

## Treatment Parameters and Efficacy of Photobiomodulation for Pain Relief Chukuka S. Enwemeka, PhD, FACSM

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**Objective:** Photobiomodulation (PBM) has been widely used for pain relief for more than 35 years. However, its efficacy continues to be questioned. This presentation summarizes the latest rigorous meta-analysis, which clearly show that PBM effectively relieves pain of various etiology, and suggests treatment parameters that seem most effective. In three meta-analysis of the literature, we aggregated and coded relevant original studies from every available source. Papers that met pre-established inclusion criteria were subjected to statistical meta-analysis, using Cohen's *d* statistic to determine treatment effect sizes. In one of the meta-analysis, we used machine learning technology to predict essential treatment parameters that seem to optimize treatment **Results:** In our initial meta-analysis studies, 52 effect sizes were computed from the 22 papers that met the inclusion criteria. The resulting overall mean effect size was highly significant;  $d = +0.84$  (95% confidence interval = 0.44 to 1.23). The effect size remained significant even when a high outlying *d*-value was conservatively excluded from the analysis;  $d = +0.66$  (95% confidence interval = 0.46 – 0.86). The Fail-Safe number associated with the overall treatment effect, i.e., the number of additional studies in which phototherapy has negative or no effect on pain needed to negate the overall large effect size of +0.84, was 348. A total of 96 papers with 232 treatment effect sizes were used for machine learning study. As with our first two meta-analyses, the average effect size was highly significant:  $d=+1.36$  (confidence interval [95% CI] = 1.04–1.68). The most effective treatment parameter was found to be total energy over the course of treatment, in the bimodal ranges of 120–162 J and 15.36–20.16 J. None of the remaining parameters was independently effective for pain relief. **Conclusion:** These studies indicate that appropriate doses of PBM effectively relieves pain of various etiologies; making it a valuable addition to contemporary pain management armamentarium.

### References

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