

Benefits of Environmental Aids to Chronobiology Management and Its Impact on Depressive Mood in an Operational Setting

Authors : M. Trousselard, D. Steiler, C. Drogou, P. van-Beers, G. Lamour, S. N. Crosnier, O. Bouilland, P. Dubost, M. Chennaoui, D. Léger

Abstract : According to published data, undersea navigation for long periods (nuclear-powered ballistic missile submarine, SSBN) constitutes an extreme environment in which crews are subjected to multiple stresses, including the absence of natural light, illuminance below 1,000 lux, and watch schedules that do not respect natural chronobiological rhythms, for a period of 60-80 days. These stresses seem clearly detrimental to the submariners' sleep, with consequences for their affective (seasonal affective disorder-like) and cognitive functioning. In the long term, there are abundant publications regarding the consequences of sleep disruption for the occurrence of organic cardiovascular, metabolic, immunological or malignant diseases. It seems essential to propose countermeasures for the duration of the patrol in order to reduce the negative physiological effects on the sleep and mood of submariners. Light therapy, the preferred treatment for dysfunctions of the internal biological clock and the resulting seasonal depression, cannot be used without data to assist knowledge of submariners' chronobiology (melatonin secretion curve) during patrols, given the unusual characteristics of their working environment. These data are not available in the literature. The aim of this project was to assess, in the course of two studies, the benefits of two environmental techniques for managing chronobiological stress: techniques for optimizing potential (TOP; study 1)3, an existing programme to help in the psychophysiological regulation of stress and sleep in the armed forces, and dawn and dusk simulators (DDS, study 2). For each experiment, psychological, physiological (sleep) or biological (melatonin secretion) data were collected on D20 and D50 of patrol. In the first experiment, we studied sleep and depressive distress in 19 submariners in an operational setting on board an SSBN during a first patrol, and assessed the impact of TOP on the quality of sleep and depressive distress in these same submariners over the course of a second patrol. The submariners were trained in TOP between the two patrols for a 2-month period, at a rate of 1 h of training per week, and assigned daily informal exercises. Results show moderate disruptions in sleep pattern and duration associated with the intensity of depressive distress. The use of TOP during the following patrol improved sleep and depressive mood only in submariners who regularly practiced the techniques. In light of these limited benefits, we assessed, in a second experiment, the benefits of DDS on chronobiology (daily secretion of melatonin) and depressive distress. Ninety submariners were randomly allocated to two groups, group 1 using DDS daily, and group 2 constituting the control group. Although the placebo effect was not controlled, results showed a beneficial effect on chronobiology and depressive mood for submariners with a morning chronotype. Conclusions: These findings demonstrate the difficulty of practicing the tools of psychophysiological management in real life. They raise the question of the subjects' autonomy with respect to using aids that involve regular practice. It seems important to study autonomy in future studies, as a cognitive resource resulting from the interaction between internal positive resources and "coping" resources, to gain a better understanding of compliance problems.

Keywords : chronobiology, light therapy, seasonal affective disorder, sleep, stress, stress management, submarine

Conference Title : ICSRD 2020 : International Conference on Scientific Research and Development

Conference Location : Chicago, United States

Conference Dates : December 12-13, 2020