International Journal of Physical Education and Sports Sciences

Vol. 10, Issue No. 17, July-2016, ISSN 2231-3745

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AN INTERNATIONALLY INDEXED PEER REVIEWED & REFEREED JOURNAL

www.ignited.in

International Journal of Physical Education and Sports Sciences
Vol. 10, Issue No. 17, July-2016, ISSN 2231-3745

A Research on Various Consequences of Yoga Practices on Stress and Heart Rate Variabiligy

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Abstract – Mental health professionals experiencing work-related stress may experience burn out, leading to a negative impact on their organization and patients. The aim of this study was to examine the effects of yoga classes on work-related stress, stress adaptation, and autonomic nerve activity among mental health professionals. Physical activity (PA) and exercise are often used as tools to reduce cardiovascular stress and therefore the risk for developing cardiovascular diseases. Meanwhile, heart rate variability (HRV) has been utilised to assess both stress and PA or exercise influences.

Mindfulness meditation has beneficial effects on brain and body, yet the impact of Vipassana, a type of mindfulness meditation, on heart rate variability (HRV) – a psychophysiological marker of mental and physical health – is unknown. We hypothesised increases in measures of well-being and HRV, and decreases in ill-being after training in Vipassana compared to before (time effects), during the meditation task compared to resting baseline (task effects), and a time by task interaction with more pronounced differences between tasks after Vipassana training.

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INTRODUCTION:-

Helping behaviors occur when people decide to provide assistance and then carry out an action. The decision and process of helping behaviors involves complex social cognition and rational decision making. In current society, the assistance in which mental health professionals provide patients with problems of daily living is increasing in importance. However, mental health professionals are subjected to persistent and repeated emotional stress due to intensive and lengthy interactions with patients, resulting in the phenomenon of professional burnout. Findings from a study by Sahraian, Fazelzadeh, Mehdizadeh, and Toobaee (2008) indicated thatmental health professionals showed significantly higher levels of emotional exhaustion and depersonalization in comparison with those working in other specialties. In the highly specialized field of mental health, professionals who are often under time constraints experience stress when dealing with complex patients who are potentially violent or are at risk for suicide. Mental health professionals including psychiatrists, nurses, psychologists, social workers, advanced practice nurses, and occupational therapists are often called upon to maintain a positive attitude and enthusiasm, especially in the face of multiple accreditation inspections and high work demands. Work-related stress develops gradually and affects both the physical and mental health of those experiencing it, which can eventually lead to burnout. Work-related stress symptoms include insomnia, sleep disturbances, menstrual disorders, body weight fluctuations, irritation, and depression (Bauer et al., 2003). Burnard (1991) described how work-related stress directly affects the physical and mental health of mental health professionals and indirectly affects the organization and even the patients.

If work-related stress and stress adaptation ofmental health professionals was better understood, more assistance could be provided to them to assist them in handling their stress, maintaining their enthusiasm, and engaging in their work. Yoga is a body–mind exercise which promotes physical, mental, and spiritual relaxation by way of Asanas (bodily positions of stretching, breathing and meditation; Bhavanani, Ramanathan, Balaji, & Pushpa, 2014). Through yoga practice, individuals may be able to work better in highly stressful situations (Louie 2014). Knobben (2013) carried out a literature review of 32 studies that examined the effects of yoga on quality of life and improvement of mental health in healthy people and patients. They found that yoga had an effect of .49 (49%) improvement on depression. They concluded that yoga was an effective exercise program for all populations, including healthy people and patients with mental illness or somatic illness. Lavey et al. (2005) also demonstrated that yoga exercise significantly improved the symptoms in psychiatric patients.

Studies of yoga effects on work-related stress in the medical field focus primarily on nursing staff. Few

studies have measured effects of yoga on work-related stress and stress adaptation in different mental health professionals, particularly those in Chinese societies where Daoism religion is popular. Daoism emphasizes living a harmonious life with compassion, moderation and humility. These tenets of Daoism may enhance the effects of yoga practice. We conducted a pilot study of a yoga program for mental health professionals in our institution. The participants perceived positive feelings after the yoga practices and expressed “the mood is more relaxed” and “yoga helps to modify long-lasting poor standing or sitting postures.” For this reason, we hypothesized that yoga could effectively reduce the work-related stress of mental health professionals by well designed and implemented yoga classes, which could provide a suitable means of stress adaptation for health professionals.

Based on this hypothesis, our aim was to investigate the effects of yoga on work-related stress, stress adaptation, and balance of autonomic nerve activity amongmental health professionals including psychiatrists, nurses, psychologists, social workers, and occupational therapists. It also was hoped that the improvement of work-related stress would be correlated with balance of heart rate variability (HRV) for better stress adaptation. Therefore, this study had three objectives as listed:

(1) Work-related stress and stress adaptation of mental health professionals in the experimental group will be significantly improved after yoga intervention.

(2) Work-related stress and stress adaptation of mental health professionals in the experimental group will be significantly improved after yoga intervention compared to those in the control group.

(3) The HRV indexes, comprised of sympathetic (LF) and parasympathetic (HF) nerve functions as well as autonomic nerve activity (LH/HF), of the mental health professionals in the experimental group may be significantly improved after yoga intervention compared to those in the control group.

World health is in transition. In this busy age prevalence of sedentary life style is increasing and so are the associated lifestyle disorders. Anxiety, stress, depression, mental tension, obesity, hypertension and diabetes have become almost inevitable companions of human life. Studies have shown links between chronic life stress and cardiovascular diseases.

The study of heart rate variability (HRV) offers insight into the autonomic control of the heart. Sympathetic activation and a reduction in parasympathetic modulation is one important pathway where a significant portion of cardiovascular risk is conferred . Reduced HRV (lower vagal tone) is associated with diabetes, hypertension, obesity, high cholesterol, physical inactivity, smoking and advanced age. Among the various risk factors, physical inactivity is an important risk factor and modification of this risk factor reduces cardiovascular risk, morbidity and mortality.

Cardiorespiratory and autonomic functions are predictors of overall long term survival rates and could be used as a tool to assess health status of an individual. It is pointed out in many studies that there is an urgency to reach a better understanding of the relationship of impaired functions of body to disease in order to undertake preventive measures.

Pursuing a physical activity such as sport and yoga which could help in achieving efficient cardio respiratory functions and optimal sympathovagal balance is an essential preventive strategy. There are several studies, which have shown improved autonomic function in athletes and yoga practitioners. However there is no study, which has compared them with each other and with sedentary workers. This study aims to examine the physiological variables in regular practitioners of yoga, and to compare these variables with regular runners, and with who have no regular health promoting practice. This design is meant to highlight the specificity of potential differences among individuals who practice yoga, running and those who do not.

PHYSICAL ACTIVITY AND HEART RATE VARIABILITY

The adaptive process by which an organism maintains homeostasis is known as allostasis with variable allostatic loads commonly experienced by humans (Frodl and O’Keane, 2012). When exposure to chronic stress becomes excessive, the allostatic load experienced may promote important alterations in stress sensitive systems that are intimately linked to the pathophysiology of many diseases. The most studied of all stress related disorders is cardiovascular disease (CVD), which has been highlighted as the leading cause of mortality worldwide (WHO, 2011). Previously, stress experienced by a person at their place of employment or work has been suggested to substantially increase their CVD risk (Thayer et al., 2010) with the risk of coronary heart disease being increased by 50% among workers.

Physical activity (PA) and exercise have been extensively recognized as important influences on the relationship between psychosocial stress and CVD (Hamer, 2012) probably because of its influence on physical fitness. Thus, it would be expected that more active individuals, who conversely possess higher physical fitness, would be more resilient to mental stresses. In this regard, interventions that involve PA in conjunction with other beneficial practices (e.g.

social support) in the workplace may be very effective for the control of allostatic load at an individual level.

However, the expected greater stress resilience in those individuals with a greater physical fitness has been questioned as the stress-buffering effect of physical fitness has not always been demonstrated. This lack of demonstration may be related to methodological constraints of previous studies with further studies warranted to elucidate the important role that PA and exercise could have on workers cardiovascular health, potentially as an important stress-buffer.

Heart rate variability (HRV) is an easy and non-invasive tool for the assessment of variations in beat-to-beat intervals and autonomic nervous system activity with HRV obtained by linear methods within the domains of time and frequency analyses and nonlinear methods. HRV has been studied extensively in regards to CVD, exercise, and stress.

MINDFULNESS MEDITATION, WELL-BEING, AND HEART RATE VARIABILITY

In the last two decades, psychological interventions derived from mindfulness meditation practices have been increasingly used to treat

a variety of stress, pain and anxiety-related conditions. Mindfulness refers to the state of being attentive to and aware of what is taking place in the present; mindfulness meditation comprises a variety of techniques that help focus attention in a non-analyticalway and avoid discursive, persistent, or obsessive thoughts. These techniques – such as quieting the mind, and exercising self-control – can have a profound influence on mind and body, and show promise as an alternative tool to regulate emotions, mood, and stress. However, the acute and longer term concomitants of mindfulness meditation training, and potential mechanisms of action are still not well understood. In particular, there is a need to further understand the effects of meditation on the autonomic nervous system, a major component of emotional experience. While limited research has examined the effects of Zen meditation, different styles may have distinctive effects. For instance, Zen meditators show distinctive respiration changes that are not evident in other styles such as yoga (Sarang and Telles, 2006) or traditional Chinese practices (Tang et al., 2009). Here we examine the impact of a particularly intensive form of mindfulness meditation – Vipassana – on heart rate variability, an important psychophysiological marker of mental health and wellbeing.

Meditation and well-being - One of the goals of mindfulness is to allow thoughts to arise, be examined dispassionately, and allowed to fade, without practitioners being emotionally influenced by their contents. This process is a fundamental part of Vipassana meditation. This technique is also similar to the reappraisal strategy for emotion regulation, which can serve to decrease subjective, physiological and neural responses, rather than increasing them as is the case with emotion suppression.

Mindfulness techniques appear to be linked in a variety of ways to well-being. Important behavioural examples include reduction in distractive and ruminative thinking and symptoms of anxiety and mood disorders, and improved emotion regulation. Individual differences in the ability to regulate emotional responses are also related to differences in mindfulness, even in non-meditators. These findings suggest the possibility that mindfulness meditation influences well-being via changes in emotion regulation.

Furthermore, trait mindfulness was associated with wider prefrontal and diminished amygdale activity during an affect labelling task in non-meditators, suggesting a possible mechanism for the role of mindfulness in emotion regulation.

Well-being and heart rate variability - Heart rate variability (HRV) is a measure of beat-to-beat variability in heart rate that is mediated by the autonomic nervous systems. Parasympathetic influence on HRV is primarily mediated by the vagusnerve, which can provoke rapid changes from cardiac cycle to cardiac cycle, and is primarily responsible for fluctuations in respiratory sinus arrhythmia (RSA) and high frequency HRV (HF). Sympathetic influence is primarily controlled by release of norepinephrine and catecholamines, precluding direct manifestation in short term fluctuations Sympathetic neural activity can alter cardiac behaviour only slightly from beat to beat, and thus RSA measured through HF HRV is often used as a biomarker of pure PNS activity. That is, the level of vagal outflow will be reflected in the magnitude of RSA, which is typically measured at the speed of normal breathing, at cycles from approximately 3 to 7 s (i.e. 0.15–0.4 Hz). THM, on the other hand is component of low frequency (LF) HRV which reflects an oscillation of arterial pressure. Recent studies suggest that low frequency power more closely approximates baroreflex outflow, rather than sympathetic activation (Goldstein et al., 2011).

Meditation and HRV - The effects of Vipassana on HRV have not to our knowledge been systematically researched, although several other mindfulness based meditation techniques have been examined in more detail in novice and experienced meditators.

The acute task-related cardiovascular effects of Zen meditation compared to resting baseline in practitioners with varying levels of experience have been better studied than Vipassana. Lehrer et al. (1999) found that respiration rates fell dramatically during Zen breathing meditation in experienced meditation practitioners. High frequency (HF) HRV decreased as a percentage of total variance (although there were no significant changes for absolute HF power). Total heart rate (HR) oscillation amplitude increased, as did absolute low frequency (LF) power — reflecting a shift in RSA towards lower-frequency waves. These findings confirmed that Zen breathing meditation results in an increase in low and very low frequency HR oscillations, shifting the majority of HRV spectral power into the low frequency band. Within-subjects shifts in RSA during Zen meditation compared to resting baseline varied with experience. Strong HF oscillations were observed in novices; while for the most experienced practitioners, variance centred in the LF range and was linked to RSA, being associated with decreased breathing rate during meditation (Peressutti et al., 2012).

METHODOLOGY

This study was a single-blind, parallel-arm randomized controlled trial in which the analyzer was unaware of which group was the experimental or control group. The intervention consisted of a series of weekly, 60-minute yoga classes over a 12-week period. Those who were assigned to the control group participated in a free tea time during which they watched television and did not exercise. The participants each signed an informed consent prior to enrolling in the study.

The research participants were 60mental health professionals in a teaching hospital who were not involved in any formal exercise program. They were randomly assigned to the yoga group or control group. This experimental study estimated the sample size based on effect size = .45, power = .8, alpha level = .05, two-tailed, and it was calculated to be 28 for each group; taking 10% of loss to follow-up into consideration, the sample size was set to be 30 for each group. Each participant completed a pretest and a posttest. The inclusion criteria consisted of mental health professionals who were not involved in a formal exercise program and who were willing to participate in this study. Exclusion criteria included pain due to injuries to shoulders, waist, or lower back, and musculoskeletal diseases such as muscle strains, that made participants unsuitable to participate in this study. The participants were recruited through poster advertisement and in person. After we received registration, a meeting was held to explain the details of the trial. Then, the participants signed the informed consent form and were randomly assigned to yoga or control groups by drawing lots. There were 30 participants each in the yoga and control groups. It was expected that the two groups were homogeneous through drawing lots of random allocation.

The research tools of the study consisted of subjective self-administered scales and an objective biofeedback (HRV) monitor. Before and after the yoga intervention, all participants were asked to complete the self-administered scales including: demographic characteristics (e.g., gender, age, marital status, religious preference, educational status, and years of work), professional background, work-related stress scale, and stress adaptation scale. Also, HRV was measured, retrieved, and analyzed at pre- (6 weeks), midpoint, and post- (12 weeks) tests to reflect the relevant physiological signals of autonomic nerve activity, such as sympathetic nerve function, parasympathetic nerve function, and autonomic nerve activity.

Research data collected from the participants by questionnaire and HRV examination were coded and double-checked. Data analyses were carried out by using SPSS version 20.0 forWindows (SPSS Inc., Chicago, IL, USA). Chi-square tests and *t* tests were used to compare the differences of the demographic characteristics and data at baseline between the two groups. Analysis of Covariance (ANCOVA) was used to test whether the two groups had significant changes between pre and posttests by controlling the confounding of the covariates.

CONCLUSION

Overall, the effects of meditation on well-being and ill-being were consistent with expectations; the results of the self-report measures suggest that Vipassana mediation had a pronounced positive psychological effect on the participants. Cardiovascular results, however, were more complex. After meditation training, the meditation task increased normalised HF HRV, as is common for mindfulness meditation tasks without paced breathing. While the pattern of results for other HRV measures did not accord neatly with our expectations, results provide a useful insight into the nature of ANS function during and following Vipassana meditation.

Mental health professionals experience work-related stress from work or work-related factors. The work-related stress can result in fatigue, anxiety, depression, reduced work capacity, and even symptoms of burnout. Mental health professionals, similar to other health professionals, are susceptible to physical and psychological burnout while caring for people with mental illness (Lauber, Nordt, Braunschweig, & Rossler, 2006). Mental health professionals must learn to cope with work-related stress and improve their adaptation to stress. This study showed that a weekly regular yoga practice over a 12-week period significantly decreased work-related stress and increased stress adaptation of mental health professionals.

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