REHAB SUMMIT

501: Using Mindfulness to Improve Outcomes With Chronic Pain Patients

Clyde Boiston, PT, OCS, CMF

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Using Mindfulness To Improve Outcomes With Chronic Pain Patients

Created and Presented by

Clyde Boiston, PT, OCS, CMF, TCHI

Some of the Many Benefits of Mindfulness

Scientific research suggests that Mindfulness has the potential to….

Reduce stress
Decrease symptoms of anxiety and depression
Reduce chronic physical pain
Boost our body's immune system and help us fight disease
Improve our attention and ability to concentrate
Increase interpersonal skills and improve relationships
Stimulate creativity

What Is Mindfulness?

"Paying attention to our present moment experience with openness, curiosity, and a willingness to be with what is"
(UCLA)

"Mindfulness is simply settling into the present moment with a curious, non judging awareness…..allowing whatever is there to be there and not trying to make things be any particular way"
(Jon Kabat-Zinn)

Mindful vs. Mindless?

Operating on Auto Pilot

Where do our minds go when they're not in the present moment?

Why is it so hard to be happy with things just the way they are?

Happiness as "The Journey" rather than "A Destination"

The Interconnected Nature of Mind and Body

The foundation of centuries old Eastern spiritual traditions
is the idea of a powerful mind-body connection

Believing that the thoughts we are thinking and the emotions we are feeling
can cause associated visceral responses in the body and vice versa

A multitude of alternative holistic interventions complement
this idea that combined health in both the mind and body
is linked to increased wellness and greater longevity
(Davidson and Goleman, 2017)

Thoughts On Working With Physical Pain

Pain is a natural and inevitable part of life….but Suffering is optional

Story of the 2 Arrows

Maintaining neutrality around a stimulus prevents
cognitive appraisals from influencing affective responses

We cannot control the pain that enters our life -
but how we relate to the pain is what we do have control over

Ways In Which Humans Historically Tend To Respond To Physical Pain

Identifying with the pain

Catastrophizing around the pain

Running from the pain….trying to "fix it"

Relating in unhealthy ways by blaming ourselves for the pain

Experiential Activity:

Body Scan Meditation

Some Background on Meditation and Pain

In 1979, Jon Kabat-Zinn began researching the use of Mindfulness meditation and yoga for the alleviation of chronic pain in patients with cancer and other terminal diagnoses

Developed 8 week program called Mindfulness Based Stress Reduction (MBSR)

It didn't get rid of the pain….in fact, it didn't even necessarily decrease the pain

But what it did do….almost universally….was teach the subjects how to increase their ability to tolerate pain….and how to improve their quality of life

The relief came from a shift in the way the people perceived their pain

MBSR Principles and Insights

Primary principle of MBSR is teaching that pain is not a monolithic, never changing entity

Pain actually ebbs and flows….
it changes in quality, intensity, and even location

With Mindfulness, we can investigate the little moments of pain…..rather than viewing it globally

MBSR Principles and Insights

Insights gained from MBSR include the understanding that….

Thoughts about pain are just simply that….thoughts

We are not our pain….that is not what defines us

Everyone else has pain at various times in their life….just like us
(feelings of interconnectedness)

Most unpleasant things in life are often only temporary

Research Reveals Meditation Can Change The Ways Our Bodies Experience Pain

Brief Overview of some of the key brain areas that research suggests are positively impacted by meditation….

Somatosensory areas - for touch and pain due to increased bodily awareness

Insula - attunes us to our internal state and influences our emotional self awareness

Areas of the PFC - Important in paying attention and which improve meta awareness

Orbitofrontal cortex - a highly evolved brain region associated with increasing positive mood
(and also enhancing self regulation abilities)

Regions of the cingulate cortex - also an important part of the circuitry for self regulation
(from Kieran 2014 Meta Analysis)

The Default Mode Network

One of the most interesting things revealed by brain scans is that, even when we are not engaged in any active mental task, there are regions of the brain that light up

Primary areas are the mPFC (midline of the prefrontal cortex)
and the PCC (postcingulate cortex)

It seems that, when we aren't focusing our attention on a task, our minds tend to wander and the brain activity reflects this

And this mind wandering is very often focused on the self….
mental activity referencing "I" or "me"

Neuroscientist Marcus Raichle named this phenomenon the "Default Mode Network"

How The Default Mode Network Works

By framing every thought and event in terms of how it impacts us personally, the "default mode" makes each of us the center of the universe as we know it

Involves all the stories we tell ourselves….and how, over time, we've come to believe them as absolute truth

But when we are able to let the self-referencing go and pay full attention to what's at hand….without judging it in terms of good or bad or creating stories around it…. we enter a "state of flow" which can make us feel more joyous

The prefrontal areas no longer need to make an effort to do the work of "disentangling" and there is a gradual lessening in the connectivity among the various nodes of the default circuitry
(Garroson K. et al, 2013)

Functional MRI Demonstrates Different Mechanisms of Action For Pain Attenuation Through Mindfulness

fMRI has significantly advanced our understanding of the neurophysiological processes behind Mindfulness and pain relief

A 2019 review of the literature demonstrated there are multiple neural pathways responsible for the pain relief experienced with mindfulness meditation and that they vary across different levels of meditative experience
(Zeidan F. et al 2019)

This is also true with regard to how well an individual handles the stress that is often a natural sequelae of physical pain. Richard Davidson from University of Wisconsin at Madison has been performing brain scans on a full range of meditators, from novices to Buddhist monks, since1992 and has found that resilience and recovery from stress is very dose specific when it comes to meditation practice….the more experienced the meditator, the more quickly the brain recovers from stress
(Kral T.R.A. et al 2018)

Dispositional (Trait) Mindfulness

There are meditation naive individuals who, for one reason or another, just seem to be more "naturally mindful", whether it be through personality or disposition

This is known as Dispositional (or trait) mindfulness - an innate, unlearned ability to be naturally aware of present moment experience in a non reactive manner

Zeidan et al found a significant relationship between higher dispositional mindfulness and lower pain ratings in response to noxious heat (49 C) stimuli. The mechanism here was greater deactivation of the posterior and midline nodes of the "default mode network" (mPFC, PCC/precuneus, and inferior and lateral temporal cortices)
(Zeidan F. et al 2018)

Dispositional (Trait) Mindfulness

In a similar study, Harrison et al found that individuals with higher trait mindfulness had higher pain threshold values (time before the pain sensation is noted) and imaging revealed weaker connectivity between the central nodes of the default mode network (mPFC, PCC) (Harrison et al. 2018)

Further, the Zeidan study showed the ability of individuals exhibiting higher trait mindfulness to separate the noxious sensory stimuli from the process of making affective appraisals (the theory that we create specific emotional feelings through our own unconscious cognitive appraisal of a situation or a stimulus)

Novice or Beginning Meditators

Research suggests that less experience with meditation practice can still have positive benefits when dealing with pain

Although the nature of the mindfulness resulting from these decreased term interventions appears to be more of a "state" (temporary condition) than a "trait" (lasting quality we have come to embody)

In this instance, the neural process involved is more "top down", with a very unique "reappraisal"mechanism whereby higher order brain regions (orbitofrontal cortex, anterior cingulate cortex, and anterior insula) regulate low level nociceptive neural targets (particularly the thalamus and primary somatosensory cortex)
(Zeidan F. et al., 2011) (Halassa M.M. et al., 2014) (Tang Y.Y. et al., 2015)

Experienced Mindfulness Meditators

The neural processes are different still in the scenario of pain regulation and relief in experienced mindfulness meditators (>1000 hours of practice)

Grant and Rainville were the first to demonstrate that adept Zen meditation practitioners required significantly higher noxious heat stimulation to report the same level of pain as age matched controls
(Grant J.A. and Rainville P., 2009)

Experienced Mindfulness Meditators

In their followup study, again using fMRI to assess brain activity in response to noxious heat stimuli, seasoned Zen practitioners were able to bear more pain than age matched controls

Additionally, they showed less activity in the link between the higher brain centers which evaluate the pain (i.e. sensory affective appraisal), namely the dorsal PFC and ACC, and the lower brain regions that sense the pain (particularly the thalamus)

Essentially they were able to view the pain as if it were a more neutral sensation. While their sensory circuitry felt the pain, their thoughts and emotions did not react to it (Grant J.A. et al., 2011)

Even more importantly, the Zen practitioners were not even meditating during this study! (validating the idea of a "trait" vs. a "state"). Multiple earlier studies had already demonstrated the phenomenon of extended meditation practice leading to significant increases in pain threshold and lower pain sensitivity even when the participants were not actually practicing mindfulness (Cherkin D.C. et al., 2016) (Gatchel R.J. et al., 2016) (Morone N.E. et al., 2016)

A Summary of Each of These 3 Scenarios

Dispositional (Trait) Mindfulness - The mechanism here was greater deactivation of the posterior and midline nodes of the "default mode network" (mPFC, PCC/precuneus, and inferior and lateral temporal cortices) which decreased the tendency for cognitive reappraisals that can influence our affective responses

Novice Meditators - The process here is more of a"top down" one where the mindfulness based pain relief is associated with higher order (orbitofrontal cortex and anterior cingulate cortex and anterior insula) regulation of low level nociceptive neural targets, particularly the thalamus and primary somatosensory cortex

Experienced Meditators - This involved a very significant decoupling of the circuits in the higher centers which evaluate the pain (the dorsal PFC and ACC), from the lower brain regions that sense the pain (particularly the thalamus). While the sensory circuitry felt the pain, it was viewed as a neutral sensation so that there was no associated emotional reactivity

Differing Action of Mindfulness vs. Opioids

There are many endogenous neurotransmitters within the human body (including the cannabinoid, serotonergic, dopaminergic, and opioidergic) although the endogenous opioidergic system is characterized as the primary pain modulating system. Higher order brain regions release endogenous opioids which bind with various pain receptors to alleviate physical pain (Watkins L.R. et al., 1982)

A 2016 double blind study by Zeidan et al conducted on meditation naive individuals given some brief mindfulness training prior to the study, and using the opioid antagonist Nalaxone (Narcan), concluded that mindfulness training provides analgesic effects independent of endogenous opioids (Zeidan F. et al, 2016)

The imaging studies revealed increased activity in higher levels of the brain associated with the cognitive modulation of pain (ACC, OFC, and insula) paired with a suppression of ascending information regarding the noxious stimuli being transmitted from lower brain levels

Meditation had the potential to cause executive shifts in attention which allowed a nonjudgemental reappraisal of the sensations and kept them from reaching the level of conscious awareness

Some Diagnosis Specific Studies on Mindfulness and Pain

Mindfulness research has been conducted on a variety of pain scenarios….headaches, pelvic pain, irritable bowel syndrome, cancer related pain, neuropathic pain, fibromyalgia….including the one which results in the greatest number of physician referrals to Physical Therapy, namely low back pain (LBP)

A 2016 study by Morone, looking at older adults with chronic LBP found MBSR effective not only in reducing the level of pain that people felt, but also in how disabled they became. And their lower subjective pain levels were still present at a 6 month followup
(Morone N.A. et al., 2016)

And a study that same year by Turner and colleagues showed that MBSR produced a greater reduction in pain catastrophizing in chronic low back pain patients when it was compared with cognitive behavioral therapy (CBT) and the usual standard of care (TAU)
(Turner J.A. et al., 2016)

A study on Fibromyalgia patients found significant improvements in the psychological symptoms they were suffering (including stress) at the same time that it lessened many of their subjective symptoms
(Cash E. et al., 2015)

Diabetic Neuropathic Pain

The most common microvascular complication of diabetes is diabetic peripheral neuropathy, affecting up to half of the
diabetic population and often being accompanied by chronic pain
(Benbow 2004) and (Gore 2005)

Chronic pain has also been associated with anxiety and depression in these patients which, in turn, has been linked with higher HbA1c levels and greater severity of diabetic complications
(Crispin-Trebejo 2015) and (Dirmaier 2010) and (Krein 2005)

A study of 105 older females with diabetes looked at the effects of mindfulness meditation (MM) on reducing chronic neuropathic pain as compared to progressive relaxation meditation (PM) and a group of controls

The study revealed a subjective drop of 2.2 points in average daily pain rating using the 0-10 visual analog pain scale across the 12 weeks of the study (from 5.2 to 3.0) with mindfulness meditation as compared to a drop of only 0.6 points from 5.4 to 4.8 with the progressive relaxation meditation
(Hussain N. and Said A.S.A., 2019)

Post Op Total Joint Replacement Pain

Total joint arthroplasty is considered the definitive surgical intervention for end stage osteoarthritis

Both prior level of physical conditioning as well as pre surgery levels of psychological distress have been considered important factors in determining how well a patient will rehabilitate post operatively with regard to both pain level and functional outcomes

A study in Australia of 127 individuals determined by health survey to have decreased psychological well being and who were preparing for total knee arthroplasty were randomly assigned to either an 8 week MBSR program or treatment as usual (TAU). Each was evaluated at baseline and then again at 3 and 12 months post surgery

Although no specific causal mechanisms were identified, the study findings were positive in that both subjective pain levels were decreased and functional physical recovery was improved in the TKA patients who underwent MBSR training versus the controls. And these gains were still maintained at their one year followup
(Dowsey M, et al., 2019)

Mindfulness vs. Medication

A 2016 meta analysis on the use of mindfulness for pain relief reviewed dozens of studies and concluded that mindfulness and meditation practice was a viable, conservative alternative to the use of pain medication

One significant reason for this determination was due to the fact that mindfulness is very often just as effective as medication without having any of the undesirable side effects

And the ability of Mindfulness to provide pain analgesia actually increases over time….unlike traditional medication therapies which often plateau in efficacy as the patient's body builds up a tolerance
(Veehof, M.M., 2016)

A Few Words On Acceptance vs. Attention

Attention and Acceptance are two distinctly different….but equally important….components of mindfulness practice

Attention is the ongoing awareness of present moment experience, both sensory and perceptual. This involves focusing attention and fine tuning our concentration skills

Acceptance is taking the mental stance of being open and receptive to the experience, whatever it is. Not judging or labeling it as being either good or bad….instead just allowing it to be there

So the question becomes….which is the better approach toward pain….bringing our focus to rest upon it with a strict quality of attention….or having some equanimity, allowing whatever is there to be there, non reactively and without judgement? Accepting the simple truth that….it is what it is?

A Few Words On Acceptance vs. Attention

A 2019 study divided 119 healthy college students with no mindfulness training or experience into 4 groups: (1) acceptance of pain (2) attention to pain (3) both acceptance of and attention to the pain (4) a control group. The participants in each of the groups underwent a cold pressor test both before and after receiving mindfulness training that was specific to the mental stance they would adopt
(Wang, Y., et al., 2019)

For the cold pressor test, participants were asked to submerge their hands in warm water for 2 minutes and then take them out and immediately re submerge them into ice cold water as a means of inducing pain. They would then attempt to keep their hands in the ice water for 5 minutes. Pain threshold and pain tolerance were each measured in addition to several other pain parameters. They were then asked to rate the pain using the 0-10 visual analog scale at the
moment they removed their hands from the cold water

A Few Words On Acceptance vs. Attention

Findings of the study were that both the acceptance strategy and the combined acceptance and attention group demonstrated increased pain tolerance and endurance after the training, and both were greater than the attention group or the control group
(Wang, Y., et al., 2019)

These results were consistent with an earlier meta analysis which had looked at the effectiveness of acceptance
strategies and concluded that they were superior to other strategies for pain tolerance
(Kohk A., et al., 2012)

Experiential Activity:

Meditation on the Sensations of Pain

Tying It All Together:
Some Key Ideas to Bring Into the Meditation

Cultivating the Capacity to Be With the Pain:
No expectation that the pain will be completely relieved
Learning to "be" with the pain….noticing its subtle nature and all the stories we tell ourselves

"Leaning In" to Touch the Pain as Your Mindfulness Grows Stronger:
Moving back and forth and gradually increasing the time spent with the pain
Becoming aware of both areas….casting a"sidelong glance" at the pain

Incorporating the Open Hearted Quality of Kindness Into the Practice:
Kindness is a wonderful antidote to pain and the suffering that often accompanies it
Cultivating Compassion and Gratitude for the courageous nature of our body

Take Home Lessons For Mindfulness Based Pain Relief

The pain relief obtained through mindfulness meditation does not come about by engaging any one particular brain mechanism or neural pathway to reduce pain, but rather through a combination of processes that reflect effortful reappraisal of the pain sensations

The mechanisms of mindfulness based pain relief do not necessarily reduce the intensity of the pain but they do impact the brain's contextual evaluation of the pain

Across all reported pain focused studies, mindfulness meditation impacts the affective dimension of pain (i.e. the way we relate emotionally to the pain) more so than the sensory aspects of pain

Take Home Lessons For Mindfulness Based Pain Relief

The greatest benefit of mindfulness in reducing pain comes from its ability to change the relationship between an individual and their pain (by altering their subjective perception)

There is a spillover effect of mindfulness pain relief which comes by reducing the impact of the common co morbidities so often associated with chronic pain (particularly anxiety and depression), and all of which exacerbate the pain experience

And most importantly….the ability of Mindfulness to provide pain analgesia increases over time with sustained mindfulness meditation practice….which is the complete opposite of traditional pain therapies which often plateau in efficacy as patients build up tolerance to the effects of their pain medication. And there have been no unhealthful risks of addiction or abuse ever shown from mindfulness meditation