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PG Cert/PG Dip/MSc Assessment

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Mindfulness Based Stress Reduction (MBSR): Evidence for improved biological stress markers

Introduction

In recent history, there has been an increase in the number of eastern cultural and medicinal practices that have been adopted into western culture. Mindfulness and meditation have gained tremendous momentum in recent decades as a means of reducing stress among a host of other potential benefits. (Trousselard, Steiler, Claverie, & Canini, 2014) Mindfulness conceptualization and practice originate from various extant religions such as Hinduism, Buddhism, Judaism, Islam, and Christianity. The concept is far more explicit in Hinduism and Buddhism when compared to other mainstream religions although the notion itself seems to be universal. (Siegling & Petrides, 2014) Mindfulness is generally considered a state of being that one strives to apply throughout life. In western psychology, there is a consideration of mindfulness as a trait not unlike personality traits, implying some degree of inheritance.

The popularization of mindfulness in the west is attributed to Jon Kabat-Zinn along with other notable figures, most of which studied under Buddhist practitioners. Jon Kabat-Zinn is best known for Mindfulness Based Stress Reduction (MBSR), a stress reduction practice that originated around 1979. MBSR incorporates Buddhist philosophy and meditation practice in the context of western society. Purser & Milillo (2015) reference Jon Kabat-Zinn's definition of mindfulness which is described as "paying attention in a particular way: on purpose, in the present moment, and nonjudgmentally", although the acceptance of this definition is questioned in the same article. The historical interpretation of mindfulness is not as clear, is somewhat paradoxical, and does not lend itself easily to the western scientific lens. That being said, there has been a surge of research in this area and attempts to understand this longstanding practice in the context of stress are abundant.

Stress

Stress plays an important role in growth and survival, although it can also be detrimental even debilitating. (Salleh, 2008) For example, acute stress from challenging life experiences will prompt an organism to mobilize systems that aid in resilience throughout the adaptive process. However, excessive amounts of acute stress or long bouts of chronic stress reduce adaptability, perpetuate pain, and result in a destructive internal environment. The growing number of stress related disorders certainly play a role in the popularization of mindfulness and meditation. The World Health Organization (WHO)(n.d.) estimates that the global cost of stress in terms of lost productivity is upwards of $1 trillion/year. James et al. (2018) conducted a review of the 2017 Global Burden and Disease study; authors suggest that mental and substance use disorders alone strongly warrant delegation of resources to mental health services. Stress is highly implicated in each of those disorders and seems to be correlated with physical illness in varying degrees. Thus, the true cost of stress may not be truly reflected in the data.

Researchers must also consider the condition of the organism and its ability to tolerate stress as this would certainly alter the interpretation of stress on a case-by-case basis. Stress disorders are typically seen as psychological in nature and imply the presence of anxiety, depressive, and/or psychotic disorders. However, the physical toll that stress or perceived stress can have on the body is undeniable. This shift toward an integrated mind-body system has prompted many researchers to devise studies that observe an independent variable that is psychological in nature with biological markers as the dependent variable(s). MBSR provides an appropriate program to use as a standard in biological stress research.

MBSR & Biological Stress Markers

Biological stress is measured using specific biomarkers that typically occur in one or more of the following categories: cellular oxidation, systemic inflammation,

cardiopulmonary, immunologic, gastro-intestinal, endocrine, neurologic structure/function, and epigenetic responses/alterations. Most of the metrics that have been used in MBSR research fall under cardiopulmonary, immunologic, neurologic, and endocrine categories. (Parswani, Sharma, & Iyengar, 2013) A recent study used MBSR in a randomized controlled trial with thirty patients suffering from coronary heart disease (CHD). Researchers randomly assigned participants to MBSR intervention (n=15) or a treatment as usual (TAU) group (n=15) and observed four outcome measures: hospital anxiety and depression scale (HADS), perceived stress scale (PSS), blood pressure, and body mass index. After statistical analysis authors found that there was a significant shift in all outcome measures for the MBSR group compared to the TAU group. The main limitation here is that the intervention group received support external to the benefits of mindfulness simply by attending an MBSR program whereas the control had an 8-week wait period.

In 2016, O'Leary, O'Neill, & Dockray conducted a systematic review of six studies using salivary cortisol as a primary measure. Five of the studies analyzed for the cortisol awakening response (CAR) which is believed to be correlated with reactivity of the hypothalamic-pituitary-adrenal (HPA) axis, a primary system in stress response. Three studies in the review measured cortisol diurnal slope, which is a measure of cortisol decrease throughout the day, a function in healthy adults. Time of measurement and sampling method varied between studies which presents a challenge when interpreting data. Authors of the review found that the data indicates that mindfulness is beneficial for participants although the impact of cortisol levels and mental distress don't always correlate. This may be due to methodological issues, metric choice or inefficient sampling. (Hellhammer, Wüst, & Kudielka, 2009) Measuring cortisol via salivary samples has questionable validity though it is widely accepted as a useful metric in understanding stress response.

Hoge et al. (2018) sought to measure the effect of MBSR on seventy-two patients diagnosed with generalized anxiety disorder (GAD) in a randomized controlled trial. Researchers measured endocrine (adrenocorticotropin hormone (ACTH), cortisol) and immunologic (tumor necrosis factor alpha and interleukin 6) response. Participants were in either an MBSR intervention group (n=43) or a stress management education (SME) group (n=29). All participants were administered the trier social stress test (TSST), a test meant to replicate real-world stress. Blood samples were collected and analyzed after each TSST (pre and post intervention). The data indicated that the MBSR intervention group had significant improvement in each of the outcome measurements. The SME group samples post intervention showed an increase in ACTH and the other three measurements showed little to no change. Authors of the study controlled for additional effects inherent in any intervention by having the control group participate in a stress management education course. Though the results are positive, and the reduced physiological stress is remarkable, ultimately this study observed lab stress which would seem to lack a degree of applicability in real-world circumstances.

Davidson et al. (2003) devised a study studying healthy participants and the effects of MBSR in a work environment. The MBSR group (n=25) was compared against a wait list control group (n=16). Authors of the study measured brain electrical activity via electroencephalography and electrooculography. They found that there was greater left-side anterior activation in the brain. Authors suggest that this shift in relative activation could be describing greater propensity towards positive stimuli as well as adaptability in the presence of negative stimuli. Additionally, immunologic response to the influenza vaccine was measured by antibody titers via blood draw. A baseline measurement was collected between weeks 3 and 5; samples were collected again after participants received the influenza vaccine. Those that were in the MBSR group had a greater number of antibody titers in response to the

vaccine when compared against the wait list control group suggesting greater resilience in this instance. This study provides an excellent high-level view of brain activity in combination with immune response to a stressor. Authors acknowledge that conducting an MBSR program in a busy work environment may have an impact on results. Furthermore, it is difficult to accurately account for confounding variables as is the case with any study conducted outside of laboratory conditions. Overall, the study displayed a remarkable shift in the MBSR intervention group.

Conclusion

Although it's early in mindfulness research, MBSR seems to be highly beneficial for participants not only subjectively but biologically. The various biological stress markers measured among the studies discussed previously provide a comprehensive view of physiologic response to MBSR training. Collectively, this data suggests that there is a positive shift in four of eight major biological systems. Mindfulness research lacks consistent methodological approach which makes replication difficult, resulting in confounded interpretations. MBSR provides a means of training and promoting mindfulness as a lifelong practice. Many of the studies are relatively brief and in the context of a lifelong practice short term measurements would be unlikely to reflect long term cumulative improvements. Despite the relatively brief nature of some studies, MBSR group participants still showed marked improvement in biological stress markers. Each of the studies recommend that further research needs to be conducted in order to verify findings. MBSR provides a standard for research and overtime researchers must agree and adhere to a standard methodological approach.

It would seem that given the life-long nature of mindfulness practice an 8-week intervention could only accomplish so much and this is true although it provides an excellent base for participants to continue their practice well after the MBSR program. Research has

consistently shown that MBSR has a positive impact on biological stress. The potential that can be found in this program and mindfulness practice at large is tremendous and those that take up the practice will likely benefit from it.

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