Journal of Evidence-Based
Complementary & Alternative Medicine

The Interrelated Physiological and Psychological Effects of EcoMeditation: A Pilot Study

Journal:	*Journal of Evidence-Based Complementary & Alternative Medicine*
Manuscript ID	JEBCAM-2017-09-0072.R1
Manuscript Type:	Original Manuscript
Keywords:	meditation, Depression, cortisol
Abstract:	This study investigated changes in psychological and physiological markers during a weekend meditation workshop (N=34). Psychological symptoms of anxiety, depression, PTSD and happiness were assessed. Physiological markers included cortisol, salivary immunoglobulin A (SigA), heart rate variability (HRV), blood pressure (BP), and resting heart rate (RHR). On posttest, significant reductions were found in cortisol (-29%, $p < .0001$), RHR (-5%, $p = .0281$) and pain (-43%, $p = .0022$). Happiness increased significantly (+11%, $p = .0159$) while the increase in SigA was non-significant (+27%, $p = .6964$). Anxiety, depression, and PTSD all declined (-26%, $p = .0159$; -32%, $p = .0197$: -18%, $p = .1533$), though changes in PTSD did not reach statistical significance. No changes were found in BP, HRV, and HC. Participants were assessed for psychological symptoms at 3-month follow-up but the results were non-significant due to inadequate sample size (n=17). EcoMeditation shows promise a stress-reduction method.

The Interrelated Physiological and Psychological Effects of EcoMeditation

Abstract

This study investigated changes in psychological and physiological markers during a weekend meditation workshop (N=34). Psychological symptoms of anxiety, depression, PTSD and happiness were assessed. Physiological markers included cortisol, salivary immunoglobulin A (SigA), heart rate variability (HRV), blood pressure (BP), and resting heart rate (RHR). On posttest, significant reductions were found in cortisol (-29%, $p < .0001$), RHR (-5%, $p = .0281$) and pain (-43%, $p = .0022$). Happiness increased significantly (+11%, $p = .0159$) while the increase in SigA was non-significant (+27%, $p = .6964$). Anxiety, depression, and PTSD all declined (-26%, $p = .0159$; -32%, $p = .0197$: -18%, $p = .1533$), though changes in PTSD did not reach statistical significance. No changes were found in BP, HRV, and HC. Participants were assessed for psychological symptoms at 3-month follow-up but the results were non-significant due to inadequate sample size (n=17). EcoMeditation shows promise a stress-reduction method.

Key words: anxiety; depression; group therapy; EcoMeditation; meditation

Introduction

The benefits of meditation, especially for the promotion of health and reduction of stress, have been widely researched.[1] [2] As a form of mental training that aims to improve an individual's core psychological abilities, meditation includes a range of practices such as mindfulness meditation, mantra meditation, yoga, tai chi and qi~~chi~~gong.[2] ~~-~~Neuroscientific investigation of mindfulness meditation and improvements in psychological health has increased markedly in the past 30 years. This form of meditation has been associated with enhancements in emotional regulation,[3] lowered intensity and frequency of negative emotion,[4] [5] and improved

positive mood states.[6 7] Pain, depression, psychological distress, and anxiety have all been shown to respond to meditation practices.[8 9]

In addition to the often-cited psychological improvements participants experience, physiological markers also respond to meditation practices. Reductions in cortisol secretion have been noted after participation in Mindfulness-Based Stress Reduction (MBSR) programs.[10] MBSR is been associated with a significant reduction in skin conductance level, indicating lowered sympathetic nervous system tone.[11] Decreased stress reactions have also been noted after participation in mindfulness programs,[12] as well as faster recovery to baseline cortisol levels after stress.[13] Finally, mindfulness ~~processes~~ practices have also been associated with changes in the brain, in particular decreases in the size of the amygdala, the limbic structure that regulates fear,[14] and ~~alterations~~ volumetric increases in brain regions associated with attention, memory, self-awareness, and emotional regulation.[15] Mindfulness, MBSR, meditation and similar practices therefore appear to have far reaching effects on physiological functioning and this makes them useful self-~~management~~ regulation tools.

The present study examined changes in psychological and physiological markers among participants in weekend meditation workshop where four evidenced-based techniques were taught. Participants learned and used EcoMeditation, which includes a range of stress-reduction skills. EcoMeditation dispenses with the religious and philosophical explanations common to schools of meditation and instead focuses on physiological cues. It requires no belief system, religious orientation, philosophical explanatory framework, spiritual worldview or prior experience. Instead, it has participants mimic the physiological state of an experienced practitioner. Participants mechanically assume breathing patterns and body postures that are characteristic of long-time meditators.

EcoMeditation combines elements of four evidence-based techniques: the Quick Coherence Technique for regulating HRV,[16] Clinical Emotional Freedom Techniques (Clinical EFT),[17] mindfulness meditation,[18] and neurofeedback.[19] It is described in a manual.[20] This study represents the first time this combination of these techniques has been subject to empirical investigation. EcoMeditation is not based on any type of philosophical or spiritual approach; instead it has participants simply mimic the physiological states of a master meditator.

Method

The study used a convenience sample of 34 participants at a residential conference center. The study was reviewed for human subject protections and approved by the Ethics Committee of the National Institute for Integrative Healthcare (NIIH01152016). All participants provided informed consent. Table 1 represents the baseline characteristics of study participants at recruitment. The majority of participants were women (70%), over 45 years of age.

Table 1: Baseline characteristics of study participants at recruitment

	Demographics and Baseline Characteristics		
	Subjects	Male	Female
N	34	10 (29.4%)	24 (70.6%)
Age			
Mean	48.9	57.9	44.8
Standard deviation	16.2	14.6	15.8
Min	29	34	29
Max	81	79	81
Systolic Blood Pressure (mm Hg)			
Mean	113.4	124	108.3
Standard deviation	17.6	21.4	13.4
Min	88	94	88
Max	156	156	128
Diastolic Blood Pressure (mm Hg)			

Mean	75.7	80.3	73.5
Standard deviation	17.9	11.4	8.1
Min	61	62	61
Max	104	104	88
Heart Rate (BPM)			
Mean	69.6	69.2	69.8
Standard deviation	11.1	6.5	12.9
Min	50	58	50
Max	97	79	97
Cortisol (nMol/L)			
Mean	7.5	8.5	7.1
Standard deviation	4.4	5.0	4.2
Min	2.5	3.7	2.5
Max	20.9	19.9	20.9
SigA (ug/ml)			
Mean	216.8	159.7	229.9
Standard deviation	225.7	282.9	203.2
Min	20.4	20.4	37.4
Max	856.7	856.7	776.3

Beats per minute (BPM) assesses heart rate. Mm Hg assesses blood pressure. SigA = Salivary immunoglobulin A.

Formatted: Normal

Measures. Depression and anxiety were assessed using the Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983).[21] The HADS includes seven questions related to anxiety and seven related to depression. Items are scored from 0-3 and summed. The possible range of scores ranges 0-21 for either anxiety or depression. Clinical levels are considered to be >8. Happiness (Abdel-Khalek, 2006) and pain (Matheson et al., 1996) were assessed using 11-item Likert scales ranging from 0 to 11 with 0 representing minimum and 10 maximum values.[22] [23] PTSD was assessed with the 2-item form of the PTSD Checklist (PCL; Lang et al., 2012).[24] All assessments are reliable and valid.

A standard blood pressure cuff (Omron 3; Omron Healthcare, Lake Forest, IL) was used to measure resting heart rate (RHR) and blood pressure (BP). HeartMath Pro Plus hardware and software was used to assess heart rate variability (HRV) and heart coherence (HC; HeartMath.com). Salivary immunoglobulin A (SigA) and cortisol were assessed using saliva swabs (Sabre Labs, Capistrano, California). To eliminate variances due to circadian fluctuations, cortisol samples were collected at the same time pre and post (10 am).

EcoMeditation Practice. Participants learned and used EcoMeditation, a form of mediation based on providing physiological relaxation cues to the body. EcoMeditation is described in the manual for Whole Energy Lifestyle (WEL), which includes a suite of stress-reduction skills such as mindfulness training, breathwork, heart coherence training, qigong, Clinical EFT, and Gestalt empty chair work.[20] Systematic reviews find the practices taught in WEL to be "evidence-based".[25 26 27 28 16] Approximately half the time (6 hr) was spent discussing the physiological effects of meditation while the other half (6 hr) was spent in meditation itself or interacting in group feedback sessions after the meditation exercises.

~~Results~~

Participant scores on the psychological measures were compared before and after treatment using the Wilcoxon Signed Rank Test for paired samples. Changes in physiological markers such as BP, RHR, cortisol, SigA levels, HRV and HC were also determined using the Wilcoxon Signed Rank Test. All statistical analyses were performed using the R statistical package version 3.3.1.[29]

Results

Between the pre and post-test time points, subjects experienced significant decreases in pain, anxiety, and depression (see Figure 1 and Table 2). Physiological indicators of health such as

RHR and cortisol were also significantly decreased. The changes corresponded with an increase in overall happiness ($p = 0.0159$). Though not statistically significant, a downward trend was observed for PTSD symptoms and an upward trend was observed for SigA. However, BP, HRV, and HC remained unchanged between the two time-points.

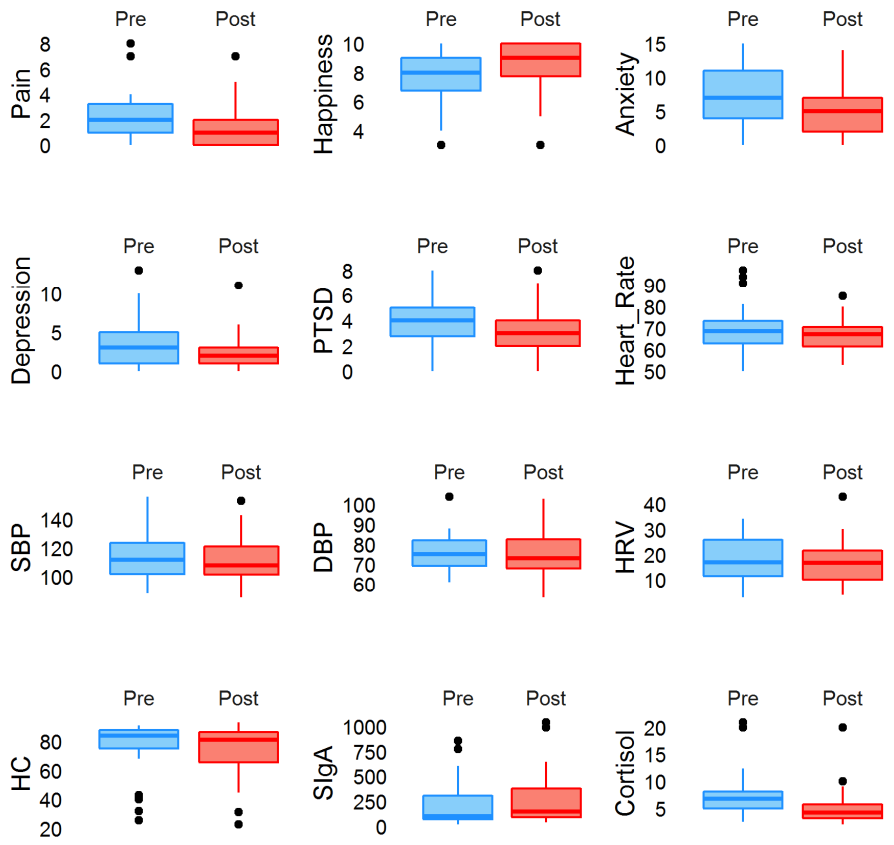

Figure 1. Score changes following treatment in study participants. Outliers within each group are represented by the black dots.

Table 2: Participant Measure Outcomes Pre versus Post Intervention (N = 34)

Scale	Pretest, Mean ±SD	Posttest, Mean ±SD	Change in Mean	Z statistic	P-value	Percent Change (%)
Pain	2.64 ± 2.18	1.5 ± 1.67	-1.1429	-2.9914	0.0022	-43.24
Happiness	7.57 ± 1.89	8.43 ± 1.77	0.8571	2.4222	0.0159	11.32
Anxiety	6.85 ± 4.53	5.09 ± 3.84	-1.7576	-2.8360	0.0036	-25.66
Depression	3.76 ± 3.35	2.55 ± 2.29	-1.2121	-2.3198	0.0197	-32.26
PTSD	4.07 ± 2.04	3.36 ± 1.83	-0.7143	-1.4718	0.1533	-17.54
Heart rate (BPM)	69.61 ± 11.1	66.3 ± 7.69	-3.3108	-2.1801	0.0281	-4.76
Systolic Blood Pressure (mm Hg)	113.36 ± 17.62	111.04 ± 16.2	-2.3201	-1.3832	0.1712	-2.05
Diastolic Blood Pressure (mm Hg)	75.68 ± 9.65	75.67 ± 10.96	-0.0119	-0.1323	0.9011	-0.02
HRV	17.85 ± 9.03	17.29 ± 9.37	-0.5671	-0.5124	0.6176	-3.18
Heart Coherence	75.78 ± 18.91	73.11 ± 18.22	-2.6698	-0.3188	0.7579	-3.52

		275.06 ±				
SigA	216.78 ± 225.71	272.43	58.2771	0.4084	0.6964	26.88
Cortisol	7.5 ± 4.35	5.3 ± 3.51	-2.2047	-3.8803	<0.0001	-29.38

Beats per minute (BPM) assesses heart rate. Mm Hg assesses blood pressure. SigA = Salivary immunoglobulin A. HRV = heart rate variability.

A follow-up was performed two months after the event using online questionnaires to measure psychological symptoms. Seventeen participants provided follow-up data. Outcomes were compared to symptom levels pre and post intervention. The results are show in tables 3 and 4.

Table 3: Psychological Outcomes Pre Intervention vs Follow Up (N = 17)

Scale	Pretest, Mean ±SD	Follow Up, Mean ±SD	Change in Mean	Z statistic	P-value	Percent Change (%)
Pain	2.41 ± 2.06	1.94 ± 2.16	-0.4706	-0.6489	0.5164	-19.51
Happiness	7.71 ± 1.93	7.94 ± 1.82	0.2353	0.3659	0.7144	3.05
Anxiety	7.47 ± 4.29	6.53 ± 4.59	-0.9412	-0.6172	0.5371	-12.59
Depression	4.12 ± 3.44	3.00 ± 2.48	-1.1176	-1.0866	0.2.772	-27.14
PTSD	4.29 ± 1.89	3.47 ± 1.66	-0.8235	-1.3464	0.1782	-19.18

Table 4: Psychological Outcomes Post Intervention vs Follow Up (N = 17)

Scale	Posttest, Mean ±SD	Follow Up, Mean ±SD	Change in Mean	Z statistic	P-value	Percent Change

						(%)
Pain	1.41 ± 1.46	1.94 ± 2.16	0.5294	0.8361	0.4031	37.5
Happiness	8.47 ± 1.87	7.94 ± 1.82	-0.5294	-0.8356	0.4034	-6.25
Anxiety	6.53 ± 3.92	6.53 ± 4.59	0	0	1	0
Depression	3.35 ± 3.64	3.00 ± 2.48	-0.3529	-0.3704	0.7409	-10.53
PTSD	3.76 ± 1.75	3.47 ± 1.66	-0.2941	-0.5022	0.6155	-7.8125

Analysis showed that there was no significant change on any psychological marker between the pretest and follow-up time points, or between the post-test and follow-up time points. While symptom changes were generally in a positive direction, with pain, anxiety, depression and PTSD levels down, and happiness up, only 17 participants were available for follow-up resulting in too small a sample to achieve statistical significance.

Discussion

This was the first study to examine the efficacy of EcoMeditation, a combination of four evidenced-based stress-reduction techniques. Participants experienced significant decreases in psychological symptoms of anxiety, depression and pain, and an increase in overall happiness. RHR and cortisol were also significantly decreased. The brief length of the intervention did not result in changes in BP, HRV, and HC, although a downward trend was observed for PTSD and an upward trend was observed for SigA measurements (the levels of which vary in response to physical and psychological stress through interactions with the autonomic nervous system). A larger sample size and a longer intervention may impact these variables. Our findings show that meditation can affect psychological and physiological markers simultaneously, a result generally

consistent with the results of previous studies of meditation. Other investigations find a strong association between anxiety and depression and physiological markers of stress.[30 31]

A strength of the study was that it used both subjective self-report and noninvasive objective physiological markers. ~~A~~ Measures of psychological stress ~~reaction~~ such as ~~higher levels of~~ anxiety, irritation, fear, worry, tension or anger ~~also co-occurs with~~may be reflected in measures of physiological ~~stress~~ stress~~reactions~~.[32 33 34] The addition of physiological measures in psychological research is worthwhile as they provide objective data independent of the subjective self-reports of participants.

The study also points to the value of mediation as a medical intervention. Though not usually considered medical treatment, meditation affects a wide array of physiological markers. Cortisol and RHR in particular are regarded as markers of overall health, and improvement in these measures correlates with many other beneficial endocrinal, epigenetic, cardiovascular and nervous system changes. While pharmacological treatments are available, they often have adverse side effects and risks which are absent from non-drug interventions such as meditation.

Once the physiological changes associated with a stress-reduction method have been mapped and correlated with psychological markers, it is reasonable to assume that when later studies find psychological improvement, physiological improvement may be co-occurring. Changes in the levels of stress hormones such as cortisol and immune markers such as SigA are only possible when the expression levels of the genes coding for these complex protein molecules have altered. Interventions such as EcoMeditation may thus be considered in the category of epigenetic treatments.

EcoMeditation is unusual among meditation methods in that it does not rely on any prior training or a spiritual worldview. As an agnostic and physical cue-based system, it is acceptable

to participants with a wide variety of ideologies and religious backgrounds. It can be learned in a single session and is easily incorporated into the lifestyles of even busy participants, with a minimal recommended dose of 15 min/day.

Limitations. Limitations of the study include the absence of a control or comparison group and the small number of participants. The effects obtained could have been due to non-specifics present in any therapy, to the supportive nature of the group, to demand characteristics, to sympathetic attention, or to the stress-reducing effects of the residential setting. A study of participants at a wellness retreat found that the setting alone produced improvements in multiple dimensions of health.[35]

The heterogeneity of ages in the sample limits the generalizability of the findings with regards to BP, since aging is associated with increased risk for hypertension. Further, due the small sample size, it was not possible to obtain statistically significant results for PTSD, HRV, HR, or BP at posttest. A power analysis revealed that it would take a minimum of 44 participants to achieve results at a significance level of 0.05 and 90% power. Nonetheless, this initial study demonstrates that EcoMeditation is associated with beneficial change on a range of psychological measures during the experience itself, as well as heart rate and cortisol levels. Psychological symptom improvement was observed on follow-up as well, though because of attrition in the sample the results were not statistically significant. The US National Center for Complementary and Integrative Health has indicated meditation to be safe for healthy people and reports that it can rarely cause or worsen psychiatric symptoms.[36]

Further research should investigate the potential of EcoMeditation in a number of dimensions. It is necessary to identify its effects as a standalone treatment independent of the residential settings used in this study, and to determine the degree to which it is tolerated in

medical settings such as hospitals and clinics. It would also be interesting to discover if it has a prophylactic effect, reducing patient risk for cortisol-related diseases such as cancer and BP-related conditions like cardiac events. The findings of the current study suggest that EcoMeditation might be associated with changes in brain signaling, and EEG could determine if it produces benefits such as increases in EEG alpha, delta and theta waves and reductions in beta. It might be investigated in larger populations, with heterogeneous demographic groups, and with delivery methods different from the group format employed in the present study. It lends itself to virtual therapies such as smartphone apps and social media sites. Finally, it is necessary to identify the minimum effective dose as well as the optimal dose required to produce the physiological benefits found in this study.

Conclusions

EcoMeditation is a non-pharmacological approach that teaches body-based skills in emotional and autonomic nervous system regulation. The practice of EcoMeditation may be associated with improvement in psychological symptoms, as well as with certain physiological markers of health, including resting heart rate and salivary cortisol levels. Future randomized controlled trials will assess whether the benefits to participants found in this pilot study are replicated when using rigorous experimental designs.

References

[1] Baer, R. A. (2003). Mindfulness training as a clinical intervention: A conceptual and empirical review. *Clin. Psychol. Sci. Practice 10*, 125–143.

[2] Ospina, M. B. et al. (2007). *Meditation practices for health: State of the research*. Evid. Rep. Technol. Assess. (Full Rep.) *155*, 1–263.

[3] Robins, C. J., Keng, S.-L., Ekblad, A. G. & Brantley, J. G. (2012). Effects of mindfulness-based stress reduction on emotional experience and expression: A randomized controlled trial. *J. Clin. Psychol. 68*, 117–131.

[4] Chambers, R., Lo, B. C. Y. & Allen, N. B. (2008). The impact of intensive mindfulness training on attentional control, cognitive style, and affect. *Cogn. Ther. Res. 32*, 303–322.

[5] Ding, X., Tang, Y. Y., Tang, R. & Posner, M. I. (2014). Improving creativity performance by short-term meditation. Behav. *Brain Funct. 10*, 9.

[6] Jain, S. et al. (2007). A randomized controlled trial of mindfulness meditation versus relaxation training: Effects on distress, positive states of mind, rumination, and distraction. Ann. Behav. Med. 33, 11–21/

[7] Tang, Y. Y. et al. (2007). Short-term meditation training improves attention and self-regulation. Proc. Natl Acad. Sci. USA 104, 17152–17156.

[8] Bohlmeijer, E., Prenger, R., Taal, E., Cuijpers, P. (2010). The effects of mindfulness-based stress reduction therapy on mental health of adults with a chronic medical disease: A meta-analysis. J. Psychosom. Res, 68(6),539–544. doi:10.1016/j.jpsychores.2009.10.005.

[9] Shapiro, S.L. (2009). The integration of mindfulness and psychology. J. Clin. Psychol, 65(6), 555–560. doi:10.1002/jclp.20602.

[10] Matousek, R.H., Dobkin, P.L., & Pruessner, J. (2010). Cortisol as a marker for improvement in mindfulness-based stress reduction. Complement. Ther. Clin. Practice, 16(1), 13–19. doi:10.1016/j.ctcp.2009.06.004.

[11] Lush, E., Salmon, P., Floyd, A., Studts, J.L., Weissbecker, I., & Sephton, S.E. (2009). Mindfulness meditation for symptom reduction in Fibromyalgia: Psychophysiological correlates. J. Clin. Psychol. Med. Settings, 16(2), 200–207. doi:10.1007/s10880-009-9153-z

[12] Creswell, J. D., & Lindsay, E. K.(2014). How does mindfulness training affect health? A mindfulness stress buffering account. Current Directions in Psychological Science, 23, 401-407.

[13] Brown, K. W., Weinstein, N., & Creswell, J. D.(2012). Trait mindfulness modulates neuroendocrine and affective responses to social evaluative threat. Psychoneuroendocrinology, 37, 2037-2041.

[14] Hölzel, B. K., Carmody, J., Evans, K. C., Hoge, E. A., Dusek, J. A., Morgan, L., Pitman, R. K., & Lazar, S. W. (2010). Stress reduction correlates with structural changes in the amygdala. Social Cognitive and Affective Neuroscience, 5, 11-17.

[15] Fox, K. C. R., Nijeboer, S., Dixon, M. L., Floman, J. L., Ellamil, M., Rumak, S. P., Sedlmeier, P., & Christoff, K. (2014). Is meditation associated with altered brain structure? A systematic review and meta-analysis of morphometric neuroimaging in meditation practitioners. Neuroscience & Biobehavioral Reviews, 43, 48-73.

[16] McCraty, R., & Zayas, M. A. (2014). Cardiac coherence, self-regulation, autonomic stability, and psychosocial well-being. *Frontiers in Psychology, 5,* 1090.

[17] Church, D. (2013). Clinical EFT as an evidence-based practice for the treatment of psychological and physiological conditions. Psychology, 4(8), 645–654. doi:10.4236/psych.2013.48092

[18] Davidson, R. J., Kabat-Zinn, J., Schumacher, J., Rosenkranz, M., Muller, D., Santorelli, S. F., ... & Sheridan, J. F. (2003). Alterations in brain and immune function produced by mindfulness meditation. Psychosomatic medicine, 65(4), 564-570.

[19] Zotev, V., Krueger, F., Phillips, R., Alvarez, R. P., Simmons, W. K., Bellgowan, P., ... & Bodurka, J. (2011). Self-regulation of amygdala activation using real-time fMRI neurofeedback. *PloS One, 6*(9), e24522

[20] Church, D. (2011). WEL : Whole Energy Lifestyle (1st ed.). Santa Rosa, CA: Energy Psychology Press.

[21] Zigmond, A. S., & Snaith, R. P. (1983). The Hospital Anxiety and Depression Scale. Acta Psychiatrica Scandinavica, 67(6), 361–370. doi:10.1111/j.1600-0447.1inavica, 67(6), 361–370. doi:10.1111/j.1600-0447.1983.tb09716.x

[22] Abdel-Khalek, A. M. (2006). Measuring happiness with a single-item scale. Social Behavior and Personality: an international journal, 34(2), 139-150.

[23] Bijur, P. E., Latimer, C. T., et al. (2003). Validation of a verbally administered numerical rating scale of acute pain for use in the emergency department. Acad Emerg Med 10(4): 390-392.

[24] Lang, A. J., Wilkins, K., Roy-Byrne, P. P., Golinelli, D., Chavira, D., Sherbourne, C., ... & Stein, M. B. (2012). Abbreviated PTSD Checklist (PCL) as a guide to clinical response. *General Hospital Psychiatry, 34*(4), 332-338.

[25] Chiesa, A., & Serretti, A. (2009). Mindfulness-based stress reduction for stress management in healthy people: a review and meta-analysis. The journal of alternative and complementary medicine, 15(5), 593-600.

[26] Church, D., Feinstein, D., Palmer-Hoffman, J., Stein, P. K., & Tranguch, A. (2014). Empirically supported psychological treatments: the challenge of evaluating clinical innovations. The Journal of nervous and mental disease, 202(10), 699-709.

[27] Jahnke, R., Larkey, L., Rogers, C., Etnier, J., & Lin, F. (2010). A comprehensive review of health benefits of qigong and tai chi. American Journal of Health Promotion, 24(6), e1-e25.

[28] Wagner-Moore, L. E. (2004). Gestalt Therapy: Past, Present, Theory, and Research. Psychotherapy: Theory, Research, Practice, Training, 41(2), 180.

[29] R Core Team, (2016). R: A Language and Environment for Statistical Computing. Vienna, Austria: R Foundation for Statistical Computing; 2014. R Foundation for Statistical Computing.

[30] Steimer, T. (2002). The biology of fear-and anxiety-related behaviors. *Dialogues in Clinical Neuroscience, 4,* 231-250.

[31] Goddard, A. W., Ball, S. G., Martinez, J., Robinson, M. J., Yang, C. R., Russell, J. M., & Shekhar, A. (2010). Current perspectives of the roles of the central norepinephrine system in anxiety and depression. Depression and anxiety, 27(4), 339-350.

[32] Terluin B., van Marwijk H.W., Ader H.J., et al. (2006). The Four-Dimensional Symptom Questionnaire (4DSQ): A validation study of a multidimensional self-report questionnaire to assess distress, depression, anxiety and somatization. BMC Psychiatry., 6,34.

[33] Thrall G., Lane D., Carroll D., & Lip G.Y (2007). A systematic review of the effects of acute psychological stress and physical activity on haemorheology, coagulation, fibrinolysis and platelet reactivity: Implications for the pathogenesis of acute coronary syndromes. Thromb Res, 120, 819–47

[34] Hall, N., Altman, F., & Blumenthal, S. (1996). Mind–body interactions and disease and psycho neuroimmunological aspects of health and disease. Chicago, IL: Health Dateline Press.

[35] Cohen, M. M., Elliott, F., Oates, L., Schembri, A., & Mantri, N. (2017). Do Wellness Tourists Get Well? An Observational Study of Multiple Dimensions of Health and Well-Being After a Week-Long Retreat. The Journal of Alternative and Complementary Medicine, 23(2), 140-148.

[36] National Center for Complementary and Integrative Health (2010). Meditation: An introduction. National Center for Complementary and Integrative Health : USA.