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Low-Level Light Therapy as a Potential Prophylaxis of Myopia: A Literature Review

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HIGHLIGHTS

Low-Level Light Therapy is a promising therapy for myopia control, demonstrating both effectiveness and safety, making it a potential treatment option for managing myopia.

ABSTRACT

Myopia is a common refractive problem found in children and adults. High myopia can lead to severe ocular complications; therefore, controlling myopia is very important as a prophylactic measure. Low-level light therapy (LLLT) is starting to be widely used as an intervention to control myopia. This article describes myopia control using LLLT, aiming for the public and clinicians to understand and utilize this technology optimally. Based on clinical studies and randomized controlled trials (RCTs), LLLT was shown to be effective in controlling myopia through significant changes in axial length (AL), spherical equivalent refraction (SER), and choroidal thickness. Although the current studies are from China, LLLT can also be considered for myopia control in other countries.

Key words: low-level light therapy, myopia, photobiomodulation

INTRODUCTION

Low-level light therapy (LLLT) or repeated low-level red-light therapy (RLRLT) is a widely used photobiomodulation therapy in dermatology. LLLT emits infrared laser light that can be absorbed by the target tissue, resulting in cellular photoactivation without thermal damage. This cellular photoactivation can repair damage to cellular structure and function. LLLT is commonly used to reduce inflammatory reactions, promote wound healing, and treat neurological problems [1].

LLLT has great potential in treating various other health problems, including myopia. Myopia is a common refractive problem found in children and adults. Myopia cases continue to increase rapidly every year and are a concern among the public [2]. As a new preventive method for myopia, LLLT is favored for its effectiveness and safety profile. However, clinicians are skeptical about the role of LLLT for myopia as it is a new interventional LLLT. In this literature review, the authors aim to provide a detailed and compelling explanation of LLLT intervention for myopia.

LITERATURE REVIEW

Myopia

Myopia is a common refractive problem found during childhood. It occurs when the image of an object focuses in front of the retina, resulting in a blurry or indistinct image of the object. Myopia is a serious health challenge due to its rapid emergence. It is estimated that by 2030, almost half of the world's population will have myopia. The increasing incidence of myopia is closely related to a lack of outdoor activity, increased screen time, and prolonged near-vision work. The prevalence of myopia is higher in Asian children compared to children in European countries [3].

Myopia is called progressive when it worsens, becoming high myopia (≥-6 D). High-degree myopia carries a high risk of irreversible visual impairment such as myopic maculopathy, glaucoma, retinal tear, or retinal detachment. Treatment focuses on arresting the progression of myopia so that eye health and quality of life can be maintained. One of the preventive measures proposed by the researchers is to renovate the walls and roof of classrooms to glass to increase exposure [4].

Low-level light therapy

LLLT has been widely used to treat various conditions, such as skin rejuvenation, wrinkles, acne scars, hypertrophic scars, psoriasis, vitiligo, hair root stimulation, dental treatment, post-injury muscle recovery, tinnitus, primary dysmenorrhea, diabetic ulcers, and treatment of drug side effects for breast carcinoma. Previous studies mentioned that LLLT has good efficacy, but reliability is still low. This is due to the low sample size, lack of randomization, lack of uniformity regarding usage specifications, follow-up period, inclusion criteria, and exclusion criteria. The mechanism of action of LLLT is still not fully known, so these things raise skepticism among clinicians [1].

LLLT uses light with moderate intensity and does not damage tissue, with a density <100 MW/cm^2 and wavelengths between 390–700 nm and 780–1100 nm. 390–600 nm wavelength is used for superficial tissues, while 600–1100 nm is used for deeper tissues [1]. The principle of photobiomodulation also exists in intense pulsed light (IPL) therapy [5]. The difference between IPL and LLLT is that the light emitted by IPL uses xenon lamps with wavelengths that vary between 400–1200 nm so that it can be absorbed by chromophore varieties such as melanin and hemoglobin [5, 6].

LLLT may be an alternative to controlling myopia. The mechanism of LLLT in controlling myopia is still unknown [4, 7]. The hypothesis is that light plays a role in increasing the synthesis and release of dopamine (DA) by the retina. DA is an essential neurotransmitter regulating refractive development, β receptor activation, vision signal transduction, and myopia progression. Activation of D_2 sub-receptors can cause myopia, while activation of D_1 sub-receptors can cause hypermetropia. DA functions to increase choroidal thickness and slow the progression of myopia [7].

Low-level light therapy effectiveness for myopia

Common indicators used to monitor the progression of myopia are spherical equivalent refraction (SER) and axial length (AL). The LLLT intervention method for myopia is generally given for 3 min per session, 2 sessions a day, 5 days a week, and a minimum interval of 4 h between sessions. The duration of LLLT use varies from 1 month to 12 months (the majority of studies used 12 months of intervention). Most clinical studies and RCTs showed a significant reduction in SER and AL values post-LLLT intervention use. A summary of LLLT study results for myopia can be seen in table 1.

The multicenter RCT study by Jiang et al. showed the efficacy of LLLT in reducing myopia progression by 69.4–76.6% ($p < 0.001$). The effectiveness of LLLT was higher in participants with a compliance rate >75% (76.8% reduction in AL and 87.7% SER) compared to compliance <50% (44.6% reduction in AL and 41.7% SER) [4]. The RCT study by He et al. showed a 54.1% reduction in the relative incidence of myopia in children with pre-myopia who received LLLT so that LLLT can be used to prevent myopia [8]. The study by Dong et al. showed that the use of LLLT for 6 months was able to reduce SER progression by >0.25 D (16.1%) and shortening of AL by >0.05 mm (23.2%) [9]. The study by Xu et al. used a similar intervention method, but the difference was that LLLT was used 7 days a week. This study

showed good efficacy of LLLT in patients with high myopia with a significant reduction in AL (50.3%, p <0.001) [10]. The use of LLLT in adult patients was also effective, with a significant shortening of AL values within 28 days (p <0.05) [11].

The multicenter retrospective study by Wang et al. described significant factors (p <0.05) affecting the decrease in AL rate, such as age, long initial AL size, and large initial SER. Older age has a higher degree of myopia, making it more likely for AL shortening to occur after LLLT use. Meanwhile, younger age tends to have more remarkable scleral plasticity, thus providing a greater AL shortening response after LLLT use. There was no significant difference between male and female gender (p = 0.164) [12]. A prospective clinical study by Zhang et al. showed significant AL and SER reduction results with age and baseline SER factors. There was no significant difference in AL and SER between genders (p = 0.261 and p = 0.447, respectively) [13]. A retrospective study by Qiu et al. also reported a significant shortening of AL in the group of children with older age (p <0.001) [14]. A prospective clinical study by Lin et al. showed a decrease in AL associated with the degree of myopia (p <0.001) [15].

In addition to SER and AR, LLLT also impacts choroidal thickness. Indicators such as macular choroidal thickness (mCT), luminal area (LA), stromal area (SA), total choroidal area (TCA), and choroidal vascularity index (CVI) are used in studies to assess the progression of myopia. An RCT study by Xiong et al. showed improved mean and central mCT results in patients who received LLLT intervention [16]. A prospective clinical study by Liu et al. explained that macular thickening had no significant effect on macular microvascularity [17]. A multicenter RCT secondary analysis study by Xuan et al. showed choroidal thickening (increased LA, SA, TCA, and CVI) in patients who received LLLT intervention. In addition, LLLT also increases blood flow and subfoveal thickness, which usually decreases with the progression of myopia [18]. RCT studies by Liu et al. and Zhao et al. showed significant improvement in CVI and subfoveal choroidal thickness (SFChT) after 28 days of LLLT use [11, 19]. An RCT study (n = 35) by Zhou et al. provided a contrasting report, i.e., no significant difference in SFChT between LLLT and SVS (single-vision spectacles) [20]. The RCT study by Liu et al. showed a significant increase (p <0.05) of blood flow and choroidal thickness (CT) in the fovea, parafovea (ParaF), and perifovea (PeriF), which correlated with decreased SER (73.8%) and AL (67.9%) [21]. The study by Cao et al. also reported significant choroidal thickening post-LLLT use [22]. These results support the role of LLLT in decreasing myopia progression, as choroidal thinning is associated with myopia progression, axial elongation, and rapid onset of myopia macular degeneration [16, 18].

A comparative clinical study by Swiatczak and Schaeffel compared red LED light with a wavelength of 620 (±10) nm and near-infrared (NIR) 875 (±30) nm monocular for 10 min. Red light with a wavelength of 620 nm showed a 77% shortening of AL in non-myopic patients and 41% in myopic patients. Meanwhile, NIR light with a wavelength of 875 nm did not induce the shortening of AL in either myopia or non-myopia patients. The difference in AL change between the 620 nm and 875 nm intervention groups in participants with myopia was 19.8 µm (-13.3 [±17.3] µm vs. +6.5 [±11.6] µm, respectively, p = 0.005). While the difference between groups in non-myopic participants was 0.9 µm (+0.2 [±12.1] µm vs. +1.1 [±11.2] µm, respectively, p = 0.83) [23].

Compared to other therapies

RCT study by Chen et al. showed the efficacy of LLLT for 12 months was more significant than 0.01% atropine eye drops in controlling myopia progression. The reduction in AL progression <0.1 mm was 53.2%, while the atropine group was only 9.7% (p < 0.001) [24]. The multicenter RCT study by Xiong et al. showed a significant reduction in AL by combining LLLT with orthokeratology (Ortho-K). In addition to improvement in AL, this combination also provided good visual acuity results. 64.3% of participants who received the LLLT + Ortho-K combination achieved 20/25 visual acuity. Combining LLLT + Ortho-K can be a good option for myopia control and reducing spectacle dependency [25]. The use of LLLT alone can decrease AL and increase SFChT better than the use of Ortho-K (p <0.001) [26]. Changes in AL values have a significant correlation with SFChT thickening (r = 0.51, p <0.01) [11].

Long-term effectiveness

The long-term efficacy of LLLT showed promising results (75%) in maintaining myopia progressivity. The AL (0.12 [±0.16] mm) and SER (-0.20 [±0.56] D) values in the group that continued continuous LLLT showed a significant difference in results (p <0.001) when compared to the group that discontinued LLLT use (AL 0.42 [±0.20] mm, and SER -0.91 [±0.48] D). There was a rebound effect after discontinuation of LLLT therapy, but this finding needs further investigation. The rebound effect can also be found in myopia patients treated with 1% atropine and Ortho-K [27]. The RCT study by Chen et al. also reported a rebound effect (AL increased 0.16 mm, 95% CI: 0.11–0.22 mm; SER increased -0.20 D, 95% CI: -0.26 – -0.14; D; p <0.05) after discontinuation of LLLT therapy [28].

Adverse event

In contrast to the results of Ostrin and Schill's study [29], other clinical trial studies found no serious side effects or structural or functional damage in using LLLT for myopia

[4, 8–10, 16, 24]. However, in the RCT study by Jiang et al. 6 participants did not continue LLLT therapy due to feeling too bright (n = 2), not cooperating with instructions (n = 3), and conversion to orthokeratology (n = 1) [4]. The RCT study by Liu et al. reported brief complaints of intolerance to bright light and dry eyes (n = 2) [21]. A prospective clinical trial (n = 108) by Zhu et al. showed LLLT was safe to administer for 12 months without any structural or functional abnormalities [30].

CONCLUSION

LLLT is a potential new therapy that is effective and safe for myopia control in pediatric and adult patients. Compared with other therapies, LLLT therapy shows significant superiority. However, currently, research on LLLT for myopia only exists in China. In addition, studies comparing LLLT with other therapies are few. Therefore, further research is needed using multiethnic samples in several countries and large sample sizes to confirm the effectiveness and safety of LLLT.

TABLE 1

Summary of low-level light therapy research results for myopia.

Author (Year)	Study design, country	Sample size	Duration	Results
Jiang et al. (2021) [4]	Multicenter RCT, China	246	12 months	***Intervention (650 nm LLLT + SVS)*:** AL: 0.13 mm (95% CI: 0.09–0.17 mm) SER: -0.20 D (95% CI: -0.29 – -0.11 D) ***Control (SVS)*:** AL: 0.38 mm (95% CI: 0.34–0.42 mm) SER: -0.79 D (95% CI: -0.88 – -0.69 D) ***Comparison*:** AL: 0.26 mm (95% CI: 0.20–0.31 mm, p <0.001) SER: -0.59 D (95% CI: -0.72 – -0.46 D, p <0.001) No adverse event reported. No structural or functional damage.
He et al. (2023) [8]	School-based RCT, China	139	12 months	***Intervention (650 nm LLLT)*:** AL: 0.30 (±0.27) mm SER: -0.35 (±0.54) D ***Control*:** AL: 0.47 (±0.25) mm SER: -0.76 (±0.60) D ***Comparison*:** AL: 0.17 mm (95% CI: 0.11–0.23 mm, p < 0.001) SER: -0.41 D (95% CI: -0.56 – -0.26 D, p <0.001) No adverse event. No structural or functional damage.
Dong et al. (2022) [9]	Prospective RCT, China	111	6 months	***Intervention (LLLT)*:** AL: 0.02 (±0.11) mm SER: 0.06 (±0.30) D ***Control (sham 10%)*:** AL: 0.13 (±0.10) mm SER: -0.11 (±0.33) D ***Comparison*:** AL: -0.11 mm (95% CI: -0.15 – -0.07 mm, p <0.001) SER: 0.17 D (95% CI: 0.05–0.29 D, p = 0.003) No adverse event. No structural or functional damage.
Xu et al. (2024) [10]	Multicenter RCT, China	192	12 months	***Intervention (LLLT + SVS)*:** AL: -0.06 mm (95% CI: -0.10 – -0.02 mm) SER: 0.11 D (95% CI: 0.02–0.19 D) IOP: -0.29 mmHg (95% CI: -0.87–0.30 mmHg) ***Control (SVS)*:** AL: 0.34 mm (95% CI: 0.30–0.39 mm) SER: -0.75 D (95% CI: -0.88 – -0.62 D) IOP: -0.56 mmHg (95% CI: -1.16–0.04 mmHg) ***Comparison*:** AL: 0.41 mm (95% CI: 0.35–0.47 mm, p <0.001) SER: -0.86 D (95% CI: -1.04 – -0.68 D, p <0.001) IOP: -0.27 mmHg (95% CI: -1.11–0.57 mmHg, p = 0.43) No adverse event. No structural or functional damage.

Liu et al. (2022) [11]	RCT, China	98	4 weeks	***Intervention (650 [±10] nm LLLT)*:** AL: -0.06 mm (p <0.05) SFChT: 18.34 µm (p <0.05) CVI: 0.38 (±0.05) (p <0.05) ***Control*:** AL: 0 mm (p >0.05) SFChT: 2.3 µm (p >0.05) CVI: 0.36 (±0.04) (p >0.05) ***Correlation test*:** SFChT–AL changes: r = 0.51 (p <0.01) Age–AL changes: r = 0.92 Baseline AL–AL changes: r = 0.94 No structural or functional damage.
Wang et al. (2023) [12]	Retro-spective multicenter, China	434	12 months	***AL changes*** Overall: -0.14 (±0.10) mm ***AL changes based on age (p = 0.010)*** 3–5 years: -0.27 (±0.26) mm 5–7 years: -0.21 (±0.17) mm 7–9 years: -0.15 (±0.08) mm 9–11 years: -0.11 (±0.07) mm 11–13 years: -0.13 (±0.06) mm 13–15 years: -0.14 (±0.08) mm 13–15 years: -0.14 (±0.06) mm ***AL changes based on myopia status (p = 0.045)*** Low myopia: -0.11 (±0.06) mm Moderate myopia: -0.16 (±0.11) mm High myopia: -0.15 (±0.08) mm ***AL changes based on AL baseline (p = 0.271)*** AL <26 mm: -0.14 (±0.10) mm AL ≥26 mm: -0.16 (±0.09) mm ***AL changes based on gender (p = 0.261)*** Male: -0.13 (±0.08) mm Female: -0.15 (±0.11) mm ***Pearson's correlation test*:** Initial SER–Initial AL: r = -0.728 (p <0.0001) Final SER–Final AL: r = -0.747 (p <0.0001) SER rate–AL rate: r = -0.655 (p <0.0001)

Zhang et al. (2024) [13]	Prospective clinical trial, China	336	3 months	***AL changes*** Overall: -0.03 mm ***AL changes based on age (p = 0.000)*** <8 years: 0.01 (±0.09) mm 8–9 years: -0.01 (±0.09) mm 9–10 years: -0.02 (±0.10) mm 10–11 years: -0.06 (±0.11) mm 11–12 years: -0.06 (±0.09) mm ≥12 years: -0.03 (±0.10) mm ***AL changes based on baseline SER (p = 0.000)*** 0 to +1.25 D: 0.01 (±0.08) mm -1.00 to 0 D: -0.01 (±0.09) mm -2.00 to -1.00 D: -0.03 (±0.11) mm -3.00 to -2.00 D: -0.06 (±0.12) mm -6.00 to -3.00 D: -0.08 (±0.10) mm ≤ -6.00 D: -0.09 (±0.07) mm ***AL changes based on gender (p = 0.261)*** Male: -0.04 (±0.09) mm Female -0.03 (±0.11) mm ***SER changes*** Overall: -0.01 (±0.36) D ***SER changes based on age (p = 0.031)*** <8 years: -0.08 (±0.38) D 8–9 years: -0.03 (±0.34) D 9–10 years: -0.04 (±0.36) D 10–11 years: -0.01 (±0.33) D 11–12 years: 0.02 (±0.32) D ≥12 years: 0.10 (±0.42) D ***SER changes based on baseline SER (p = 0.000)*** 0 to +1.25 D: -0.20 (±0.40) D -1.00 to 0 D: -0.05 (±0.32) D -2.00 to -1.00 D: 0.04 (±0.33) D -3.00 to -2.00 D: 0.02 (±0.34) D -6.00 to -3.00 D: 0.09 (±0.38) D ≤-6.00 D: 0.09 (±0.46) D ***SER changes based on gender (p = 0.447)*** Male: 0.00 (±0.33) D Female: -0.02 (±0.37) D
Qiu et al. (2024) [14]	Prospective clinical trial, China	342	12 months	***AL changes (p <0.001)*** 4–8 years: 0.06 (±0.17) mm 9–13 years: -0.07 (±0.13) mm ***AL changes rate (p < 0.001)*** 4–8 years: 0.27 (±0.26) mm/year 9–13 years: -0.14 (±0.06) mm/year
Lin et al. (2023) [15]	Prospective clinical trial, China	164	2 months	***AL changes (p <0.001)*** SVS low-moderate myopia: 0.08 (±0.40) mm LLLT low-moderate myopia: -0.03 (±0.11) mm LLLT high myopia: -0.07 (±0.11) mm ***SER changes (p = 0.456)*** SVS low-moderate myopia: -0.26 (±1.91) D LLLT low-moderate myopia: 0.06 (±0.37) D LLLT high myopia: 0.06 (±0.30) D
Xiong et al. (2022) [16]	Multicenter RCT, China	120	12 months	***Intervention (650 nm LLLT + SVS)*:** Average mCT: 9.09 µm (95% CI: 4.71–13.47 µm) Central mCT: 7.34 µm (95% CI: 1.86–12.83 µm) AL: 0.12 mm (95% CI: 0.09–0.15 mm) SER: -0.22 D (95% CI: -0.30 – -0.14 D) ***Control (SVS)*:** Average mCT: -10.41 µm (95% CI: -15.21 – -5.60 µm) Central mCT: -12.09 µm (95% CI: -18.09 -6.09 µm) AL: 0.38 mm (95% CI: 0.35–0.41 mm) SER: -0.80 D (95% CI: -0.88 – -0.72 D) ***Comparison*:** Average mCT: 19.50 µm (95% CI: 8.68–30.32 µm, p <0.001) Central mCT: 19.43 µm (95% CI: 5.91–32.95 µm, p <0.001) AL: -0.26 mm (95% CI: -0.33 – -0.18 mm, p < 0.001) SER: 0.58 D (95% CI: 0.38–0.77 D, p <0.001) No adverse event. No structural or functional damage.

Liu et al. (2024) [17]	Prospective clinical trial, China	40	6 months	***Intervention (650 nm LLLT)*:** AL: 0.14 (±0.18) mm (p <0.05) SER: 0.25 (±0.09) D (p <0.05)
Xuan et al. (2023) [18]	Secondary analysis of multicenter RCT, China	143	12 months	***Intervention (650 nm LLLT + SVS)*:** LA: 11.70 × 10^3 μm² (95% CI: [4.14–19.26] × 10^3 μm²) SA: 3.92 × 10^3 μm² (95% CI: [0.56–7.27] × 10^3 μm²) TCA: 15.61 × 10^3 μm² (95% CI: [5.02–26.20] × 10^3 μm²) CVI: 0.21% (95% CI: -0.09–0.51%) ***Control (SVS)*:** LA: -18.78 × 10^3 μm² (95% CI: [-26.16 – -11.40] × 10^3 μm²) SA: -7.29 × 10^3 μm² (95% CI: [-10.58 – -4.00] × 10^3 μm²) TCA: -26.03 × 10^3 μm² (95% CI: [-36.37 – -15.68] × 10^3 μm²) CVI: -0.47% (95% CI: -0.76 – -0.17%) ***Comparison*:** LA: 30.48 × 10^3 μm² (95% CI: [19.89–41.07] × 10^3 μm²) SA: 11.21 × 10^3 μm² (95% CI: [6.50–15.92] × 10^3 μm²) TCA: 41.63 × 10^3 μm² (95% CI: [26.79–56.47] × 10^3 μm²) CVI: 0.68% (95% CI: 0.26–1.10 %)
Zhao et al. (2023) [19]	Clinical trial, China	67	4 weeks	***Intervention (650 [±10] nm LLLT + SVS)*:** SFChT: 14.5 μm (95% CI: 9.6–19.5 μm) ***Control (SVS)*:** SFChT: -1.7 μm (95% CI: -9.1–5.7 μm) ***Comparison*:** SFChT: p <0.0001
Zhou et al. (2023) [20]	RCT, China	35	12 months	***Intervention (650 nm LLLT + SVS)*:** AL: -0.02 (±0.11) mm SER: 0.28 (±0.26) D SFChT: 20.89 (±39.48) μm ***Control*:** AL: 0.48 (±0.16) mm SER: -0.97 (±0.25) D SFChT: 11.14 (±28.95) μm ***Comparison*:** AL: p = 0.000 SER: p = 0.000 SFChT: p = 0.441 No adverse event. No structural or functional damage.
Liu et al. (2024) [21]	RCT, China	85	12 months	***Intervention (650 [±10] nm LLLT)*:** CT-fovea: 11.99 (±32.66) μm (p <0.05) CT-ParaF: 10.69 (±31.77) μm (p <0.05) CT-PeriF: 3.89 (±26.80) μm (p <0.05) ***Control*:** CT-Fovea: -28.74 (±26.89) μm (p <0.05) CT-ParaF: -25.83 (±25.40) μm (p <0.05) CT-PeriF: -24.75 (±24.21) μm (p <0.05) ***Comparison*:** CT-fovea: p <0.001 CT-ParaF: p <0.001 CT-PeriF: p <0.001
Cao et al. (2024) [22]	RCT, China	336	12 months	***Intervention (650 nm LLLT + SVS)*:** AL: -0.11 (±0.10) mm SER: 0.24 (±0.27) D CT: 16.46 (±18.15) μm ***Control (SVS)*:** AL: 0.26 (±0.16) mm SER: -0.65 (±0.33) D CT: -22.26 (±12.05) μm ***Comparison*:** AL: 0.37 mm (95% CI: 0.34–0.40 mm, p <0.001) SER: -0.89 D (95% CI: -0.95 – -0.83 D, p <0.001) CT: -38.72 μm (95% CI: -42.02 – -35.41 μm, p <0.001) No adverse event. No structural or functional damage.

Chen et al. (2022) [24]	RCT, China	60	12 months	***Intervention (650 nm LLLT)*:** AL: 0.08 mm (95% CI: 0.03–0.14 mm) SER: -0.03 D (95% CI: -0.08 – -0.01 D) ***Control (0.01% atropin)*:** AL: 0.33 mm (95% CI: 0.27–0.38 mm) SER: -0.60 D (95% CI: -0.70 – -0.48 D) ***Comparison*:** AL: -0.24 mm (95% CI: -0.32 – -0.17 mm, p <0.001) SER: 0.57 D (95% CI: 0.40–0.73 D, p <0.001) No adverse event. No structural or functional damage.
Xiong et al. (2024) [25]	Multicenter RCT, China	47	12 months	***Intervention (LLLT + Ortho-K)*:** AL: -0.02 mm (95% CI: -0.08–0.03 mm) ***Control (Ortho-K)*:** AL: 0.27 mm (95% CI: 0.19–0.34 mm) ***Comparison*:** AL: -0.29 mm (95% CI: -0.44 – -0.14 mm)
Xiong et al. (2021) [26]	RCT, China	229	6 months	***Intervention-1 (LLLT)*:** AL: -0.06 (±0.15) mm SER: 0.21 (±0.34) D SFChT: 35.30 (±31.75) µm ***Intervention-2 (Ortho-K)*:** AL: 0.06 (±0.15) mm SFChT: 14.98 (±22.50) µm ***Control (SVS)*:** AL: 0.23 (±0.06) mm SER: -0.50 (±0.24) D SFChT: -16.84 (±7.85) µm
Xiong et al. (2022) [27]	Follow up study RCT, China	114	12 months	***Continued LLLT*:** AL: 0.12 (±0.16) mm SER: -0.20 (±0.56) D ***Did not continue LLLT*:** AL: 0.42 (±0.20) mm SER: -0.91 (±0.48) D ***Comparison*:** AL: p <0.001 SER: p <0.001 No adverse event. No structural or functional damage.
Chen et al. (2023) [28]	Prospective clinical trial, China	86	12 months	***Intervention (635 nm LLLT + SVS)*:** AL: 0.01 mm (95% CI: -0.05–0.07 mm) SER: 0.05 D (95% CI: -0.08–0.19 D) ***Control (SVS)*:** AL: 0.39 mm (95% CI: 0.33–0.45 mm) SER: -0.64 D (95% CI: -0.78 – -0.51 D) ***Comparison*:** AL: p <0.05 SER: p <0.05 Significant rebound effect after the discontinuation of LLLT (p <0.05): AL: 0.16 mm (95% CI: 0.11–0.22 mm) SER: -0.20 D (95% CI: -0.26 – -0.14 D)
Zhu et al. (2024) [30]	Prospective clinical trial, China	108	12 months	***Intervention (650 nm LLLT + SVS)*:** AL: -0.05 mm SER: 0.21 D ***Control (SVS)*:** AL: 0.45 mm SER: -0.86 D ***Comparison*:** AL: p <0.001 SER: p <0.001 No adverse event. No structural or functional damage.

Liu et al. (2024) [31]	RCT, China	144	12 months	***Intervention-1 (650 [±10] nm LLLT – Myopia)*:** AL: 0.03 (±0.12) mm SER: -0.08 (±0.38) D ***Control-1 (Control – Myopia)*:** AL: 0.42 (±0.17) mm (92% vs LLLT, p <0.001) SER: -0.86 (±0.56) D (90.9% vs LLLT, p <0.001) ***Intervention-2 (650 [±10] nm LLLT Premyopia)*:** AL: 0.15 (±0.18) mm SER: -0.18 (±0.42) D ***Control-2 (Control – Premyopia)*:** AL: 0.29 (±0.13) mm (50.3% vs LLLT, p <0.001) SER: -0.52 (±0.44) D (65.3% vs LLLT, p = 0.001)

AL – axial length; CT – choroidal thickness; CT-fovea – choroidal thickness in the fovea; CT-ParaF – choroidal thickness in the parafovea; CT-PeriF – choroidal thickness in the perifovea; CVI – choroidal vascularity index; IOP – intraocular pressure; LA –luminal area; LLLT – low-level light therapy; mCT –choroidal thickness; Ortho-K – orthokeratology; RCT – randomised control trial; SA – stromal area; SER – spherical equivalent refraction; SFChT – subfoveal choroidal thickness; SVS – single-vision spectacles; TCA – total choroidal area.

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