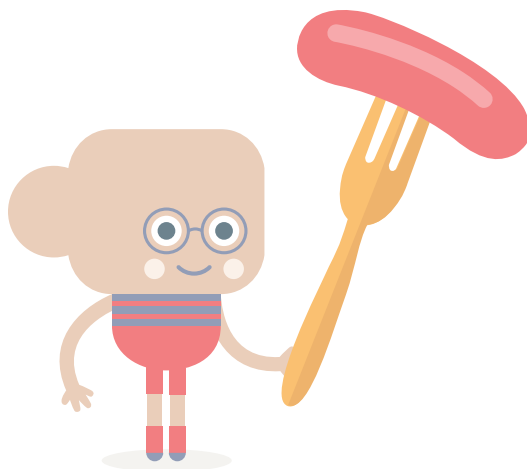
**Yale University**



## 11. EATING

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Research investigating the relationship between mindfulness practice and binge eating in individuals without clinically diagnosed eating disorders found a decline in binge eating, anxiety and depressive symptoms and an increase in self-acceptance following mindfulness practise.<sup>26</sup>



Andy says

If we can understand how our mind works, we can understand our relationship with food.

We can then make the changes we want to make from a place of calm and clarity. The result is that we find a weight, shape and size which is healthy, natural and comfortable.

## 12. HEART HEALTH

**Preliminary research focused on patients with coronary heart disease has found a significantly reduced risk of heart attack and stroke in those practicing meditation.<sup>27</sup>**



David says

Meditation is known to evoke the ‘relaxation response’ whereby blood pressure, heart rate, breathing rate and oxygen consumption all reduce.

It’s the opposite of the stress response, which is why it has such wide ranging potential to benefit physical and mental health.

Even in the early stages of research, it’s incredibly promising to see that mindfulness practice might be effective in helping prevent the number one global cause of death.<sup>28</sup>



Andy says

Headspace does not differentiate between body and mind, for the two are inseparable. When the mind is still, the body is still, when the mind is at ease, the body is at ease.



Preliminary results show that over 8 weeks the use of our app was associated with:

- Significant improvements in mental wellbeing
- Reductions in diastolic blood pressure
- Significant reductions in stress and anxiety symptoms
- Significant increases in the amount of job control employees felt they had
- Improved sleep quality



We've conducted two large studies, one with a Fortune 50 technology brand and another with a Fortune 200 pharmaceutical company.



## SUMMARY

Even though the science is new, the benefit isn't. Meditative techniques that form modern mindfulness teaching have been used for 1000s of years.

We hear a lot from our users about the transformative effects that the Headspace journey has on their everyday lives, and it's great to see so much research now backing this up. It's exciting and sometimes challenging to keep up with it all, but so helpful in developing our product and communicating the benefits of meditation.

Further Headspace research is in the pipeline and we're currently developing a special science app for large-scale trials, so watch this space!



### About the author

Andy is the co-founder of Headspace, a project which aims to make meditation simple and relevant for modern day living. He is a Meditation Consultant and a former Buddhist monk. For more than 10 years, his meditation training took him all over the world and in 2004 he returned to the UK with one simple aim in mind: to demystify meditation, to make it accessible, relevant and beneficial for as many people as possible.



### About the author

Dr. David Cox, our Chief Medical Officer, is responsible for overseeing all scientific and medically-related research work that Headspace is involved in. David is a qualified doctor with a wide range of experience spanning several years working in a central London Accident & Emergency department, moving on to operational management and NHS system design. David also spent several years at management consultancy McKinsey & Co.



# HEADSPACE

TREAT YOUR HEAD RIGHT



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# REFERENCES

- 1** Brewer, J., Worhunsky, P., Gray, P., Tang, Y., Weber, J. & Kober, H. (2011). Meditation experience is associated with differences in default mode network activity and connectivity. *Proceedings of the National Academy of Sciences*, 108, 20254-20259.
- 2** Jha, A., Krompinger, J. & Baime, M. (2007). Mindfulness training modifies subsystems of attention. *Cognitive, Affective & Behavioral Neuroscience*, 7, 2. 109-119.
- 3** Hölzel, B. K., J. Carmody, M. Vangel, C. Congleton, S. M. Yerramsetti, T. Gard & S. W. Lazar. (2011). Mindfulness practice leads to increases in regional brain gray matter density. *Neuroimaging*, 191, 36-43.
- 4** Siegel, D. (2013). *The Science of Mindfulness*. Accessed online from: <http://www.mindful.org/the-science/medicine/the-science-of-mindfulness>
- 5** Sedlmeier, P. et al. (2012). The psychological effects of meditation: a meta-analysis. *Psychological Bulletin*, 138, 8, 1139-1171.
- 6** Wolever, R., Bobinet, K., McCabe, K., MacKenzie, L., Fekete, E., Kusnick, C. & Baime, M. (2012). Effective and viable mind-body stress reduction in the workplace: two RCTs. *Complimentary and Alternative Medicine*, 12, 87.
- 7** Hofmann, S., Sawyer, A., Witt, A., & Oh, D. (2010). The effect of mindfulness-based therapy on anxiety and depression: A meta-analytic review. *Journal of Consulting and Clinical Psychology*, 78, 2, 169-183.
- 8** The World Health Organization. Depression. Accessed online from <http://www.who.int/mediacentre/factsheets/fs369/en/>
- 9** Kuyken, W., Byford, S., Taylor, R. S., Watkins, E., Holden, E., White, K., et al. (2008). Mindfulness-based cognitive therapy to prevent relapse in recurrent depression. *Journal of Consulting and Clinical Psychology*, 76, 6, 966-978.
- 10** Ma, S. & Teasdale, J. (2004). Mindfulness-Based Cognitive Therapy for Depression: Replication and Exploration of Differential Relapse Prevention Effects. *Journal of Consulting and Clinical Psychology*, 72, 1, 31-40.
- 11** Zeidan, F., Johnson, S. K., Diamond, B. J., David, Z., & Goolkasian, P. (2010). Mindfulness meditation improves cognition: Evidence of brief mental training. *Consciousness and Cognition*, 19, 2, 597-605.
- 12** Jha, A., Stanley, E., Kiyonaga, A., Wong, L., & Gelfand, L. (2010). Examining the protective effects of mindfulness training on working memory capacity and affective experience. *Emotion*, 10, 1, 54-64.
- 13** Davidson, R., Kabat-Zinn, J., Schumacher, J., Rosenkranz, M., Muller, D., Santorelli, S., et al. (2003). *Journal of Psychosomatic Medicine*. 65, 4, 674-570. experience. *Emotion*, 10, 1, 54-64.

- 14** Kabat-Zinn, J., Wheeler, E., Light, T., Skillings, A., Scharf, M., Cropley, T., Hosmer, D., & Bernhard J. (1998). Influence of a mindfulness meditation-based stress reduction intervention on rates of skin clearing in patients with moderate to severe psoriasis undergoing phototherapy (UVB) and photochemotherapy (PUVA). *Psychosomatic Medicine*, 60, 5, 625-632.
- 15** Condon, P, Desbordes, G., Miller, W., & DeSteno, D. (2013). Meditation increases compassionate responses to suffering. *Journal of Psychological Science*.
- 16** Kok, B. et al. (2013). How Positive Emotions Build Physical Health. Perceived Positive Social Connections Account for the Upward Spiral Between Positive Emotions and Vagal Tone. *Journal of Psychological Science*, 24, 7, 1123-1132.
- 17** Dekeyser, M., Raes, F., Leijssen, M., Leysen, S. & Dewulf, D. (2008). Mindfulness skills and interpersonal behavior. *Journal of Personality and Individual Differences*, 44, 5, 1235-1245.
- 18** Barnes, S. et al., (2007). The role of mindfulness in romantic relationship satisfaction and responses to relationship stress. *Journal of Marital and Family Therapy*. 33, 4. 482–500.
- 19** Greenberg, J., Reiner, K. & Meiran, N. (2012). “Mind the Trap”: Mindfulness Practice Reduces Cognitive Rigidity. *Public Library of Science*, 7, 5.
- 20** Dunford & Thompson. (2010). Relaxation and mindfulness in pain: a review. *Journal: Reviews in Pain*, 4, 18-23.
- 21** Gross, C. et al. (2011). Mindfulness-Based Stress Reduction vs. Pharmacotherapy for Primary Chronic Insomnia: A Pilot Randomized Controlled Clinical Trial. *Journal: Explore*, 7, 2, 76-87.
- 22** The National Sleep Foundation. Sleep and mental health conditions, accessed from: <http://www.sleepfoundation.org/article/sleep-topics/depression-and-sleep>
- 23** Ong, J., Shapiro, S. & Manber, R. (2008). A Mindfulness-Based Approach to the Treatment of Insomnia. *Journal of Clinical Psychology*, 66, 11, 1175-1184.
- 24** Brewer, J., Mallik, T., Babuscio, C., Nich, H., Johnson, C., Deleone, C. Minnix-Cotton, S., Byrne, H., Kober, A., Weinstein, K., Carroll, B. & Rounsaville. (2011). Mindfulness Training for smoking cessation: results from a randomized controlled trial. *Drug and Alcohol Dependence*. 119, 79-80.
- 25** Tang, Y., Tang, R. & Posner, M. (2013).`Brief meditation training induces smoking reduction. *Proceedings of the National Academy of Sciences*.
- 26** Smith, B. (2006). A Preliminary Study of the Effects of a Modified Mindfulness Intervention on Binge Eating. *Journal of Evidence-Based Complementary & Alternative Medicine*, 11, 3, 133–43.
- 27** Schneider, R. et al. (2012). Stress Reduction in the Secondary Prevention of Cardiovascular Disease. Randomized, Controlled Trial of Transcendental Meditation and Health Education in Blacks. *Journal of Circulatory Cardiovascular Qualitative Outcomes*, 5, 6, 750-758.
- 28** The World Health Organization. Cardiovascular Disease. Accessed online from: <http://www.who.int/mediacentre/factsheets/fs317/en/>

NO MATTER

— *how many* —

CLOUDS

THE BLUE SKY

IS ALWAYS THERE

