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## Mindfulness based stress reduction (MBSR) program leads to a reduction in physiological evaluated stress

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Background: Oxidative stress has complex interactions with our lifestyle habits that negatively affect our health. Increasing evidence suggests that chronic psychosocial stress enhances oxidative stress, which in turn may contribute to aging and aetiology of many lifestyle-related degenerative diseases. Mindfulness practice is defined as "paying attention in an intentional and non-judgmental way to the present moment". Past studies investigating the link between mindfulness and stress response demonstrated that Mindfulness-Based Stress Reduction (MBSR) program is an effective stress management technique which have beneficial effects on emotional and psychological responses to stressors. In contrast, there have been less studies of its effect on physiological parameters, such as oxidative stress. Methods: In this study, we evaluated the effectiveness of MBSR program on a sample of 42 people (age 30-66 years). In particular, we analyzed blood pressure, plasma concentration of carotenoids and salivary cortisol levels, before (baseline) and after an MBSR training (8 weeks). Cortisol was measured by an Enzyme Immunoassay kit. Carotenoid concentration was evaluated by Raman spectroscopic technique. Levels of perceived stress, anxiety and awareness were assessed by Perceived Stress Scale, State Anxiety Inventory, and Mindful Attention Awareness Scale questionnaires, respectively. Student's t was used for statistical analysis ( $P < 0.05$ ). Results: Mindfulness practice significantly reduced salivary levels of cortisol ( $P < 0.01$ ), blood pressure in hypertensive people ( $P < 0.01$ ) and increases blood concentration of carotenoids ( $P < 0.05$ ). An increase in awareness and a decrease in perceived stress and anxiety were also observed. All the parameters analysed showed a statistically significant improvement ( $P < 0.01$ ). Conclusions: These preliminary data are a first indication that the MBSR program is an effective tool to ameliorate antioxidant defence (as indicated by carotenoids data) confirming positive effects on blood pressure and psychological outcomes. Further studies on pro-inflammatory cytokine levels and overall redox related mechanisms are needed to better evaluate MBSR systemic effects.

Keywords: blood pressure; carotenoids; cortisol; mindfulness-based stress reduction; stress.

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