

Ultra Weak Photon Environments for Phantom Limb Pain: Evidentiary and Mechanistic Considerations

Muhammad Aslam^{1*}, Ayesha Tahreen¹, Minha Dureshahwar¹ and Mehak Buttani²

¹Chandka Medical College, Larkana, Pakistan

²Peoples University of Medical and Health Sciences for Women (PUMHSW), Nawabshah, Pakistan

*Corresponding author

Muhammad Aslam, Chandka Medical College, Larkana, Pakistan.

Received: September 08, 2026; **Accepted:** September 11, 2026; **Published:** September 15, 2026

We read with interest the hypothesis review by Liu and Gu proposing Ultra Weak Photon Environments (UWPEs) as a non-contact adjunctive approach to phantom limb pain (PLP) [1]. Bilateral amputees, for whom conventional mirror therapy may be difficult or infeasible, represent an important therapeutic gap, and exploring non visual approaches is a worthwhile direction. However, two issues warrant clarification before the proposed approach progresses to clinical investigation.

First, important evidentiary gaps remain between photon biology, the proposed neurobiological mechanisms, and relief of PLP. The authors describe potential effects involving nervous system coherence, cortical stabilisation, autonomic regulation and sensory motor integration, while acknowledging that available observations of PLP improvement are anecdotal and insufficient to establish causality or clinical efficacy [1]. This distinction is particularly relevant because cortical reorganisation, although implicated in PLP pathophysiology, does not consistently correlate with pain severity. A 2025 systematic review of 13 fMRI studies found inconsistent associations between primary motor cortex reorganisation and PLP intensity [2,3]. Thus, demonstrating or hypothesising cortical modulation would not, by itself, establish an analgesic effect. Similarly, a 2026 systematic review and meta-analysis of 26 randomised controlled trials found low to moderate certainty of evidence across established noninvasive PLP interventions, including mirror therapy, graded motor imagery, virtual or augmented reality, and repetitive transcranial magnetic stimulation [4]. UWPE therefore remains a biologically motivated hypothesis rather than an evidence-based treatment for PLP. Second, the proposed mechanistic rationale draws partly on photobiomodulation (PBM) literature, although the authors appropriately distinguish UWPE from conventional PBM [1]. PBM generally uses defined optical parameters, including wavelength, energy density, power, and exposure time, with its biological effects thought to involve photon absorption by cellular chromophores and downstream mitochondrial and signalling pathways [5,6]. By contrast, the target article describes UWPE as prolonged whole environment exposure at extremely low photon intensity but does not report quantitative irradiance or photon flux [1]. It is therefore not possible to determine whether the proposed exposure delivers a biologically meaningful dose to relevant

tissues. Moreover, endogenous ultraweak photon emission is well documented as a low intensity phenomenon associated with cellular metabolism, whereas its proposed role in intercellular signalling remains an area of investigation [7]. Extrapolating from endogenous photon emission or PBM to therapeutic effects from an environmental UWPE consequently requires direct experimental validation.

These limitations do not invalidate the hypothesis, but they define the evidence needed to test it. Future studies should first establish reproducible biological effects of quantified UWPE exposure and then determine whether such effects translate into clinically meaningful changes in PLP.

We encourage the authors to pursue adequately controlled studies using transparent exposure parameters, credible sham environments, validated PLP outcomes, and appropriate mechanistic measures. Independent replication would further strengthen the evidence base. Such work could determine whether this hypothesis can progress from biological plausibility to a clinically testable intervention.

Funding: The authors have nothing to report.

Ethics Statement: The authors have nothing to report.

Consent: The authors have nothing to report.

Conflicts of Interest: The authors declare no conflicts of interest.

Data Availability Statement: The authors have nothing to report.

References

1. Liu JZ, Gu HY (2026) Ultra Weak Photon Environments as a Potential Adjunctive Approach for Phantom Limb Pain: A Neuroplasticity Based Hypothesis Review. *J Neurol Res Rev Rep* 8: 1-7.
2. Collins KL, Russell HG, Schumacher PJ, Robinson Freeman KE, O'Connor EC, et al. (2018) A review of current theories and treatments for phantom limb pain. *J Clin Invest* 128: 2168-2176.

3. Galvis I, Siepmann T, Tamayo A, Harnegie MP, Fregni F (2025) A dissociation between primary motor cortex reorganization and correlation with pain intensity in phantom limb pain: a systematic review of fMRI studies. *Int J Gen Med* 18: 4601-4613.
4. Bevacqua N, Navarro T, Rava E, Intelangelo L (2026) Effects of non-invasive therapies for the treatment of phantom limb pain: a systematic review with meta-analysis and meta-regression of randomized controlled clinical trials. *Disabil Rehabil* 2: 1-28.
5. Hamblin MR (2017) Mechanisms and applications of the anti-inflammatory effects of photobiomodulation. *AIMS Biophys* 4: 337-361.
6. Nie F, Hao S, Ji Y, Zhang Y, Sun H, et al. (2023) Biphasic dose response in the anti-inflammation experiment of PBM. *Lasers Med Sci* 38:66.
7. Mould RR, Mackenzie AM, Kalampouka I, Nunn AVW, Thomas EL, et al. (2024) Ultra weak photon emission: a brief review. *Front Physiol* 15: 1348915.