Editorial: Light-Based Interventions in Myopia Control

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Introduction:

The global escalation of myopia prevalence has transformed it into a major public health concern, with projections suggesting that nearly half of the world's population may be affected by 2050[1]. Beyond conventional optical and pharmacologic approaches, two light-based strategies increased outdoor exposure and repeated low-level red-light (RLRL) therapy have gained prominence. Outdoor activity is thought to protect against myopia progression by stimulating retinal dopamine release under bright sunlight, thereby inhibiting axial elongation[2].

Clinical evidence supports both interventions. School-based outdoor programs adding approximately two hours of daily outdoor activity have demonstrated reduced incidence of new myopia and slower axial growth[3]. A dose response effect has been observed, with higher light intensity and longer duration yielding greater protection. Similarly, randomized trials in China report that children undergoing RLRL therapy exhibit markedly reduced axial elongation and myopic shift compared to controls[4]. Effect sizes for RLRL appear comparable to established optical therapies, while outdoor interventions provide more modest but population-level benefits.

Safety profiles are encouraging. Outdoor exposure is inherently low-risk aside from UV precautions and is already endorsed by pediatric health authorities. RLRL studies report no serious adverse events or retinal damage on imaging, though long-term safety and rebound effects after cessation remain uncertain. Regulatory caution persists, as RLRL devices are not yet FDA-approved and may exceed exposure limits in some jurisdictions[5]. Implementation challenges also exist: outdoor programs require sustained institutional support, while RLRL depends on device access and patient adherence.

Conclusion:

Recent trials underscore the potential of light-based strategies in myopia control. Outdoor activity remains a safe, accessible, and evidence-based preventive measure that clinicians should actively encourage. RLRL therapy offers a promising non-pharmacologic option but requires further validation regarding long-term safety, optimal dosing, and regulatory approval. Future multicenter studies across diverse populations are essential to define how these interventions can be integrated with existing optical and pharmacologic treatments. The collective responsibility of clinicians, educators, and policymakers is to translate this evidence into practice, ensuring that children worldwide benefit from effective and equitable myopia control.

References:

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