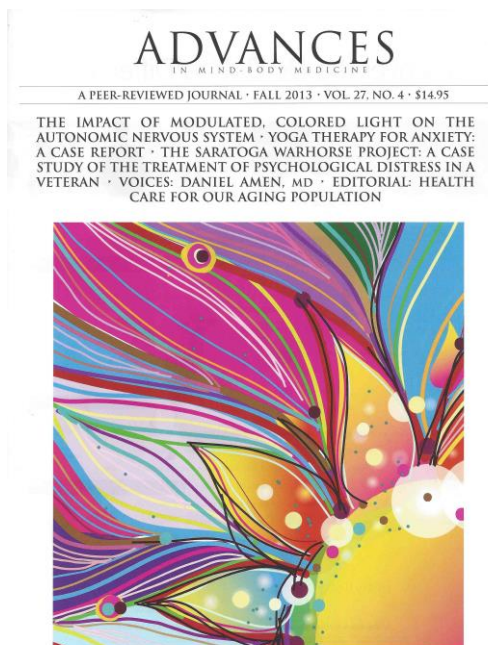


## CLINICAL RESEARCH ON LIGHT MODULATION: RESULTS SUMMARY

### ***“The Impact of Modulated Color Light on the Autonomic Nervous System (ANS)”***



A clinical study on the effects of colored light projections based on Sensortech’s [Light Modulation](#) technology as used in the Sensora system was published in 2013 by Dr. M.J. Ross, Dr. P. Guthrie (*Midwestern State University, Texas, USA*) and J.C. Dumont (*Trinity Western University, BC, Canada*) in [Advances in Mind-Body Medicine Journal](#), Vo.27, No.4. A total of 117 subjects participated in two locations (40 in Texas, USA and 77 in Québec, Canada). The study protocol involved both physiological (Heart Rhythm, Heart Rate Variability, Skin Conductance) and psychological (POMS Profile of Mood States standardized test, subjective mood evaluation) measurements.

Each subject received a 20-minute light session randomly selected from one of four types: three light modulation sessions (Relaxing, Energizing or Balancing), and one session with static white light used as a placebo.

The most important physiological results obtained are:

- All light modulation sessions led to a significant decrease in heart rhythm (3-4%) and skin conductance (20-30%), indicating a physical relaxation response.
- Heart Rate Variability increased significantly (18-20% for SDNN, 50-80% for the Low-Frequency LF component) for the light modulation sessions, indicating a state of higher well-being and coherence after the session.
- The Very Low-Frequency (VLF) component of the Heart Rate Variability increased significantly (200-240%) for the light modulation sessions, indicating an arousal of the sympathetic ANS, which corresponds to higher wakefulness and alertness.
- By contrast, the placebo (white light) session showed no significant change of the heart rhythm and Heart Rate Variability.

At the psychological level, these results are most noteworthy:

- All light modulation sessions led to a significant decrease (6-8 points) in the Total Mood Disturbance index of the Profile of Mood States (POMS) test, indicating an overall improvement in mood. In particular these POMS indexes showed the greatest decrease after the light modulation sessions: Fatigue (11-13%), Depression (7-12%) and Anger (5-8%). In all these cases, the placebo (white light) session had either reduced or non-significant impact.
- More subjects reported feeling energy (16-35%) and alertness (28-42%) with the light modulation sessions than with the placebo (10%). Fewer subjects (27-80%) felt sleepy (or reported falling asleep) during the light modulation sessions than during the placebo session. This is consistent with the physiological measurements indicating sympathetic ANS arousal.

The study also showed that each of the three types of light modulation sessions had specific effects:

- The Relaxation session led to the greatest number of subjects reporting feeling calmer (89%) and less tense (76%).
- The Energizing session led to the greatest number of subjects reporting feeling more alert (42%), more energy (35%) and less sleepy (26%). Physiologically the Energizing session also had the smallest skin conductance decrease (17%), indicating a less pronounced relaxation response.
- The Balancing session led to the greatest decreases in Total Mood Disturbance (8 points), Confusion (13%), Depression (12%) and Anger (8%) POMS indexes. Physiologically the Balancing session led to the greatest decreases in heart rhythm (4%) and skin conductance (30%), indicating a more pronounced relaxation response.

The authors conclude in this way:

**“In conclusion, it can be seen that the light modulation sessions are significantly correlated with higher well-being and coherence, as well as reduced mood disturbance. They were shown to have a dual effect, simultaneously achieving both deeper relaxation and enhanced alertness.**

**This distinctive combination of awareness and relaxation was induced by the light modulation without any conscious effort from the subjects. Known to be linked to peak performance, it has similarities with the meditation state and holds great potential for therapeutic integration.”**