World Society of Paediatric Ophthalmology & Strabismus

Myopia Consensus Statement 2025

Executive Summary:

This briefing document summarizes key findings from the provided excerpts regarding interventions to slow the progression of childhood myopia. It highlights what interventions have shown minimal or no effect, and focuses on the behavioral, environmental, optical, and pharmacological treatments demonstrating promising results. Notably, increased time spent outdoors, specific spectacle lenses and contact lenses designed to manage peripheral defocus or contrast, low-dose atropine eyedrops, and repeated low-level red-light therapy are presented as effective interventions supported by clinical evidence. The document also touches upon the mechanisms of action and potential adverse effects of these treatments.

Main Themes and Key Ideas:

The provided documents extensively review various approaches to managing the increasing prevalence of childhood myopia. The core themes revolve around:

- **Identifying Ineffective Interventions:** Several commonly used or previously explored interventions have been found to have minimal or no significant effect on slowing myopia progression.
- **Highlighting Effective Strategies:** A range of behavioral, optical, and pharmacological interventions have demonstrated statistically and clinically significant effects in slowing down the rate of myopia progression.
- **Understanding Mechanisms of Action:** Research is shedding light on how effective interventions influence eye growth and refractive development, particularly through the management of retinal defocus and contrast.
- **Presenting Evidence from Clinical Trials and Studies:** The documents heavily rely on data from numerous cross-sectional studies, longitudinal studies, randomized controlled trials (RCTs), and meta-analyses to support their conclusions.
- **Addressing Safety and Adverse Effects:** The safety profiles and potential side effects of the highlighted interventions are discussed.
- **Considering Regional Differences and Regulatory Landscapes:** The documents acknowledge that the effectiveness and availability of certain treatments may vary depending on geographical location and regulatory approval.

Most Important Ideas and Facts:

What Does Not Work or Has Minimal Effect:

- The documents explicitly state that certain interventions have yielded "zero to statistically and clinically non-significant effects." These include:
- Undercorrection
- Pinhole glasses
- Blue light blocking glasses
- Bifocal glasses
- Progressive addition spectacle lenses (PALs)
- Daytime single vision soft contact lenses / rigid gas permeable contact lenses
- Positively aspherized PALs (PA-PALs)

What Appears to Work:

1. Behavioral and Environmental Interventions:

- **Increased Time Spent Outdoors:** "The evidence for the protective effect of increased time spent outdoors in preventing or retarding myopia progression is robust." This is supported by a wide range of studies, including cross-sectional, longitudinal, RCTs, and meta-analyses.
- "2 hours daylight exposure appears to mitigate both onset and progression of myopia."
- "It is indeed luminance (Lux) that seems important: greater than 1000 Lux appears to be protective against myopia progression."
- Outdoor light levels are significantly higher than indoor levels, even in shade or with sunglasses.
- **Reduced Time on Near Tasks:** Excessive time spent on near work is associated with a higher risk of developing myopia.
- A meta-analysis found that "children who engage in more near work activities have an 80% higher risk of developing myopia compared to those who do less near work."
- "It is important to acknowledge that while evidence of prolonged task activity causing myopia progression is available, the role of reduced outdoor activity is a confounding factor."
- Taking breaks to interrupt near work is recommended.

1. Optical Treatment:

- Optical interventions aim to manipulate "retinal defocus or contrast," which influence eye growth.

- **Peripheral Retinal Defocus:** Animal studies show that peripheral retinal defocus can influence eye growth. Human studies indicate that myopic children tend to develop relative peripheral hyperopia. Conventional single-vision lenses increase peripheral hyperopic defocus.
- **Contrast Management:** The visual system is highly sensitive to contrast, and "the primary visual signals that influence eye growth are derived from defocus and contrast."
- **Spectacle Lenses:Defocus-Incorporated Multiple Segment (D.I.M.S.) Spectacle Lenses (Hoya Miyosmart):** These lenses have a central clear zone and a peripheral zone with multiple segments inducing myopic defocus.
- A 2-year trial showed a "myopia control effect was 55%".
- "The mean axial elongation was also less in the DIMS group than in the single vision spectacle lens group".
- Effect was sustained over 6 years.
- May have slightly reduced visual acuity and contrast sensitivity in peripheral gaze.
- "Atropine drops had an additive synergistic affect when used in conjunction with DIMS spectacles".
- No evidence of rebound after stopping treatment.
- **Highly Aspherical Lenslet (H.A.L.) Spectacle Lenses (Essilor® Stellest®):** These lenses use highly aspherical lenslets.
- Slowed myopia progression by up to 0.80 D and axial elongation by up to 0.35 mm over 2 years.
- Ocular growth rate in 90% of children wearing HAL lenses was "like physiologic rate of normal non-myopic children".
- The effect was sustained over 3 years.
- Inhibited choroidal thinning and potentially thickened the choroid.
- Reduced axial elongation in unilateral myopic anisometropia.
- No rebound effect observed after cessation.
- **Diffusion Optics Technology™ (DOT™) Spectacle Lenses (SightGlass Vision™):** These lenses use microscopic diffusers to slightly lower retinal contrast.
- Demonstrated safety and efficacy in children aged 6 and older.
- After 3 years, myopia progression was slowed by 0.84 D and axial length by 0.32 mm in young children.
- Showed continued benefit over 4 years compared to control lenses.
- **Contact Lenses:Soft Multifocal Contact Lenses (e.g., MiSight® 1 Day):** These lenses have concentric zones with different powers to induce myopic defocus.

- Showed a reduction in myopia progression of "on average 36.4%" and axial elongation by "37.9%".
- MiSight® 1 Day showed a "59% reduction" in spherical equivalent refractive error over 3 years compared to single vision contact lenses.
- "Myopic defocus induced by the contact lenses was correlated with a reduction in the progression of myopic refractive error and the amount of axial elongation".
- The BLINK study showed that higher add power (+2.50 D) multifocal contact lenses were more effective than medium add (+1.50 D) or single-vision lenses in slowing progression and axial elongation.
- **Orthokeratology (OK):** Overnight wear of rigid contact lenses to reshape the cornea.
- Reduces axial elongation by around 0.25 mm over a 2-year period compared to control groups.
- Pooled data from multiple studies showed a treatment effect of 0.24 mm (36.9%) in axial length change over 2 years.
- "Research to understand the mechanism underlying myopia control effect of OK lens is ongoing, although the hypothesis is a decrease in relative peripheral hyperopia caused by the steepening of the midperipheral corneal surface."
- Rebound can occur after discontinuation.

1. Pharmacological Treatment:

- **Atropine Eyedrops:** Blocks muscarinic receptors. The exact mechanism in myopia control is not fully understood but likely involves non-accommodative pathways affecting the sclera.
- Historically, 1% atropine showed high efficacy but significant side effects.
- Low-dose atropine (0.01% to 0.1%) has been extensively studied.
- The LAMP study showed dose-dependent efficacy, with 0.05% being suggested as the optimal concentration.
- "Low-dose atropine (0.01%-0.1%) has 30-60% efficacy."
- "There is a dose-related response in atropine for myopia control."
- May have additive effects with DIMS spectacles.
- Adverse effects like photophobia and blurred vision are dose-dependent and less common with lower doses.
- There are interethnic differences in response and adverse events.
- The debate over safety and effectiveness continues in some regions, while it is widely accepted in Asia.

- Trials are exploring its use to prevent myopia onset in premyopic children. The LAMP2 trial showed that nightly use of 0.05% atropine resulted in significantly lower myopia incidence in premyopic children.
- Rebound effect after cessation is possible and influenced by age and concentration used.
- Regulatory approval for myopia control varies across countries.

1. Light Therapy:

- **Repeated Low-Level Red-Light Therapy (RLRL):** Involves exposing the eye to low-level red light.
- Multiple studies and meta-analyses consistently show it slows axial length elongation.
- Some studies report a phenomenon of axial shortening.
- Showed strong effects in children with high myopia.
- Reported side effect rate is comparable to myopia reduction spectacles and significantly lower than low-dose atropine, orthokeratology, and other anti-myopia contact lenses.
- Does not appear to cause irreversible visual function loss or ocular structural damage.
- Regulatory changes in China may impact its future use there for new users, but approved devices are available in other regions.

Mechanisms of Action (Summary):

- **Peripheral Retinal Defocus:** Many optical interventions work by changing how light is focused on the peripheral retina. Inducing myopic defocus in the periphery is thought to signal the eye to slow down elongation.
- **Contrast Management:** Some interventions aim to reduce retinal contrast, which is another visual signal influencing eye growth.
- **Atropine:** Likely works through non-accommodative pathways involving muscarinic receptors in the retina and sclera.
- **Repeated Low-Level Red-Light Therapy:** The exact mechanism is still being studied, but it is hypothesized to affect blood flow and metabolic rate in the eye fundus.

Adverse Effects:

- Adverse effects are generally low for most effective interventions, especially at lower doses or with newer optical designs.
- Atropine side effects (photophobia, blurred vision) are dose-dependent.

- Contact lens wear carries a risk of complications, although the document mentions no differences in focusing ability and depth perception compared to single-vision lenses in one study.
- RLRL therapy has a reported low rate of side effects.

Important Considerations:

- The effectiveness of interventions can vary based on factors such as age, ethnicity, and baseline myopia severity.
- Combination therapies (e.g., atropine and DIMS spectacles) may offer synergistic effects.
- Rebound effect (accelerated progression after stopping treatment) is a potential concern with some interventions like orthokeratology and atropine, and needs to be managed.
- Regulatory approval and availability of specific treatments differ globally.

Conclusion:

The provided sources offer a comprehensive overview of current evidence regarding interventions to slow childhood myopia progression. The focus has shifted from ineffective treatments to a range of strategies demonstrating significant efficacy. Increased time outdoors, innovative spectacle and contact lens designs, low-dose atropine, and repeated low-level red-light therapy are presented as key tools in managing this growing public health concern. Continued research is ongoing to further refine these interventions, understand their mechanisms, and optimize treatment strategies.