

Mind Fitness Training: Emerging practices & Business Applications Applied Neuroscience

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Abstract

Emerging brain training research has demonstrated an enormous potential to reduce stress and promote optimal brain performance. Mindful awareness and working memory training have scientifically established the power to increase the capacity for unbiased attention to inner experience, focus attention, improve the ability to prioritize and manage tasks and goals, and enhance emotional intelligence. Brain plasticity research has led to widespread enthusiasm and a burgeoning brain training industry. However, performance improvement training methodologies in the business environment are not well defined. In an exploratory study, organizational behavior students were taught mindful awareness theory and introductory practice. At semester's end they demonstrated no significant gains in mindful awareness. In contrast, military personnel who received mindfulness based stress reduction training together with working memory training demonstrated significant performance improvement gains. This suggests that mindfulness training primarily designed to inform rather than to train in a rigorous, systematic way, will not produce desired results.

Keywords: mind fitness, applied neuroscience, mindfulness, working memory

I. Introduction

Omnipresent social networks are proving to be mixed blessing: employees produce more work in less time. However, there is meager offline time and 24/7 availability demand is common. The ensuing physical and psychological stress endangers productivity, health and relationships. "Perhaps now more than ever before, job stress poses a threat to the health of workers" (Sauter, Murphy, Colligan, Swanson, Hurrell, et al. 2010 p. 1). This frenetic pace is not only a threat to health but cognitive resource theory reports that the capacity for intelligent decision making is diminished in the presence of high stress. Self-regulating skills such as mindfulness training are increasingly recognized as an antidote to this toxic environment (Greeson, 2010, Brown, Ryan, Creswell, 2007, Kabat-Zinn, 2005). Neurological research offers mounting evidence that mindfulness practice may create new structures in the brain that help the brain to process more information more effectively (Stanley & Jha, 2009, Siegel, 2007, Jha, Krompinger, Baime, 2007, Tang, Yi-Yuan, Yinghus, Ma, Wang, Junhong, Fan, Yaxin, Feng, Shigang, et al. 2007).

Empirical evidence demonstrates that mindfulness practice increases the capacity for open, unbiased attention to inner experience, the ability to focus attention, and the ability to prioritize and manage tasks and goals (Jha, et al., 2007). Working memory training is an added dimension of brain fitness training that has been used in concert with mindfulness skills to increase overall brain fitness and performance for military personnel (Stanley, E. & Jha, A., 2009). Here we explore the efficacy of mind fitness training strategies designed to enhance the quality of life, improve performance, and reduce distress in the business environment.

2. Literature Review

2.1. Mindfulness Defined

Mindfulness or mindful awareness is operationally defined as *a receptive state of mind wherein attention is kept to a bare registering of the facts observed . . . permitting the individual to "be present" to reality as it is rather than react to it or habitually process it through conceptual filters. . . . Without the overlay of discriminatory,*

categorical, and habitual thought, consciousness takes on a clarity and freshness that permits more objectively informed psychological and behavioral responses (Brown, Ryan, & Creswell, 2007 p. 212). Mindsight, a term coined by Daniel Siegel “*to describe the capacity to look within, to perceive the mind, and to reflect on our experience . . . to have a thought and not be taken over by it . . . so that we can be receptive to the mind’s riches and not just reactive to its reflexes*”, can be the product of mindfulness practice (Siegel, D. 2010 p. xiii). In a recent mindfulness research update, Jeffrey Greeson reviewed the effects of mindfulness on the mind, body and behavior (Greeson, 2008). His review of the research indicates that mindfulness is associated with more positive states of mind and can beneficially influence the brain, the autonomic nervous system, stress hormones, the immune system, and health behaviors including eating, sleeping and substance abuse. Other researchers demonstrate that mindfulness practice can influence areas of the brain involved in regulating attention, awareness and emotion and thereby, significantly improve the efficiency of executive attention (Lutz et al., 2008, Tang et al., 2007). Although there are other methods that promote this mode of thinking/being such as yoga, tai chi, contemplative prayer and meditation; mindfulness and/or mindsight, as discussed here, is closely associated with neuroscientific research and is not based in religious or martial arts practice.

Our purpose here is to define mindfulness and mind fitness from a strictly neurological perspective. We further describe how mind fitness is related to social/ emotional intelligence and how it has also been demonstrated to improve cognitive performance under stress. Since research indicates that specific training protocols are essential for significant results, we describe training programs where mindful training is successful. We describe an exploratory study that failed to produce desired outcomes, and discuss how mind fitness training or “inner technology” might be adapted for corporations since it is not well defined nor mainstream (Brown, et al., 2007, Greeson 2008, Medina, 2008).

2.2. Current Mindfulness Applications

In the fields of psychotherapy and education, mindfulness practice has incorporated meditation and western psychological principles to produce empirically validated treatment programs designed to prevent relapse in people who have recovered from depression, to develop techniques for managing pain, to manage stress, as a form of psychotherapy for eating disorders, and as a classroom tool for assisting children with attention deficit disorders to focus (Begley, 2007, Doidge, 2007, Garrison Institute, 2005, Kabat-Zin, 2005). The Mind Fitness Training Institute has developed a 20 hour course designed to improve performance and enhance resilience for military personnel working in an extreme stress environments (Stanley, Jha, 2010).

2.3. Mindfulness and Social/Emotional Intelligence

Mindfulness is seen as a mechanism underlying social-emotional intelligence, involving complementary skills and overlapping content (Siegel, 2010). Current research has established social-emotional intelligence as a predictor of significant positive outcomes across diverse samples in a number of real world domains such as social relations, workplace performance, and mental and physical well being (Mayer, Roberts, Barsade, 2008). Individuals with high social/emotional intelligence have a greater capacity for regulating emotional responses, seeing situations from other’s perspective and managing challenging situations and people. Decision-makers with high emotional intelligence are more aware of their own strengths and weaknesses and more open to feedback from others which leads subordinates to share more information. This results in improved team cohesion and better situational awareness (Stanley, Schaldach, 2010).

Social-emotional intelligence has been defined as the ability to understand and manage men and women, boys and girls, and to act wisely in human relationships (Mayer et al., 2008, Thorndike, 1923). These skills involve self-awareness, self-regulation and motivation as well as the ability to focus attention and attend to subtle nuances of situations and interactions. Mindfulness is closely related in that it is described as the ability to step outside of the automatic, reactive thinking that limits awareness and conscious choice (Siegel, 2007). Social-emotional intelligence defined as the ability to carry out accurate reasoning about emotions (Goleman, 2006) then mindfulness holds keys to enhancing it. Since this skill is critical to optimal business performance, the challenge is to translate this knowledge from the world of neuroscience to world of business so that best methods of acquiring these skills can be developed.

2.4. Intelligence and Mindfulness

The plethora of “intelligences” in business literature has contributed to the lack of serious consideration for emotional/social intelligence and mindfulness that other more scientifically validated theories command.

“At one time, everyone pretty much knew what it meant to be smart in lay terms. Intelligence was thought of as stuff that people had in differing degrees, it was something you were born with and it was immutable” (Gopnik, 2006, p. 58). The discovery of neuroplasticity – the capacity of the brain to change and improve throughout life – is turning current intelligence theory on end (Wallace, 2006). Mindful awareness research that is closely connected to neuroscience by psychiatrist and neuroscientist Daniel Siegel (*The Mindful Brain*, 2007) and others such as Sharon Begley (*Train Your Mind: Change Your Brain*, 2007), Norman Doidge (*The Brain that Changes Itself*, 2007), Ellen Langer (*The Power of Mindful Learning*, 1997) and Alan Wallace (*The Attention Revolution*, 2006) has begun to bridge the gap between the sociological and “hard” cognitive behavioral scientific views. Mindfulness research cited here is scientifically validated. Scientific advances such as CAT and PET scans enable researchers to map neurological changes in the brain that can be attributed to mindful awareness practice (Begley, 2007, Doidge, 2007, Siegel, 2007). It is increasingly evident that mindful awareness is not only a corrective treatment for disorders and a component of health and well-being; it contributes to optimal mental functioning (Siegel, 2010).

2.5. Integrating Mind Fitness with Cognitive Activity

Ways in which rational cognition and mindful awareness (sensorimotor data that includes emotions) interact to enhance or restrict logical thought have not been clearly understood in the past (Siegel, 1999). Current psychological, educational, and neurological research is making the case that sensorimotor/emotional data is inextricably linked to cognition and therefore logical thinking and intelligence. However, in contemporary business texts, emotions and perceptions are often discussed as discrete themes: emotions, moods, personality characteristics, anger management, stress reduction, emotional labor, perceptions, attribution theory, etc. (Robbins & Judge, 2009, Nelson & Quick 2009). This continues the long scientific tradition of studying the mind and body separately.

Working memory is an important added element of trainable, high performance brain capacity or mind fitness. It may be enhanced through attentional control that is improved through mindfulness practice. Fluid intelligence, measured as memory capacity and speed of reasoning, is “*the ability to reason and solve problems independently of previously acquired knowledge*” (Jaeggi, et al. 2008 p. 1). Since researchers are now able to track changes in the brain, they can assess improvements in working memory capacity due to mindful awareness practice. Jaeggi et.al demonstrated in 2008 that increases in working memory and therefore fluid intelligence are possible. This research is groundbreaking because it demonstrates brain plasticity - that is it is possible to improve working memory or fluid intelligence even though it was previously thought to be immutable. Recent neuroscientific research suggests that “working memory” or “thinking in the moment” is related to success in complex and demanding environments” (Jaeggi et al., 2008) and therefore ,extremely relevant in the business world.

2.6. Current Research on Mind Fitness Training for Business Education

Current research examines whether or not mind fitness through mindful awareness training will demonstrably improve performance on tasks that require skills in sustained attention, switching, inhibition of elaborative processing and adopting a wider perspective. All of these skills contribute to greater mental acuity (Bishop, Law, Shapiro, Carlson, 2004). A Penn State study examined whether or not meditation through mindfulness training could modify the three subcomponents of attention: 1) including the ability to prioritize and manage tasks and goals, 2) the ability to voluntarily focus on specific information, and 3) the ability to stay alert to the environment. Researchers found that training that included 30 minutes a day of daily mindful awareness meditation for eight weeks enhanced performance and the ability to focus attention (Jha, et al., 2007).

This research supports earlier studies demonstrating that the practice of intentional focus on sensory experience results in synaptic changes that restructure the brain. Synaptic brain changes are documented by neuroscientific studies that show an altered brain. (Begeley, 2007, Doidge, 2007, Siegel, 2007, Wallace, 2006). Mindful awareness practice for neurological fitness can be compared to physical exercise to build strength and endurance (Greeson, 2008, Siegel, 2007). Mindfulness-based Mind Fitness Training (MMFT) is a program developed for the military that cultivates situational awareness, mental agility, and adaptability. Soldiers in battle must demonstrate extraordinary attentional capacity, self-awareness and situational awareness given the challenging, high stress, and complex environments in which they operate. Research demonstrates that trauma and stress lead to deficits in cognitive functioning. When there is low stress intelligence is fully functional and makes an optimal contribution. However, during high stress, natural intelligence not only makes no difference, but it may also have a *negative* effect.

One reason for this may be that an intelligent person seeks rational solutions, which may not be available (and may be one of the causes of stress). In such situations, a leader who is inexperienced in 'gut feel' decisions is forced to function in an entirely unfamiliar situation. Another possibility for ineffective decisions may be that the leader retreats within him/herself, to think hard about the problem, leaving the group to their own devices. Working memory capacity here is defined as the ability to maintain relevant information online while resisting interference from irrelevant information (Stanley & Jha, 2009, p 148). MMFT programs are designed to give warriors skills that optimize performance by maintaining or increasing baseline levels of working memory capacity and protecting against the stressors of deployment. They include techniques and exercises that research has proven to be effective at enhancing capacities central to mind fitness by changing brain structure and function so that brain processes are more efficient. Pilot research suggests that MMFT is successful at bolstering mind fitness and building resilience against stressors (Stanley & Jha, 2009).

3. Mindful Awareness Training in Business Education: An Exploratory Study

Some researchers have suggested that simply understanding how the brain works will assist people to become mindfully aware or that some people are inherently more mindful than others. Studies indicate that systematic practice is required to improve mindfulness. If so, how much practice? In an attempt to measure the minimum exposure necessary to change cognition, a study was conducted using classes of undergraduate business students. It was hypothesized that a lecture about brain function and mindful awareness plus an introductory meditation exercise and random reminders to practice during a sixteen week semester would evoke measurable changes of mindful awareness levels in students as evidenced by the Baer (2006) self report questionnaire.

3.1. Method

In this effort to increase mindful awareness in undergraduate business students, a random sample of 70 students enrolled in an organizational theory course was introduced to mindful awareness practice with a brief lecture. The Baer Five-facet Mindfulness Questionnaire (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006) was administered as a pre-test. The students then participated in a brief meditation exercise provided by the Mindful Awareness Research Center (MARC) at UCLA. Students were encouraged to continue this practice on their own using the MARC on-line meditations as a guide to practice. On a random basis during the course of a sixteen-week semester, reminders to meditate and references to the benefits of mindfulness and ties to social-emotional intelligence were included with course material. At the end of the semester the same questionnaire was administered as a post-test to determine whether or not this exposure to mindful awareness was sufficient to produce a measureable result.

3.2. Survey Instrument Discussion

The Five-facet Mindfulness Questionnaire (FFMQ) (Baer, et al., 2006) was used to operationalize mindfulness in this study. The actual questions are included in Appendix 1. The questionnaire used a five point Likert-type scale. Questions from five psychometrically sound, independently developed questionnaires were empirically examined by Baer et al. and were used in the development of this questionnaire so that the psychometrical soundness was reasonably established before combining all items from the five surveys into a single data set. Baer's et al., (2006) exploratory factor analysis and correlational analysis established a five-facet structure for this aggregated data pool. These factors include: 1) nonreactivity to inner experience 2) observing, noticing, attending to sensations, perceptions, thoughts and feelings 3) acting with awareness (non automatic pilot / concentration/ non distraction 4) describing, labeling with words 5) non judging of experience.

The five identifiable elements were internally consistent and only slightly correlated with one another (.34 $p < .01$). The alpha values for the five subscales included: nonreactivity = .75, observing = .83, acting with awareness = .87, describing = .91, and non-judging = .87. Regression analysis run on each facet demonstrated substantial non-overlapping content. The adjusted R² value ranged from .12 to .23. These values were then subtracted from the corresponding alpha values to establish the systematic variance of the facet. These results ranged from .56 to .75, thus demonstrating non-overlap. Baer et al. then employed confirmatory factor analysis to establish validity of this structure using an independent sample of 268 graduate psychology students. The FFMQ was chosen for this study as it demonstrates reasonable psychometric properties and is currently the only instrument that assesses all five of the mindfulness facets.

3.3. Results

In analyzing this data comparison, it is important to note that this is a dependent sample. In other words, the class completed the questionnaire for a pre-intervention benchmark. The students then attended the lecture and meditation exercise and were reminded randomly by the instructor to meditate during the 16 week course. The same questionnaire was administered at the end of the course. A t test: two –sample assuming equal variance was used to determine if the pre-post test differences were statistically significant. The pre-test and post-post test score differences were not statistically significant at either the .05 or .10 levels of significance.

Statistical analysis adjusting for gender and GPA were also analyzed with no significant results. Correlation analysis was used to determine if there was a strong statistical correlation between gender and GPA and post intervention score. Both gender and GPA had a very weak correlation to the post intervention score. In fact, the multiple coefficient of determination is .27. Hence 27% of the post intervention score is directly attributable to gender and GPA, and 73% is due to other factors. The multiple coefficient of correlation is .07. This measure is a number between -1.0 and + 1.0 that indicates the strength of the statistical relationship between the gender and GPA and the post intervention score. The closer to 0, the weaker the statistical correlation. Data analysis of the pre-test and post-test demonstrated that there was no significant change and there is a positive relationship between the pre-test and the post-test.

3.4 Justification for Statistical Methodology

The fact that this is a dependent sample is important because we have a pre-test and post-test situation using the same test subjects in the sample. We have a small sample as well so the t distribution is appropriate. The t-test 2 sample assuming equal variance is appropriate because of the small, dependent sample utilizing a pre-test post-test for comparison. Correlation analysis was used to determine if there was a statistically significant correlation between test results and GPA or gender. Results found no correlation for either factor.

3.5. Discussion

These results indicate that neural restructuring is not accomplished by traditional classroom instruction but most likely requires systematic, effortful practice to produce significant results. As stated earlier, one study reports significant improvement (i.e., enhanced performance, the ability to focus attention, prioritize and manage tasks and goals) within 8 weeks practicing 30 minutes per day (Jha, et al., 2007). The MMFP training reported that training effectiveness was dosage dependent. That is, stress management and cognitive performance in Marines who practiced Mindfulness Based Mind Fitness Training more hours was superior to those soldiers who practiced fewer hours (Stanley & Jha, 2009)

3.6 Limitations of This Study

Subjects that comprised the sample were an issue and a substantial limitation of this exploratory investigation. Though adequate for an exploratory study the sample size is small, a larger sample size would allow for confirmatory analysis. More data would allow for regression analysis which would help develop a causal model. In addition, the students had no prior exposure to mindfulness and had not contracted with the instructor to participate in a disciplined study. One important consideration for future research would be to select subjects from the business environment who make a deliberate choice to devote the time and effort required. Also, more thought should be given to improving assessment instruments. Rather than using one self-report questionnaire, multiple assessments such as the Profile of Mood States Scale, the Attention Network Test, and measures of stress related cortisol might be considered since they were used successfully in the Tang, et al. study (2007).

These results provide a challenge for training and development professionals should the benefits of brain training be widely recognized since traditional business education workshops are usually conducted without daily practice. Introducing mindfulness training in organizations is also problematic because it may be considered intrusive. One can understand that feeling because this training affects the way one thinks. However, opportunities for introspection do not force a philosophy. At Green Mountain Coffee employees are given time to avail themselves of mindfulness training that is part of a self-selected employee development program. No one is required to participate but it is recognized as an organization value (Stanford 2008). Another company that is promoting information about healthy minds in noon sessions is Google (Google, 2008). If the benefit of mindful meditation practice was understood in the same way that the benefit of physical fitness is appreciated, it would be more widely encouraged than it is presently.

3.7. Future Research

Mindfulness training has been documented to increase mental acuity in business thinking skills such as the ability to prioritize and manage tasks and goals, the ability to voluntarily focus on specific information, and the ability to stay alert to the environment. Since these skills are dependent on attentional control, we suggest that a fruitful area for future research might be to develop business training that combines working memory training together with mindfulness training as described in the MMFT program (Jha, et al., 2007). Another consideration for future research might be who might best benefit? Would high performance teams or specific managerial levels in organizations be prime candidates? Would a focus on certain types of information, in specific environments or performance goals be critical? For example, MMFT blended mindfulness skills training with concrete applications for the operational environment and information and skills about stress, trauma, and resilience in the body (Stanley & Jha, 2009).

Valid and reliable research is needed that replicates existing studies and refines the training process so that it fits the business environment. There are many questions about the recent significant findings such as: how long do training effects last and who best benefits? Carefully designed brain science training appropriate to a business environment may demonstrate that gains in social, emotional, and fluid intelligence can be achieved with significant results. A successful study should demonstrate measureable improvement in the overall health and well being of the subjects as well as a measureable improvement in job performance. Longitudinal research would also be desirable to determine whether or not improvements are permanent or transitory.

3.8. Conclusion

Appreciation for brain science and the ways in which mind fitness can be enhanced is relatively new to the business world. A few organizations are aware. Google's "How to care for your big, wonderful, high performance brain" (Google, 2008) and Green Mountain Coffee (Stanford, 2008) are examples of organizations that offer information and formal training about how to optimize cognitive function. The Joint Forces Quarterly describes military mind fitness training that improves operational effectiveness and warrior resistance to the physical and mental effects of stress (Stanley & Jha 2009). This research suggests that perhaps this skill development should not be attempted in a traditional classroom as part of knowledge based curriculum or offered in the popular one session lunch hour format. Unless training is systematic, effortful, and of sufficient duration to effect neurological change; the effort, time and resources directed toward this type of business education could be ineffective and wasteful.

Mind fitness training has enormous potential to improve overall performance as well as health and well-being in the workplace. The possibilities are, in fact, awesome. The danger is, however, that brain training is quickly becoming a fad. For example, even though more research is needed to refine brain-training efficacy, multimillion-dollar businesses have sprung up. Before the advent of wellness programs, workout rooms, and healthy nutrition, emphasis on healthy lifestyles was not as common as it is today. Similarly, as neuroscience makes brain fitness research increasingly available, mind fitness training should become more adapted to business. Although the potential benefits of mind fitness are enormous, mind fitness training should be viewed with caution unless it is based on thorough research, careful design, and systematic training.

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Appendix 1.

Pre/Post Test

Five Aspects of Mindfulness (Baer, et al., (2006)

Circle the response that most clearly describes your experience

5 being the closest to your experience

Nonreactivity to inner experience

I perceive my feelings and emotions without having to react to them 1 2 3 4 5

I watch my feelings without getting lost in them 1 2 3 4 5

In difficult situations, I can pause without immediately reacting 1 2 3 4 5

Usually when I have distressing thoughts or images

. . . I am able to notice them without reacting 1 2 3 4 5

. . . I feel calm soon after. . . . 1 2 3 4 5

. . . I step back and am aware of the thought or image
without getting taken over by it 1 2 3 4 5

. . . I just notice and let them go 1 2 3 4 5

*Observing/ noticing/ attending to
sensations, perceptions, thoughts, feelings*When I am walking, I deliberately notice the sensations
of my body moving 1 2 3 4 5When I take a shower or a bath, I stay alert to the
sensations of my body 1 2 3 4 5I notice how food and drinks affect my thoughts,
bodily sensations, and emotions 1 2 3 4 5I pay attention to sensations, such as the wind in my hair
Or the sun on my face 1 2 3 4 5I pay attention to sounds, such as clocks ticking, birds chirping
or cars passing 1 2 3 4 5

I notice the smells or aromas of things 1 2 3 4 5

I intentionally stay aware of my feelings 1 2 3 4 5

I notice the visual elements in art or nature, such as
colors, shapes, textures or patterns of light or shadow 1 2 3 4 5

I pay attention to how my emotions affect my thoughts and behavior 1 2 3 4 5

*Acting with awareness/ automatic pilot/
Concentration/nondistracted*

I find it difficult to stay focused on what's happening in the present 1 2 3 4 5

It seems I am running on "automatic" without much awareness
of what I'm doing 1 2 3 4 5

I rush through activities without being attentive to them	1 2 3 4 5
I do jobs automatically without being aware of what I am doing	1 2 3 4 5
I find myself doing things without paying attention	1 2 3 4 5
When I do things my mind wanders off and I am easily distracted	1 2 3 4 5
I don't pay attention to what I'm doing because I am daydreaming, Worrying, or otherwise distracted	1 2 3 4 5
I am easily distracted	1 2 3 4 5

Describing / labeling with words

I'm good at finding words to describe my feelings	1 2 3 4 5
I can easily put my beliefs, opinions, and expectations into words	1 2 3 4 5
It's hard for me to find words to describe what I am thinking	1 2 3 4 5
I have trouble thinking of the right words to describe how I feel about things	1 2 3 4 5
When I have a sensation in my body it's hard for me to describe it because I can't find the right words	1 2 3 4 5
Even when I'm feeling terribly upset, I can find a way to put it into words	1 2 3 4 5
My natural tendency is to put my experience into words	1 2 3 4 5
I can usually describe how I feel in the moment in considerable detail	1 2 3 4 5

Nonjudging of experience

I criticize myself for having irrational or inappropriate emotions	1 2 3 4 5
I tell myself I shouldn't be feeling the way I am feeling	1 2 3 4 5
I believe some of my thoughts are abnormal or bad and I shouldn't think that way	1 2 3 4 5
I make judgments about whether my thoughts are good or bad	1 2 3 4 5
I tell myself I shouldn't be thinking the way I am thinking	1 2 3 4 5
I think some of my emotions are bad or inappropriate and I shouldn't feel them	1 2 3 4 5
I disapprove of myself when I have irrational ideas	1 2 3 4 5
Usually when I have distressing thoughts or images, I judge myself as good or bad, depending what the thought/image	1 2 3 4 5