Efficacy of Defocus Incorporated Multiple Segments (DIMS) Spectacle Lenses in Slowing Myopia Progression and Axial Length Elongation: A Systematic Review

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Abstract

Objective

To conduct a systematic review on the efficacy of Defocus Incorporated Multiple Segments (DIMS) spectacle lenses in slowing childhood myopia progression and axial length (AL) elongation, and exploring factors associated with variations in treatment response.

Methods

PubMed, EBSCOhost, ProQuest, and ScienceDirect were searched on July 28 to September 27, 2026. Studies on DIMS spectacle lenses for childhood myopia control were reviewed on spherical equivalent refraction (SER), AL elongation, treatment response predictors, safety and tolerability, visual function, and combination therapies. Findings were synthesized.

Results

47 studies were included. Most reported that DIMS lenses slowed SER progression and AL elongation compared with single-vision spectacles. Some studies reported that benefits continued long term. Treatment response varied, with age, baseline AL, relative peripheral refraction, and ocular characteristics identified as factors influencing the differences. Available evidence also suggested that DIMS had favorable tolerability and results could be enhanced with combination therapy.

Conclusion

DIMS spectacle lenses are effective in slowing childhood myopia progression and AL elongation. However, differences in treatment response and limitations in the evidence highlight the need for further studies to clarify predictors of efficacy and establish long term safety.

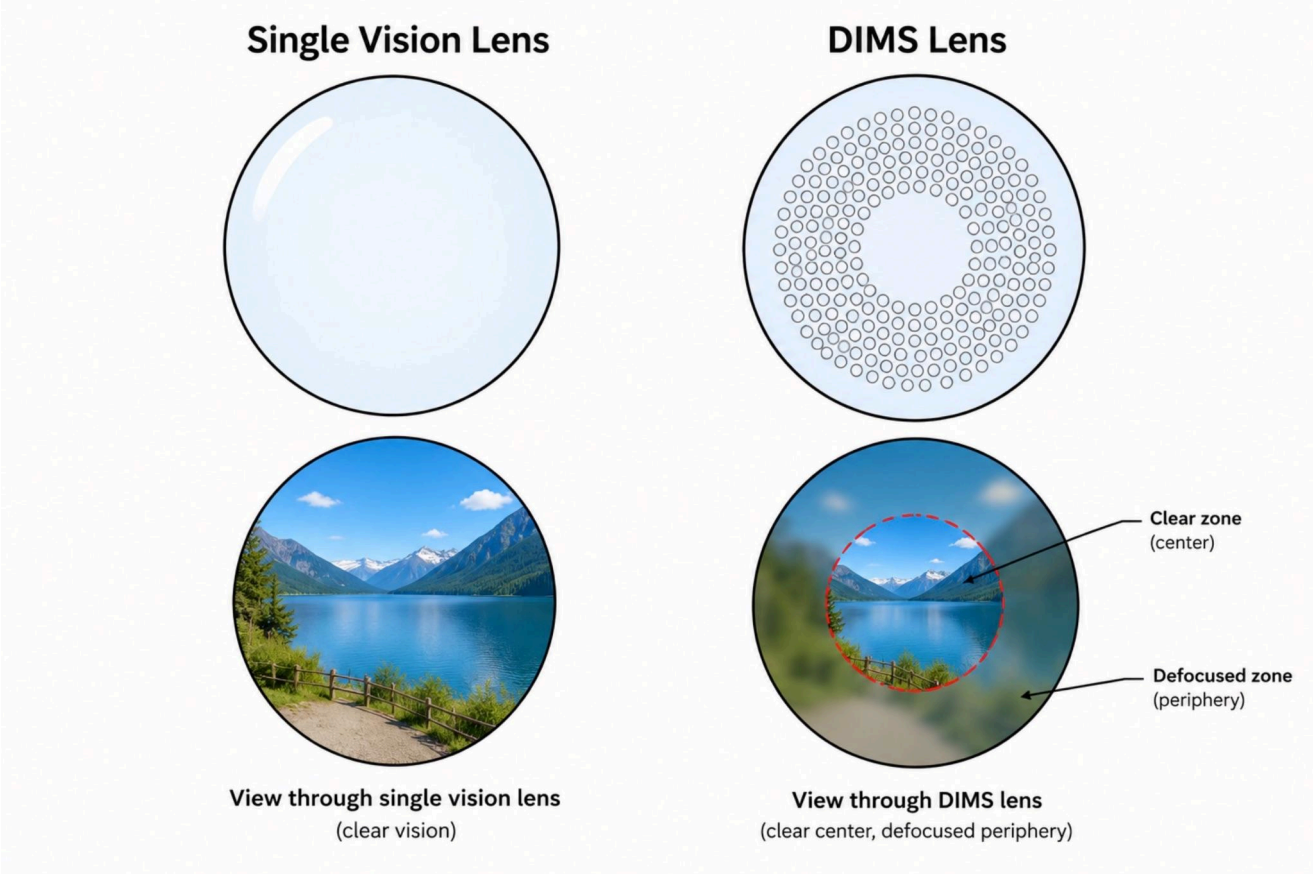
Introduction

Childhood myopia has become an increasingly important public health concern because of its rising prevalence, with almost half of the world's population predicted to be myopic by 2050 (Holden et al., 2016). Myopia develops when the eye becomes elongated, which causes light to focus in front of the retina instead of directly on it. During childhood, axial elongation is a main predictor of myopia progression, and greater elongation is associated with a higher risk of impairments like retinal detachment, glaucoma, and myopic macular degeneration (Bullimore et al., 2021). Because of this, myopia management also focuses on slowing the rate of axial growth, rather than just fixing refractive error.

Many interventions have been developed to slow childhood myopia progression, including low-dose atropine, orthokeratology, multifocal contact lenses, and specialized spectacle lenses. Spectacle based interventions are particularly important because they do not require children to insert anything inside their body or eye, and provide continuous treatment. Among spectacle-based approaches, Defocus Incorporated Multiple Segments (DIMS) spectacle lenses have received substantial attention because they are non-invasive and can easily be used daily.

As illustrated in Figure 1, DIMS lenses use a central optical zone for clear vision surrounded by multiple small segments that give myopic defocus while the child views through the lens (Lam et al, 2020). This design creates areas of myopic defocus on the retina, including in the peripheral visual field, which is hypothesized to give a signal that reduces the stimulus for increased axial elongation. Unlike conventional single-vision (SV) spectacles, which correct refractive error, DIMS lenses are designed to provide vision correction and control myopia.

Figure 1.
Comparison of single-vision and DIMS spectacle lenses. Single-vision lenses provide a clear central image, while DIMS lenses have a central clear zone (9 mm in diameter) surrounded by multiple lens segments that create myopia defocus.



The increasing adoption of DIMS lenses has made them an important intervention for slowing myopia progression. However, even though DIMS lenses have slowed myopia progression and axial length elongation in children, responses to treatment are not the same for all participants. Differences in age, baseline refractive error, axial length, and other ocular or visual characteristics may contribute to differences in myopia control. Thus, understanding which children benefit most from DIMS, as well as factors associated with reduced treatment response, is important for optimizing individual myopia management.

This systematic review evaluates the efficacy of Defocus Incorporated Multiple Segments (DIMS) spectacle lenses for controlling childhood myopia. In addition, the review examines factors associated with differences in treatment response, including baseline and ocular characteristics, to identify patterns that may explain why some children experience greater or less benefit from DIMS treatment. By synthesizing these findings, this review aims to identify remaining gaps that warrant future investigation.

Methods

Search Strategy

PubMed, ProQuest, ScienceDirect, and EBSCOhost were searched from July 28, 2026 to September 27, 2026 to identify studies evaluating DIMS spectacle lenses and their effects on childhood myopia progression. The following search string was applied: ((“myopia” OR “nearsightedness”) AND (“DIMS” OR “Defocus Incorporated Multiple Segments”) AND (“children” OR “adolescents”) AND (“axial length” OR “spherical equivalent refraction”)).

Eligibility Criteria

Studies were eligible for inclusion if they (1) included children or adolescents with myopia; (2) evaluated DIMS spectacle lenses as an intervention; (3) reported at least one measure of myopia progression, including AL or SER; and (4) used a design capable of measuring progression over time. Studies of DIMS combined with other interventions were eligible if DIMS outcomes could be identified. Studies were excluded if they did not evaluate DIMS spectacle lenses, focused only on adults, or did not contain information relevant to the focus of the review. Studies investigating other myopia-control interventions which did not provide relevant DIMS data were excluded.

Duplicate Removal and Screenings

A total of 192 records were identified through the database searches. After duplicates were removed, 91 unique records remained for screening. These records were screened based on their titles and abstracts to determine their relevance to the research question. Records identified as potentially relevant were assessed further based on the predefined eligibility criteria. Following the screening process, 47 records were determined to be relevant to the objective of the systematic review.

PRISMA Workflow

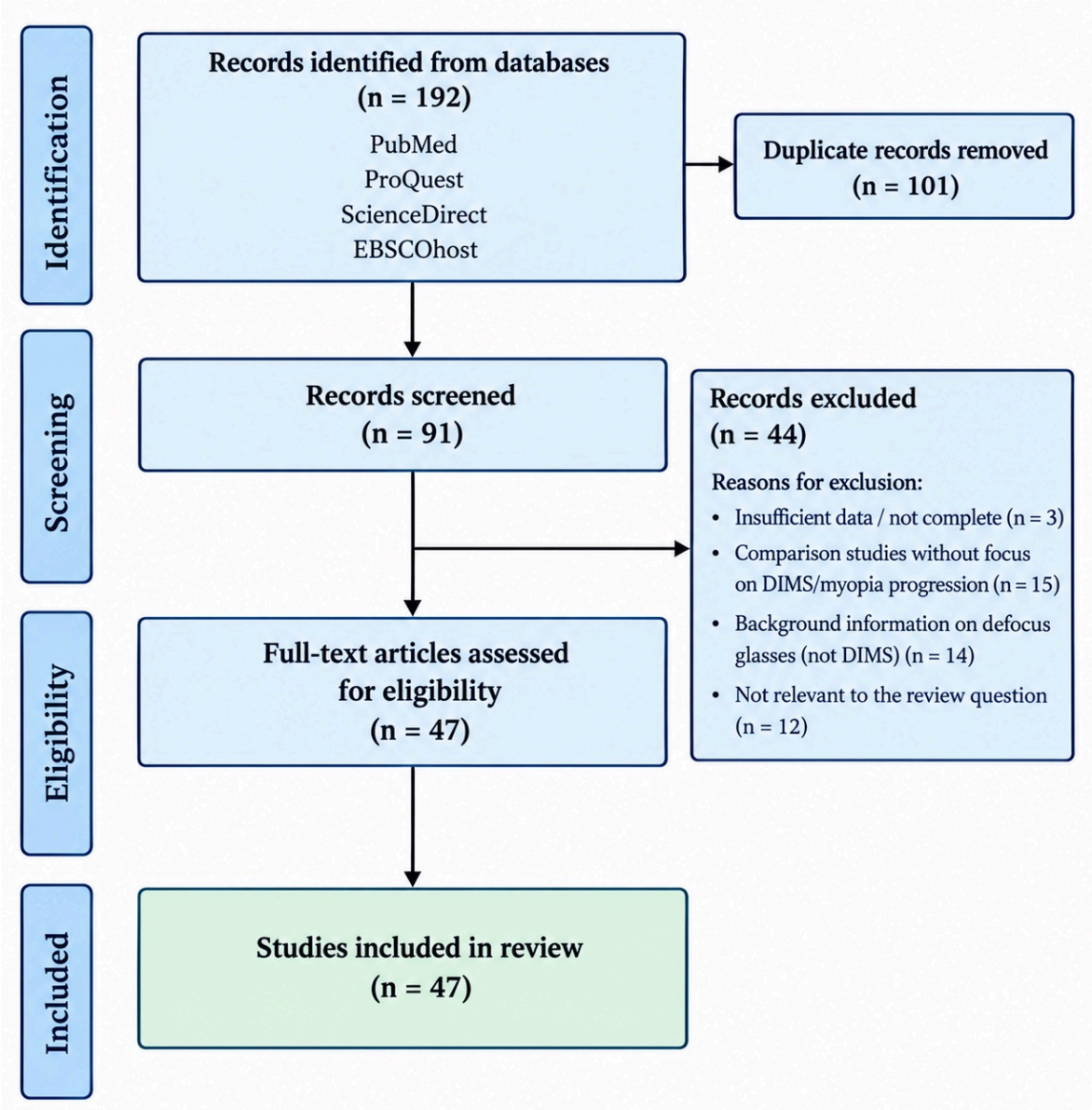
Records identified though database searches were screened for duplicates before title and abstract screening. The final selection of studies was documented using the PRISMA flow diagram which summarizes the number of records screened, duplicates removed, records screened, records excluded, and relevant studies retained through the review process.

Results

Study Selection

The literature search identified 192 records across selected databases. After removal of 101 duplicates, 91 unique records remained for titles and abstract screening. 47 studies met the inclusion criteria and were included in the systematic review. The study selection process is presented in the PRISMA flow diagram. (Figure 2)

Figure 2.



Characteristic of Included Studies

The included studies varied in design, population, follow-up duration, and outcomes. Most studies evaluated children and adolescents with myopia wearing DIMS lenses, with SV spectacles as the comparator. The primary outcomes most frequently evaluated were axial length (AL) and spherical equivalent refraction (SER). Additional outcomes included treatment-response factors, peripheral refraction, choroidal and choriocapillaris characteristics, binocular vision, accommodation, visual function, astigmatism, visual comfort, and treatment tolerability. Most participants were from Asian populations, although more recent studies included children from European and other populations. Table 1 summarizes the main

outcomes.

Table 1. Summary of main outcomes.

Outcomes	Studies Reporting Outcome	General Finding	Important variation
Axial Length	n=39	Less AL elongation with DIMS than with SV lenses.	Varied by age, baseline ocular characteristics, and duration of treatment.
SER	n=37	Slower myopia progression compared with DIMS than with SV lenses.	Differences between individuals and study populations.
Age	n=23	Older children generally showed better treatment responses; younger children progressed faster.	Age-related differences were not uniform across all studies.
Baseline SER/AL	n=16	Greater baseline myopia and longer baseline AL were associated with poorer treatment response in some studies.	Associations were not consistent across all studies.
Relative Peripheral Refraction	n=3	DIMS maintained a more symmetrical RPR profile, while SV showed more asymmetry and increased nasal hyperopic RPR. Baseline myopic RPR was associated with poorer DIMS response.	RPR was associated with refractive progression, but its relationship with axial elongation was inconsistent.
Astigmatism	n=5	DIMS remained effective across different astigmatism types, although astigmatism progression was associated with greater myopia progression in	Findings varied by astigmatism type; associations between baseline astigmatism and treatment response were inconsistent.

		some studies.	
Safety and Visual Function	n=13	DIMS generally preserved visual function and was well tolerated.	Studies varied in visual functions assessed and duration of follow-up.
Combination Therapy	n=14	Adding DIMS to atropine or RLRL was associated with greater axial slowing than the other treatment alone.	Different designs and follow-up.

Risk of Bias and Methodological Quality

The included studies varied in design and method which affected the quality of the evidence. The most common concern was study design. RCTs give the strongest evidence of DIMS efficacy, but many included studies were retrospective or observational, so children were not randomly assigned their treatment. This means their choice of treatment could have been based on clinical practice, parental preferences, or perceived progression risk. This leaves results open to selection bias. Some studies were self-controlled or had no control group, so treatment effects could not be differentiated from the natural progression of myopia. In addition, most studies followed children for only one to two years, and loss to follow-up or switching lenses can bias longer comparisons. Likewise, the definition of successful control varied between studies.

The direction of effects was similar across RCTs and observational studies. However, the quality is lower for treatment-response predictors, which came from mostly small uncontrolled, retrospective analyses. Most participants were from Asian populations and many studies were single-center, so results may not reflect the broader population. Findings also apply mainly to one to two years of treatment. Retrospective and uncontrolled results should be interpreted as associations, and percentages cannot be compared directly with other studies with different definitions or duration. The RCT results therefore carry the most quality for efficacy.

Overall DIMS Efficacy

Across the included studies, DIMS spectacle lenses were associated with slower myopia progression than SV lenses. In a two-year RCT, children wearing DIMS experienced approximately 52% less myopic progression and 62% less axial elongation compared with the SV group. (Lam et al., 2020) Findings from other populations were similar, although the size of the reported treatment effect differed. The overall direction of these findings were also observed in longer-term and observational studies. In a six-year follow-up, children who continued wearing DIMS maintained slower progression in myopia while the children who transitioned from SV spectacle lenses to DIMS also showed less progression after switching to a different treatment. (Lam et al., 2023) Differences in population, follow-up design, and outcome measures prevented quantitative pooling.

Refractive Outcomes

Changes in SER generally followed the same pattern as axial-length outcomes. In the two-year RCT, 21.5% of children in the DIMS group showed no myopia progression, compared with 7.4% in the SV group (Lam et al., 2020). Most other comparative studies also reported less refractive progression with DIMS. Real-world data has similar results. In a retrospective study conducted in a German study, approximately 65% of children achieved successful myopia control, where myopia progression is less than 0.50 D per year (Neller et al., 2024). In a retrospective study of Turkish children, 81.5% of eyes met the study's criterion for successful SER control after 12 months (Akagun et al., 2025).

Axial-Length Outcomes

Axial length elongation was consistently utilized as a predictor for myopia progression. The two-year RCT reported approximately 62% less axial elongation in the DIMS group compared with the SV group, and an age-matched analysis of the same clinical population further found that approximately 65% of DIMS treated eyes remained within the physiological range of axial growth, compared with approximately 16% of eyes receiving SV correction. (Lam et al., 2020) Similar findings were reported in the South-Eastern European cohort, where the mean axial-length increase in 12 months was 0.09 mm with DIMS compared with 0.14 mm with SV spectacles (Mocanu et al., 2026). Other studies also reported smaller increases among DIMS groups, however baseline characteristics and follow-up duration vary across studies. Differences in sample size, study design, baseline measurements, follow-up duration and control conditions contributed to variation in the reported effect size.

Factors Associated With Treatment Responses

Treatment response varied among individual children. Age was one of the most consistently investigated factors for different treatment outcomes. Studies conducted in German and other pediatric populations reported that older children generally experience better treatment outcomes, whereas younger children generally showed faster myopia progression and greater axial length elongation despite wearing DIMS spectacle lenses (Neller et al. 2024). Likewise, baseline ocular characteristics were also associated with different treatment responses. Longer baseline axial length and greater baseline myopia were associated with less favorable treatment outcomes in several studies. In a German real-world study, children with greater baseline axial length showed less successful myopia control, while higher baseline myopia was associated with greater axial elongation during follow-up (Neller et al. 2024).

Relative peripheral refractive (RPR) characteristics were also measured. One analysis found that younger children with baseline myopic RPR responded less favorably than older children with baseline hyperopic RPR (Zhang et al., 2023). The same study found that children with myopic RPR in the nasal periphery had greater progression and axial elongation, most evident at 10° and 20° nasal eccentricities (Zhang et al., 2023). A further study found that DIMS changed peripheral refraction over two years without a consistent correlation between peripheral refraction and treatment effect (Zhang et al. 2020). Figure 3 illustrates that RPR changes differ across retinal eccentricities between DIMS and SV spectacle lenses, with SV lenses showing a greater hyperopic shift toward the nasal periphery. These patterns show the general outcome of peripheral refractive profiles and are not predictors of individual response.

Figure 3.
Illustrative changes of RPR across retinal eccentricities in children wearing DIMS or SV spectacle lenses over three years based on the double masked RCT (Zhang et al. 2023) . DIMS is associated with more symmetrical peripheral refractive changes and relatively stable RPR, whereas SV lenses are associated with increasingly asymmetric RPR changes, particularly a more hyperopic shift on the nasal-retina side. Curves illustrate the generalized patterns and do not represent measured data.



Astigmatism was also measured for treatment response. A study reported lower myopia progression among children with with-the-rule astigmatism compared with children with against-the-rule or oblique astigmatism, although the subgroup showing greater axial elongation with against-the-rule astigmatism was small (Hoogendoorn et al., 2026). Another found an association between changes in cylinder power and myopia progression during DIMS wear. Higher cylinder power progression is associated with greater myopia progression (Wang et al. 2025).

Greater baseline choriocapillaris flow-void area was associated with faster axial elongation in one study, while age, pupil diameter, and corneal characteristics were also examined predictors. (Li et al., 2023) However, findings on pupil diameter were inconsistent across studies, with one analysis failing to identify a significant relationship between pupil size and myopia progression.

Safety, Visual Function, and Tolerability

Studies evaluating safety and visual function generally reported that DIMS maintained normal visual performance while providing myopia-control effects. Investigations of peripheral visual field performance found no clinically important impairment associated with the peripheral defocus in DIMS lenses. Studies examining binocular vision and accommodation likewise generally reported that DIMS wear did not produce substantial deterioration in these functions.(Lam et al, 2023) A 24-month self-controlled study of 23 Malay children measured changes in near point convergence, fusional vergence, stereopsis, and accommodation, and the investigators did not interpret these as major deterioration in visual function (Yahaya 2025). Likewise, children wearing DIMS reported favorable visual comfort and, in one comparison, less eye fatigue than children wearing conventional single-vision spectacles.

Combination Therapy

A smaller set of studies investigated DIMS in combination with other myopia control interventions such as low-dose atropine and repeated low-level red-light (RLRL). These studies generally reported greater reductions in myopia progression or axial elongation with combination treatment than with DIMS alone. In a randomized trial in European children, DIMS plus 0.025% atropine was compared with SV spectacles plus the same atropine concentration. After 12 months, AL elongation was significantly lower in the DIMS group with approximately 0.07 mm versus 0.18 mm, while the difference in SER progression was lower but not statistically significant (Guemes-Vilahoz et al., 2025). In a retrospective study of 107 children, treatment with DIMS and 0.01% atropine was associated with 1-year SER progression of 0.49 ± 0.66 D and axial length elongation of 0.28 ± 0.24 mm (Domsa et al., 2024). In a prospective, non-randomized controlled study of 146 European participants aged 6-18 years who chose their own treatment, DIMS plus 0.01% atropine was compared with DIMS alone, atropine alone, and SV spectacles. At 12 months, SER progression was significantly lower in the combined group than in the DIMS only group, whereas AL did not differ significantly between the two groups. (Nucci et al., 2023) Moreover, in a two-year retrospective study, 49 children received RLRL combined with DIMS, while 79 received RLRL alone. The group with both treatments demonstrated a greater reduction in axial length over time, with an axial length change rate of -0.014 mm/month during the first 12 months compared with -0.009 mm/month in the group with only RLRL (Ma et al., 2026).

Discussion

Overall Efficacy of DIMS Spectacle Lenses

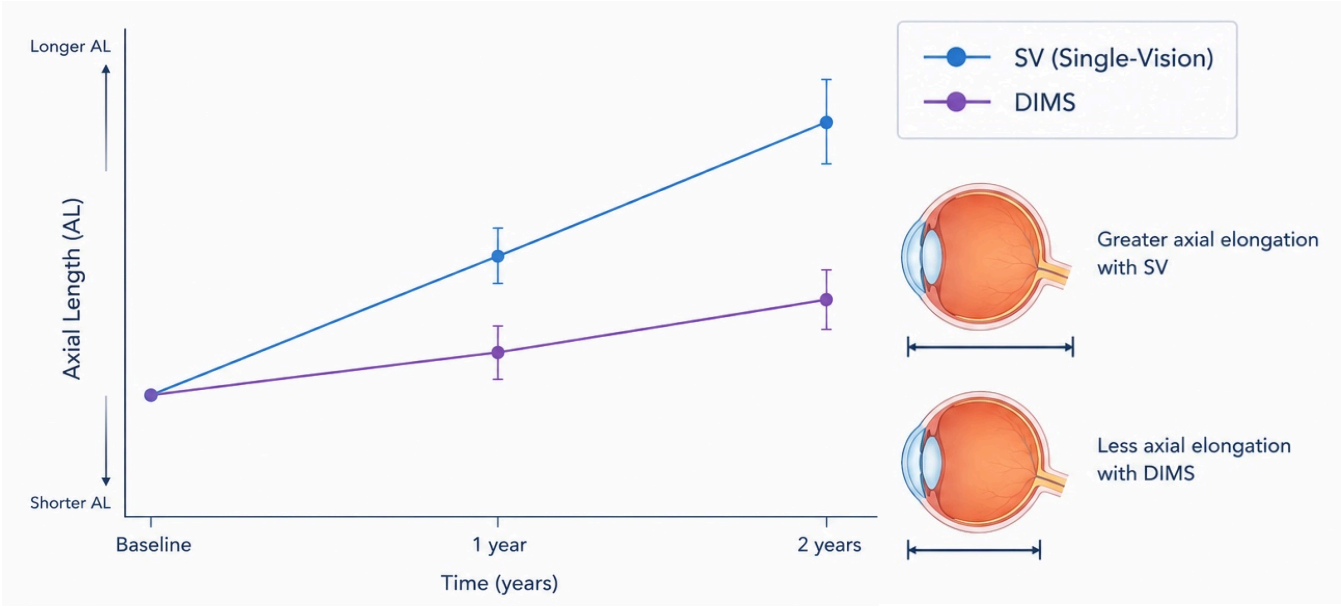
The findings of this systematic review suggest that DIMS spectacle lenses are effective for slowing childhood myopia progression compared with conventional SV lenses. The consistency of these findings across different study settings suggests that the benefits of DIMS are not limited to a single clinical population. However, the strength of the evidence differs by study design, with randomized controlled trials displaying stronger evidence of treatment efficacy than retrospective studies, which may be influenced by differences in characteristics and treatment selection. The two-year randomized controlled trial gives particularly strong evidence. Compared with SV spectacles, DIMS lenses lowered myopia progression by 52% and AL elongation by 62%, and more children showed no progression (Lam et al., 2020). These findings confirm that DIMS convey benefits in both refractive progression and structural growth. Additional real-world studies, including research conducted in European populations, have reported similar trends. For example, it was found that children wearing DIMS in a German

clinical setting had favorable outcomes, while a two-year UK study provided similar results from a population outside East Asia (Neller et al. 2024; McCullough et al., 2025).

Importantly, the reduction in AL elongation shows more evidence of DIMS efficacy beyond changes in just refractive error. Eye growth is associated with a higher risk of myopia and the consistent reduction in AL elongation across the included studies gives important evidence that DIMS does more than slow changes in refractive error. Although SER is useful for monitoring myopia, it can be influenced by optical factors that do not directly mirror eye growth. Considering both outcomes provides a more complete assessment of treatment effectiveness.

All of the evidence shows that DIMS is effective in slowing SER and AL, but the degree of the effect is not the same for all studies. Differences in age, baseline myopia, follow-up duration, and study design may contribute to these variations. The relationship between the outcomes also required careful interpretation. A favorable SER result does not necessarily mean that axial growth has been controlled, just as a reduction in AL elongation does not mean that progression has stopped completely. For this reason, the two outcomes need to be viewed in tandem rather than treated as interchangeable measures of success. These differences in axial length progression between DIMS and SV lenses are illustrated in Figure 4.

Figure 4. Illustrative changes of AL progression in children wearing DIMS versus SV spectacle lenses of the two years randomized study (Lam et al., 2020). Both groups experience eye growth, but axial elongation is slower with DIMS. The graph illustrates the general trend reported across studies and does not represent pooled numerical data.



Age matched analyses have also assessed whether AL growth among DIMS users falls within the range of normal eye development. Once such analysis reported that approximately 65% of eyes in the DIMS group achieved growth within the defined physiological range, compared with a smaller proportion in the SV group (Graff et al., 2024). This comparison demonstrates that the

goal of myopia management is not necessarily to remove all eye growth, but to reduce excessive elongation while allowing a normal growth rate.

Long-term Effectiveness and Ocular Structural Changes

As myopia may progress over many years, it is encouraging to see some evidence that benefits can last. If the benefits of DIMS persist with continued wear, the lenses can provide a practical solution for ongoing management without having children use invasive treatments like contact lenses or eye drops. However, stopping treatment or switching between treatments are not equivalent exposures. Children who continue wearing DIMS may differ from those who stop in adherence, family preferences, or underlying progression risk. Long term observations cannot always tell the effect of continued lens wear from these other factors. Future research should compare continued DIMS use with clearly defined alternative strategies and assess whether any benefits continue after treatment is stopped.

Several studies have also investigated ocular structural changes associated with DIMS use, including changes in choroidal thickness, peripheral refraction, and choriocapillaris perfusion. Research examining peripheral refraction has reported changes during treatment, suggesting that DIMS may have modified the retinal defocus experienced by the eye. A study investigated changes in choroidal thickness during DIMS treatment, and found that larger baseline choriocapillaries flow-void areas were associated with greater AL elongation among children wearing DIMS (Li et al., 2023).

These findings may help explain why treatment responses differ between children and may contribute to a better understanding of the biological processes associated with eye growth. However, structural changes and associations with treatment outcomes does not mean that a particular change directly causes myopia control. More prospective studies with control groups and repeated structural measurements are needed to determine whether these changes are the result from treatment or are simply correlated features of ocular development.

Factors Associated With Treatment Response

Although DIMS generally slowed myopia progression, participants experienced different outcomes and benefits. (Buzzonetti et al., 2024) The variation is important because effective treatment at the group level may not provide the same control for every individual. Finding reliable predictors could help clinicians determine which children may need closer monitoring or additional treatment.

Age is one of the factors examined most frequently. Some studies reported faster progression or greater AL elongation among younger children wearing DIMS, whereas other analyses found that the relative benefit of treatment did not follow a simple age related pattern. In a German real-world cohort, children younger than 10 years at baseline had less successful control than the cohort as a whole, and in a Hong Kong real-world study, younger baseline age correlated with greater annual AL elongation ($r = -0.61$) (Neller et al., 2024; Chun et al. 2025). This pattern is easy to misread, however, because the studies did not use the same age groupings with cut-offs such as under 10 years versus 10 years and older. Likewise, younger children may have more years of active myopia progression remaining and may naturally have faster eye

growth. Therefore, greater progression among younger DIMS users does not automatically mean that DIMS is less effective in this age group.

Baseline ocular characteristics may also influence outcomes. Younger age, greater baseline myopia, and larger choriocapillaris flow-void areas were associated with faster AL elongation among DIMS users. (Li et al. 2023) These findings suggest that treatment response may reflect a combination of structural factors instead of a single characteristic. Nevertheless, the study's retrospective design, single-center population, and lack of an SV control group makes the study unreliable to whether these variables specifically predict DIMS response rather than underlying general myopia progression.

Relative peripheral refraction (RPR) is another potential factor because DIMS lenses are designed to provide myopic defocus in addition to central vision correction. However, evidence may be limited. One study found that children with more myopia RPR in the nasal peripheral retina experienced greater myopia progression and axial elongation during DIMS treatment than those with hyperopic RPR. This pattern was most evident at 10° and 20° nasal retinal eccentricities, suggesting that treatment response may depend on one's baseline peripheral refractive profile (Zhang et al. 2023). Another study found that DIMS lenses changed peripheral refraction over two years, although these changes did not show a consistent relationship between peripheral refraction and treatment effectiveness (Zhang et al. 2020). Ultimately, baseline RPR may help explain individual differences in DIMS efficacy, but more research is needed to determine its reliability as a predictor of treatment response.

Data on astigmatism is similarly mixed. Some studies have compared treatment effects for eyes with and without cylinder power or astigmatism type, and certain analyses suggest that specific refractive characteristics may be associated with treatment outcomes (Wang et al. 2025). However, there is no reliable evidence that shows the correlations between astigmatism and less effective results from DIMS. Moreover, different definitions of astigmatism and subgroup sizes may account for some of the varying outcomes. For the time being, astigmatism remains a possible factor and requires further research.

Other factors such as binocular vision measures, pupil diameter, corneal curvature, and choroidal characteristics, have also been looked at. While some correlations have been found, many studies were small or observational and did not have a control group. Thus, it is unclear if these characteristics are outcomes of DIMS treatment or if it was simply related to individual myopia progression in general. Future studies should use larger, diverse prospective cohorts and standardized measurements to test whether these predictors remain significant.

Safety and Visual Function

While treatment results do not seem to be consistent, the evidence does support that DIMS lenses are generally well tolerated and can slow myopia progression without a significant deterioration in measured visual function. This is clinically relevant as the efficacy of a treatment also depends on children being able to wear the treatment and do so with good functional vision during their daily activities.

Some studies have found similar visual performance between children wearing DIMS and children wearing SV spectacles, whereas other findings have shown increased visual comfort for children wearing DIM (Ryu et al. 2021). These results suggest that the lens design can control myopia without impairing visual performance. However, the study received subjective data of comfort, not measured visual performance. Hence, results should be treated with caution. Variations in study protocols and small number of participants in some studies also make it hard to gauge the consistency of these benefits.

Studies examining accommodation and binocular vision have reported measurable changes in some parameters during DIMS wear. For example, a 24-month self-controlled study of 23 Malay children reported changes in near point of convergence, fusional vergence, stereopsis, and accommodation. The investigators did not interpret the overall changes as evidence of major deterioration in visual function. Nevertheless, the small sample and absence of a control group limit its reliability of whether these changes were caused by DIMS, or normal development (Yahaya et al. 2025).

Role of Combination Therapy

Combination therapy is a potential strategy for children whose myopia continues progressing despite optical treatment. The evidence indicates that there may be benefits from the combination of DIMS and low-dose atropine or low-level red light.

A randomized trial in European children comparing DIMS plus 0.025% atropine with SV spectacle plus the same atropine concentration found significantly less AL elongation in the DIMS group after 12 months. There was approximately 0.07 mm AL elongation in the DIMS group compared with 0.18 mm in SV group. SER progression was also lower in the DIMS group, but the difference was not statistically significant (Guemes-Villahoz et al. 2025). Similarly, adding DIMS to RLRL was associated with less axial elongation than RLRL alone (Ma et al., 2026). These findings support that DIMS adds benefits on top of other treatments. Two studies that included a DIMS-only group allowed a more direct comparison with DIMS alone. In the European study, adding 0.01% atropine to DIMS reduced SER progression significantly more than DIMS alone at 12 months, but the AL difference was not significant (Nucci et al., 2023). In the retrospective study of 107 children, DIMS plus 0.01% atropine produced a smaller AL change and less myopia progression than DIMS alone (Huang et al., 2023).

These findings imply adding atropine to DIMS gives better refractive control and possibly axial control. Combination therapy may be a reasonable strategy for children who continue to experience excessive myopia progression despite optical treatment alone. However, because supporting studies differ in design, where treatment was chosen by participants in one study, and the other was retrospective, results may have been influenced. The European study also differed between baseline groups in age, SER, and AL. These findings therefore suggest, but do not prove, an effect.

Limitations of the Evidence and Future Research

Several limitations affect the quality and generalizability of the findings. First, the search was limited to four databases (PubMed, EBSCOhost, ProQuest, and ScienceDirect). Databases

such as Embase, Web of Science, and the Cochrane Library, as well as regional databases were not searched, so relevant studies may be missing.

Second, the included studies varied in design, sample size, participant characteristics, and follow-up duration which makes direct comparisons hard. RCTs offer better evidence of efficacy, while retrospective studies are useful for examining real-world outcomes and less common populations, but are more susceptible to confounding variables and selection bias.

Third, most studies were conducted in East Asian populations, and evidence from other populations is limited. While results from European and UK cohorts show that DIMS may be effective outside of the original trial population, additional research is needed to determine whether treatment effects are similar across different ethnic, genetic, and environment. Longer follow-up is also needed as many studies assess outcomes over one or two years, whereas myopia progression can occur over childhood and adolescence.

Fourth, the evidence concerning treatment-response predictors and ocular structural changes remains exploratory. Associations involving age, RPR, astigmatism, choriocapillaris perfusion, and binocular vision have not been consistent enough to support reliable predictions. Studies also differ in their definition of successful control, making it difficult to compare different results. Standardized outcome definitions and reporting would improve the interpretability of future research.

Finally, the evidence for combination therapy and long-term safety is less robust than the evidence for the general efficacy of DIMS. More randomized trials should compare DIMS alone as the control group with a combination treatment and report both AL and SER outcomes. Future research should also examine quality of life, daily visual function, and discontinuation of treatment.

Conclusion

The evidence shows that DIMS spectacle lenses are effective in slowing myopia progression and AL elongation in children compared with single-vision spectacles. This benefit was seen in randomized and observational studies and in populations outside of East Asia, and the benefits appear to persist with continued wear. DIMS was generally well tolerated and did not significantly hinder measured visual function. Response varied between children, and age, baseline AL, baseline myopia, RPR, and astigmatism were proposed as influencing factors, but none has been established as reliable predictors. Early evidence suggests that combining DIMS with low-dose atropine may increase axial control, whereas evidence for combination with RLRL is limited.

Future research should address these gaps in several ways. Longer RCTs ideally lasting three to five years or more, should follow children after treatment stops to show whether benefits last or rebound. Studies should also use standardized definitions of successful control and report both SER and AL so that results can be compared. Predictors of response should be tested in controlled cohorts with SV or other comparison groups, adequate sample sizes, and a standardized measurement of RPR, choroidal characteristics, and astigmatism, so that predictors of DIMS response can be separated from predictors of myopia progression in

general. Combination trials with low-dose atropine and RLRL should include a control group with just DIMS treatment to show whether combinations truly outperform DIMS alone. Finally, larger and more diverse populations are needed along with tracking of long-term safety, quality of life, daily visual function, and objectively measured wear time. In the meantime, DIMS is a reasonable non-invasive option for childhood myopia control.

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