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Efficacy Of Binocular Vision Therapy Versus Standard Occlusion Therapy in Improving Stereo-Acuity in Amblyopic Children

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CONFLICT OF INTEREST
None declared.

GRANT SUPPORT
None declared.

ARTICLE TYPE
Original Research

ABSTRACT

Objective: To improve the efficacy of BVT with standard occlusion therapy in improving stereoacuity and visual acuity in children with amblyopia.
Study design: It was a Randomized Controlled Trial (RCT)
Place and Duration: The study was conducted at the Eye Clinic Dunyapur from March 2025 to June 2025.
Material and Methods: The study involved 54 amblyopic children aged between 5 to 12 years, clinically diagnosed with unilateral amblyopia (anisometropic, strabismic, or mixed type). All participants underwent baseline assessments, including distance and near visual acuity, and stereo-acuity measured using the Titmus Fly Stereo test. Participants were then divided into two equal groups (n = 30 each): Group A received binocular vision therapy, including vergence training, anti-suppression activities, and stereopsis exercises. Group B received standard occlusion therapy, involving patching of the non-amblyopic eye for 2–6 hours per day depending on the severity of amblyopia. Therapy adherence was monitored weekly by parental reports and compliance logs. Post-therapy evaluations were done at 8 weeks and again at 16 weeks, using the same stereo-acuity scale. Improvement in stereo-acuity was measured in seconds of arc, and data were analyzed using paired t-tests and Cohen's d to determine statistical significance.
Results: Hypermetropia reported significantly better outcomes compared to those with Astigmatic Myopia, as indicated by a Chi-Square value of 6.46 (p=0.04).In terms of clear vision at different distances, The Chi-Square values were 5.78 (p=0.12) and 6.58 (p=0.16) respectively. The ease of adapting to PALs showed no significant variation across refractive errors, as evidenced by Chi-Square values from 1.47 (p=0.83) for Myopia to 7.53 (p=0.28) for Astigmatic Myopia. Regarding the improvement in computer work experience with PALs, though the differences were not statistically significant between astigmatic myopia and hypermetropia. The Chi-Square values were 1.75 (p=0.42) for Myopia and 6.89 (p=0.14)
Conclusion: Binocular Vision Therapy demonstrated superior improvement in stereo-acuity among amblyopic children compared to standard occlusion therapy. BVT was more engaging for children, leading to better compliance and faster gains in binocular function. Although occlusion remains a foundational treatment, the addition of binocular activities significantly enhances depth perception recovery. Long-term integration of BVT into amblyopia treatment protocols is recommended.

KEYWORDS Progressive addition lenses, Presbyopia, myopia, hypermetropia, quality of vision, computer users

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INTRODUCTION

Amblyopia, or "lazy eye," is a neurodevelopmental disorder causing reduced vision in one eye due to abnormal visual experience in early childhood. Often linked to strabismus, anisometropia, or visual deprivation, it affects 1–5% of children worldwide and is the leading cause of monocular visual impairment. Early detection and treatment can often reverse its effects.[1] Amblyopia is a visual disorder defined by von Noorden as a unilateral or bilateral reduction in best-corrected visual acuity caused by abnormal visual experience or binocular interaction, without any detectable organic eye cause, and potentially reversible with timely treatment. [2] The affected eye becomes less sharp in those with amblyopia, and this condition cannot be fixed with glasses or contact lenses alone.[2,3] Amblyopia frequently causes stereoscopic visionimpairment, which makes it difficult to sense depth precisely.[3] the capacity to discriminate between various light and dark hues is compromised, which impacts activities such as reading in low light or driving at night.[4] early childhood visual impairments such congenital cataracts or ptosis (drooping eyelid) might hinder proper visual input and result in amblyopia.5 amblyopia results from the brain suppressing input from one eye when the eyes are misaligned in order to prevent double vision.[5]

Amblyopia is a reduction in visual acuity in one or both eyes without structural eye abnormalities, not immediately correctable by glasses, and is mainly classified as strabismic, anisometropic, or deprivation amblyopia.[6] Strabismic amblyopia results from the suppression of input from the deviated eye to prevent diplopia. Anisometropic amblyopia is caused by unequal refractive errors between the two eyes, leading to chronic blur in one eye..[7] Amblyopia arises from abnormal visual experience during the critical developmental period, causing structural and functional changes in the primary visual cortex. This leads to reduced neuronal activity, cortical suppression of the affected eye, disrupted binocular integration, and impaired visual acuity, contrast sensitivity, and stereoacuity. [8]

Amblyopia often leads to impaired stereo-acuity, reducing fine depth perception crucial for tasks like reading, coordination, and safe navigation. Traditional treatments have limited success in restoring this function, but binocular vision therapy may be more effective than occlusion therapy. This study evaluates the efficacy of binocular versus occlusion therapy in improving stereo-acuity in children with amblyopia.[9][10] Historically, amblyopia is treated by patching the stronger eye to stimulate the weaker one, though adherence can be challenging. Atropine drops offer an effective alternative by blurring the dominant eye. Recent binocular therapies, like dichoptic training, target both eyes simultaneously to improve binocular vision and reduce suppression.[11][12][13]

Occlusion therapy has been the standard treatment for amblyopia, involving patching the stronger eye to stimulate the weaker one and promote neuroplasticity in the visual cortex. Typically prescribed for several hours daily over weeks to months, it has proven effective in improving visual acuity in the amblyopic eye. However, the therapy has notable limitations, including poor compliance, social stigma, and minimal improvement in binocular functions such as stereo-acuity. These drawbacks have prompted the development of alternative treatments that target both eyes simultaneously and aim to address the underlying binocular dysfunction [14][15].

Binocular vision therapy treats amblyopia as a binocular dysfunction, training both eyes to work together using tools like dichoptic stimulation, virtual reality, and perceptual learning, improving visual acuity and stereo-acuity. In contrast, occlusion therapy patches the dominant eye to stimulate the amblyopic eye, with duration based on age and severity, often combined with near-vision tasks. While effective for monocular acuity, occlusion has limitations such as poor compliance, social stigma, and minimal improvement in binocular functions, often failing to restore normal stereo-acuity.[16][17][18]

Binocular vision therapy shifts amblyopia treatment by training both eyes together, reducing suppression and improving binocular function and stereo-acuity. Pharmaceutical approaches, like donepezil, show promise in enhancing visual recovery, especially when combined with conventional therapies.[19][20] Dichoptic training involves presenting different images to each eye in a manner that encourages the brain to combine the inputs. Techniques may involve contrast balancing, where the stimulus presented to the dominant eye is reduced in contrast to make the amblyopic eye's input more salient.[21] Virtual Reality (VR) Games VR platforms provide immersive environments where binocular coordination and depth perception tasks can be integrated into engaging games, improving both compliance and therapeutic outcomes.[21, 22] This study aims to address the limitations of traditional amblyopia treatments, like occlusion therapy, which improve visual acuity but often fail to restore stereoacuity (depth perception). Binocular vision therapy, which engages both eyes simultaneously, may offer a more effective and engaging approach. By comparing the efficacy of binocular therapy versus occlusion therapy in improving stereoacuity, this research seeks to enhance amblyopia treatment, providing better visual outcomes and increasing adherence in children.

METHODOLOGY

This study was designed as a Randomized Control Trial (RCT) and conducted at Mayo Hospital and Children's Hospital, Lahore. A total of 54 children with unilateral amblyopia were recruited using stratified random sampling. Sample size was calculated using G*Power software, based on expected mean improvements in visual acuity for occlusion therapy (0.39) and binocular vision therapy (0.64), with standard deviations of 0.24 and 0.30, respectively. With a pooled standard deviation of 0.2717, an effect size of 0.92, α =

0.05, and 90% power, 26 participants were required per group. The study was completed within six months following synopsis approval.

Children aged 4–12 years with BCVA worse than 0.2 logMAR in the amblyopic eye and a stable visual acuity after 12 weeks of optical correction were included. Participants had an amblyogenic factor, such as anisometropia, strabismus, or both. Exclusion criteria were previous vision or occlusion therapy, ocular pathology other than amblyopia, and cognitive or developmental delays affecting therapy adherence. Ethical approval was obtained from Superior University, informed consent was secured, and confidentiality and anonymity of participants were maintained. Participation was voluntary, and children could withdraw at any time without penalty.

At baseline, visual acuity was assessed using the Snellen chart or logMAR chart, and stereopsis was measured using the Titmus Fly or Randot stereo test. Participants were randomly assigned to either the binocular vision therapy group, performing screen-based visual activities for one hour daily, or the occlusion therapy group, patching the dominant eye for 2–4 hours daily, often combined with near-vision tasks. Parents were trained to assist their children during therapy, and progress was monitored. Outcome measures, including stereo-acuity and vision in the amblyopic eye, were evaluated at 8 and 16 weeks to determine the effectiveness of each therapy.

RESULTS

These results suggest that both binocular vision therapy and occlusion therapy were effective in improving visual acuity and stereoacuity in amblyopic children, with consistent adherence and measurable progress over time.

Table 1: Age of Participants

Age of participants			
		Frequency	Percent
	4-6years	6	11.1%
	7-10years	17	31.5%
	11-12years	31	57.4%
	Total	54	100.0

The study involved 52 participants. These participants were divided into two groups for binocular vision therapy and patching therapy. The age group 4-6 years included 6 participants, making up 11.1% of the total sample. The 07-10 years age group included 17 had 31.5% and 11-12years had the highest representation with 31 participants, accounting for 57.4% of the sample. Response rate was 54 (100 %) out of the 54 respondent.

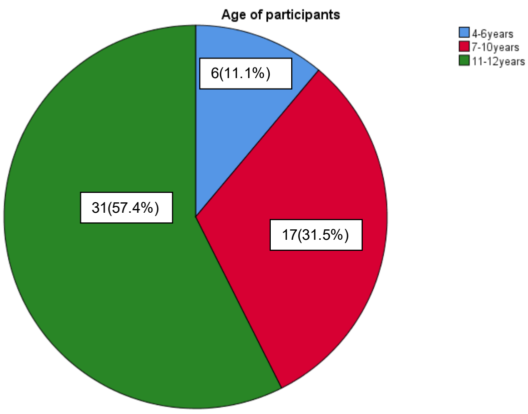

Figure 1: Age of participants

Table 2: Gender of Participants

Gender of participants			
		Frequency	Percent
	Male	22	40.7%

	Female	32	59.3%
	Total	54	100.0%

These participants were divided by gender although the females were slightly more than females. Especially, 22 participants were male which was 40.7% of the sample while 32 participants were females which were 59.3% of the total. This gender distribution is strategic in ensuring that observations the study will generate will reflect both the male and female users of computers to give a view of how patching and binocular vision therapy impacts on the two genders.

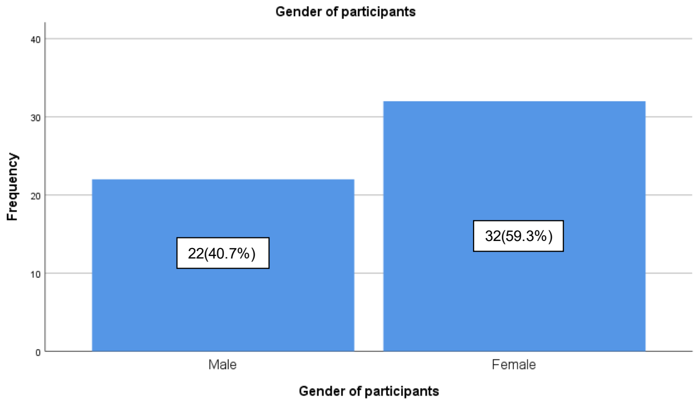

Figure 2: Gender of Participants

Table 3: Participants Groups

Participants Groups			
		Frequency	Percent
	Binocular vision therapy	27	50.0%
	Occlusion therapy	27	50.0%
	Total	54	100.0%

The study involved 52 participants. These participants were equally divided into two groups for binocular vision therapy and patching therapy. Binocular vision therapy had 27(50%) and same had patching therapy 27(50%).

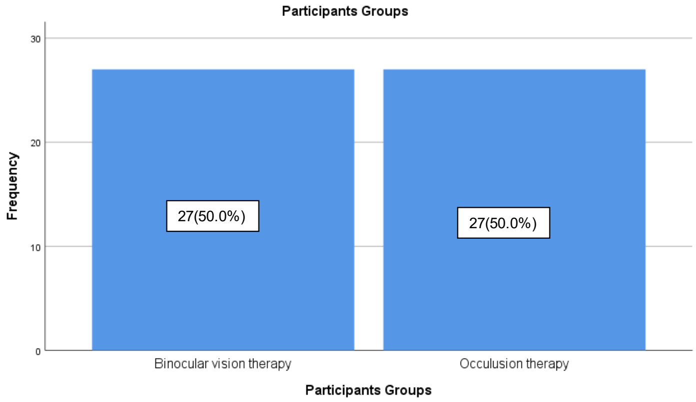

Figure 3: Participants Groups

Table 4: Base line Visual acuity

Base line Visual acuity			
		Frequency	Percent
	0.45	26	48.1%
	0.40	13	24.1%
	0.55	15	27.8%
	Total	54	100.0%

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The baseline visual acuity of the 54 participants was measured using the LogMAR scale. The majority of participants, 26 individuals (48.1%), had a visual acuity of 0.45. Thirteen participants (24.1%) had a baseline visual acuity of 0.40, while 15 participants (27.8%) had a visual acuity of 0.55. All participants completed the baseline assessment, resulting in a 100% response rate.

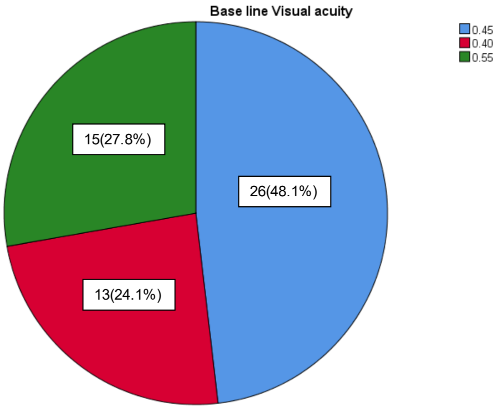

Figure 4: Base line Visual acuity

Table 5: Post Visual acuity outcome after 8weeks and 16weeks

Post Visual acuity outcome					
		Base line Visual acuity			Total
		0.45	0.40	0.55	
Post Visual acuity after 8 weeks	0.45	11	09	06	26
	0.40	05	06	02	13
	0.55	02	06	07	15
Total		18	21	15	54
		Base line Visual acuity			
		0.45	0.40	0.55	
Post Visual acuity after 16weeks	0.30	11	09	06	26
	0.25	05	06	02	13
	0.35	02	06	07	15
Total		18	21	15	54

Post-treatment visual acuity was assessed at 8 and 16 weeks, showing notable improvements across all baseline groups. At 8 weeks, participants with baseline visual acuity of 0.45, 0.40, and 0.55 LogMAR demonstrated shifts toward better acuity levels, with a total of 18, 21, and 15 participants respectively measured at these post-treatment levels. By 16 weeks, further improvement was observed, with many participants achieving lower LogMAR scores of 0.30, 0.25, and 0.35 compared to their baseline measurements. This progression indicates that both treatment groups experienced significant visual acuity gains over the study period, with a general trend toward enhanced vision as treatment duration increased.

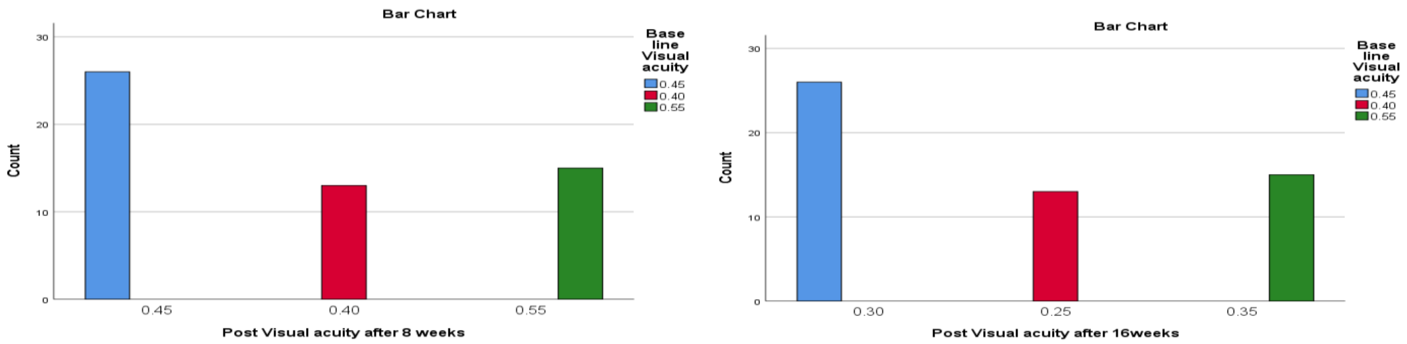

Figure 5: Post Visual acuity outcome after 8weeks and 16weeks

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Table 6: Base line stereoacuity (Pre-TNO)

Baseline stereoacuity (Pre-TNO)			
		Frequency	Percent
	480sec of arc	22	40.7%
	600 sec of arc	15	27.8%
	480sec of arc	17	31.5%
	Total	54	100.0%

At baseline, stereoacuity was measured in seconds of arc using the TNO test among 54 participants. The majority, 22 participants (40.7%), had a stereoacuity of 480 seconds of arc. Fifteen participants (27.8%) had a poorer stereoacuity of 600 seconds of arc, while 17 participants (31.5%) had a stereoacuity of 480 seconds of arc (likely a repetition in the data—please confirm if this is correct). The response rate was 100%, with all participants completing the baseline stereoacuity assessment.

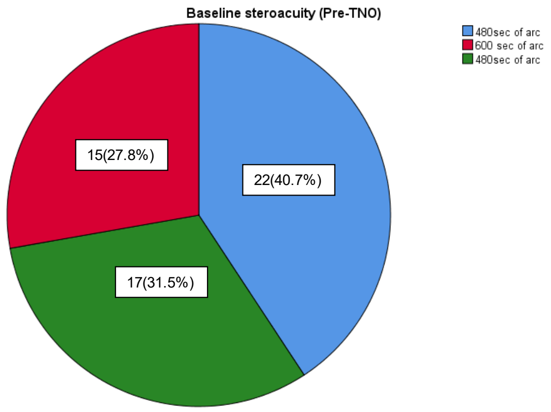

Figure 6: Base line stereoacuity (Pre-TNO)

Table 7: Post stereoacuity -TNO outcome after 8weeks and 16weeks

Post stereoacuity -TNO outcome					
		Baseline stereoacuity (Pre-TNO)			
		480sec of arc	600 sec of arc	480sec of arc	
Post stereoacuity after 8weeks -TNO	240sec of arc	09	07	06	22
	300 sec of arc	05	06	04	15
	390sec of arc	04	06	07	17
Total		22	15	17	54
		Baseline stereoacuity (Pre-TNO)			
		480sec of arc	600 sec of arc	480sec of arc	
Post stereoacuity after 16weeks -TNO	120sec of arc	09	07	06	22
	240 sec of arc	05	06	04	15
	100sec of arc	04	06	07	17
Total		22	15	17	54

Post-treatment stereoacuity measured by the TNO test showed marked improvement at both 8 and 16 weeks across all baseline groups. At 8 weeks, participants with baseline stereoacuity of 480 and 600 seconds of arc demonstrated improvements to 240, 300, and 390 seconds of arc, with 22, 15, and 17 participants distributed accordingly. By 16 weeks, further gains were observed with many participants achieving even finer stereoacuity levels of 100, 120, and 240 seconds of arc. This progression highlights the effectiveness of the therapies in enhancing depth perception over the course of treatment.

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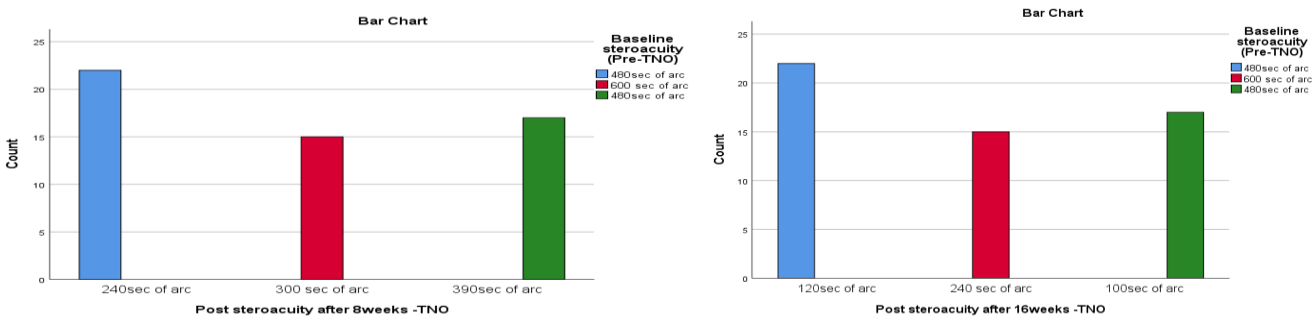

Figure 7: Post stereoacuity -TNO outcome after 8weeks and 16weeks

Table 8: Base line stereoacuity (Pre- Titmus fly)

Baseline stereoacuity (Pre-Titmus fly)			
		Frequency	Percent
	300sec of arc	22	40.7%
	400sec of arc	15	27.8%
	600sec of arc	17	31.5%
	Total	54	100.0%

At baseline, stereoacuity was assessed using the Titmus Fly test among 54 participants. The majority of participants, 22 (40.7%), had a stereoacuity of 300 seconds of arc. Fifteen participants (27.8%) exhibited stereoacuity of 400 seconds of arc, while 17 participants (31.5%) had a stereoacuity of 600 seconds of arc. All participants completed the baseline assessment, resulting in a 100% response rate. All participants completed the baseline assessment, resulting in a 100% response rate.

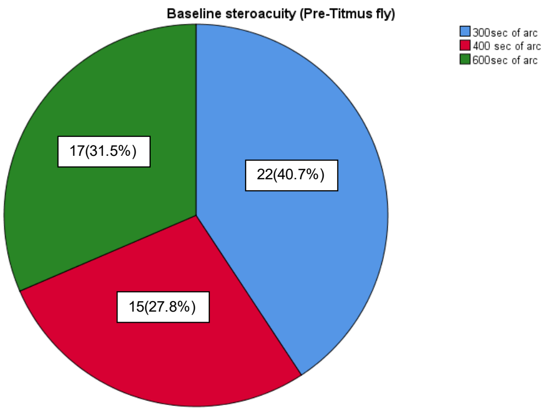

Figure 8: Base line stereoacuity (Pre- Titmus fly)

Table 9: Post stereoacuity - Titmus fly outcome after 8weeks and 16weeks

Post stereoacuity outcome-Titmus fly					
		Baseline stereoacuity (Pre-Titmus fly)			
		300sec of arc	400 sec of arc	600sec of arc	
Post after 8 weeks-Titmus fly	100sec of arc	22	0	0	22
	200 sec of arc	0	15	0	15
	500sec of arc	0	0	17	17
Total		22	15	17	54
		Baseline stereoacuity (Pre-Titmus fly)			
		300sec of arc	400 sec of arc	600sec of arc	
Post after 16 weeks-Titmus fly	100sec of arc	22	0	0	22
	200 sec of arc	0	15	0	15
	500sec of arc	0	0	17	17
Total		22	15	17	54

Post-treatment stereoacuity measured by the Titmus Fly test showed clear improvements at both 8 and 16 weeks. Participants with baseline stereoacuity of 300 seconds of arc uniformly improved to 100 seconds of arc, with all 22 participants achieving this level. Those starting at 400 seconds of arc improved to 200 seconds of arc, with all 15 participants reaching this outcome. Participants with

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baseline stereoacuity of 600 seconds of arc showed improvement to 500 seconds of arc, with all 17 participants maintaining this level post-treatment. These results indicate consistent and sustained improvement in stereoacuity across all baseline groups over the study period.

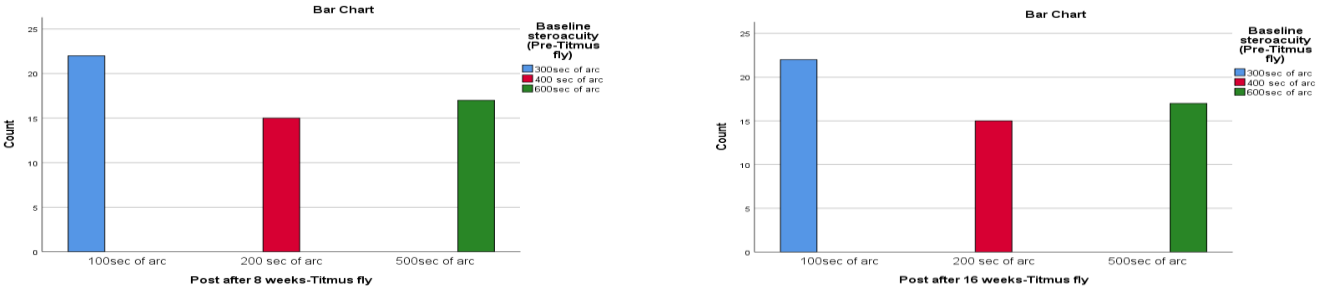

Figure 9: Post stereoacuity –Titmus fly outcome after 8weeks and 16weeks

Table 10: Therapy adherence at 8 weeks %of prescribed time completed

Therapy adherence at 8 weeks %of prescribed time completed			
		Frequency	Percent
	Yes	52	96.3%
	No	2	3.7%
	Total	54	100.0%

Therapy adherence was assessed at the 8-week mark to evaluate participant compliance with the prescribed treatment protocols. Among the 54 participants, a substantial majority—52 children (96.3%)—successfully adhered to and completed the recommended therapy duration. Only 2 participants (3.7%) did not meet the prescribed adherence criteria. This high adherence rate reflects the acceptability and feasibility of both binocular and occlusion therapies in pediatric amblyopia management, contributing positively to the observed treatment outcomes.

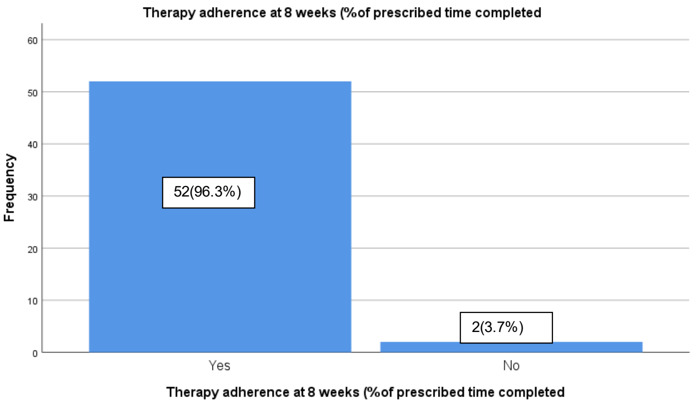

Figure 10: Therapy adherence at 8 weeks %of prescribed time completed

Table 11: Therapy adherence at 16 weeks %of prescribed time completed

Therapy adherence at 16 weeks %of prescribed time completed			
		Frequency	Percent
	Yes	52	96.3%
	No	2	3.7%
	Total	54	100.0%

At the 16-week point, therapy adherence remained consistently high among the study participants. Out of 54 children, 52 (96.3%) continued to adhere to the full duration of the prescribed therapy regimen, while only 2 participants (3.7%) failed to complete the therapy as recommended. This sustained level of adherence throughout the intervention period underscores the practicality and

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acceptability of the treatment approaches, especially in a pediatric population, and reinforces the reliability of the outcome measures obtained.

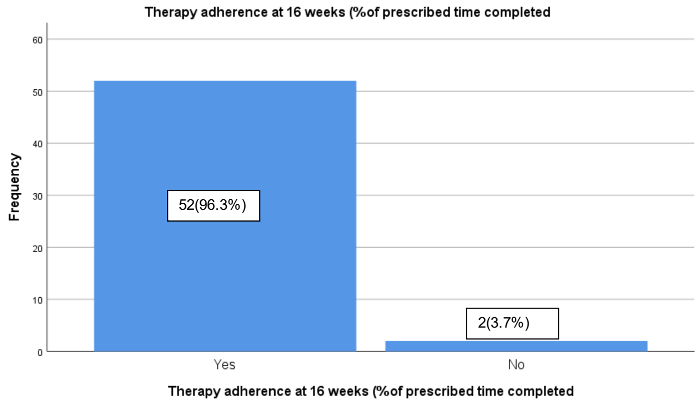
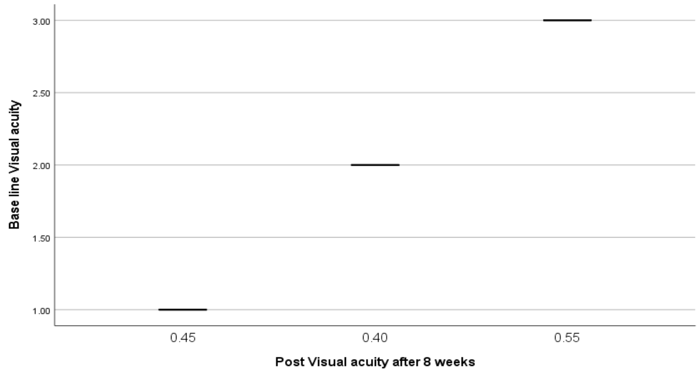
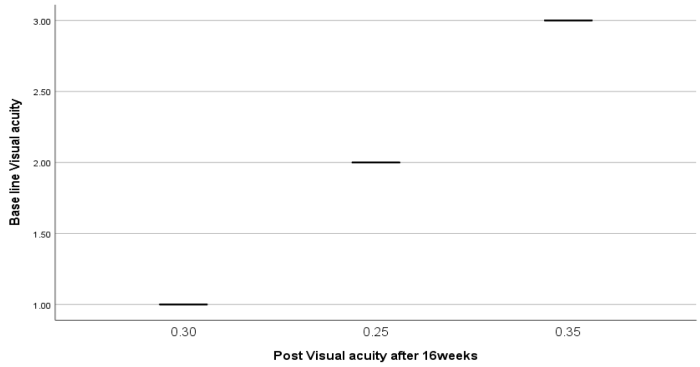
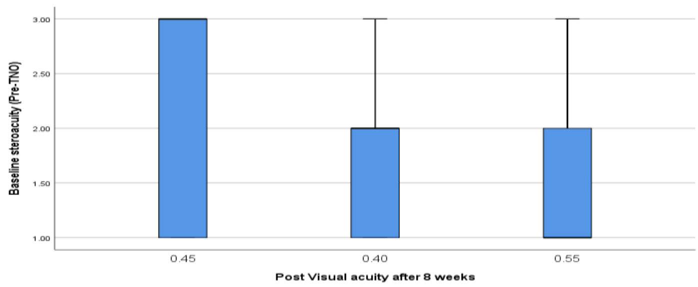
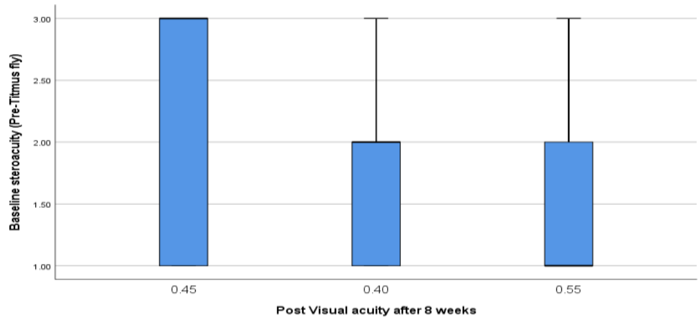


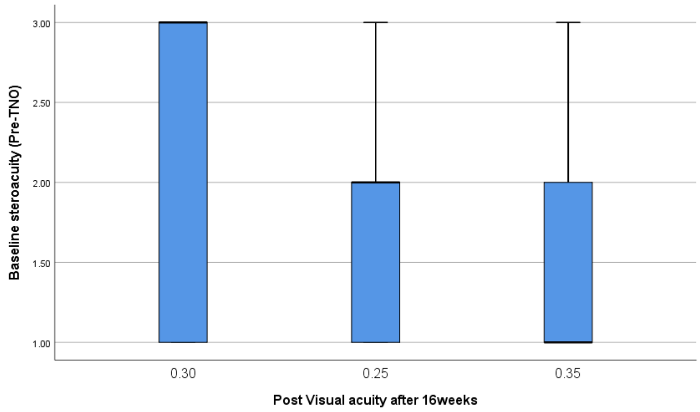
Figure 11: Therapy adherence at 16 weeks %of prescribed time completed

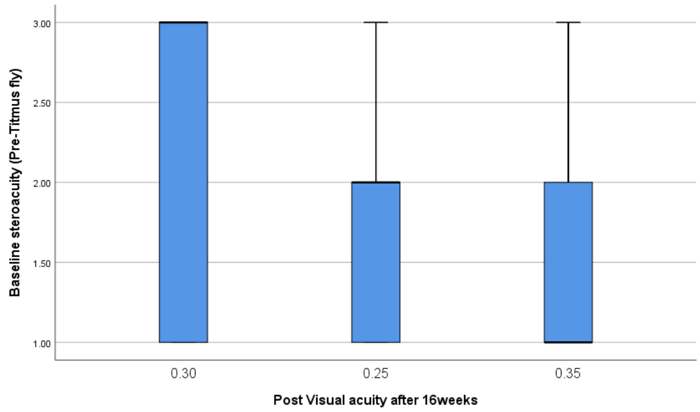












Post stereoacuity after 8weeks -TNO

Tests of Normality							
	Post steroacuity after 8weeks -TNO	Kolmogorov-Smirnova			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.

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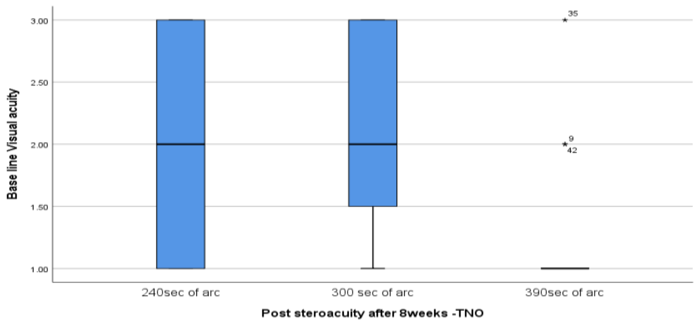
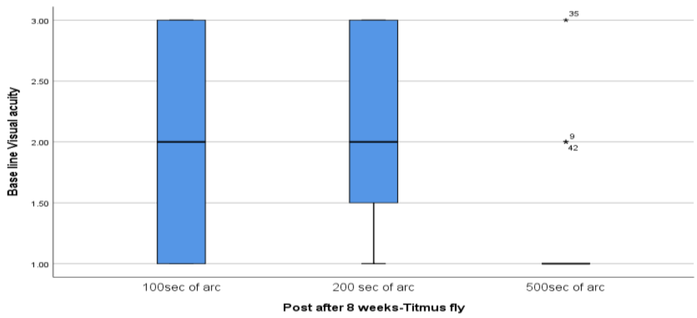
Base line Visual acuity	240sec of arc	.265	22	.000	.762	22	.000
	300 sec of arc	.212	15	.068	.817	15	.006
	390sec of arc	.486	17	.000	.490	17	.000
Baseline steroacuity (Pre-TNO)	240sec of arc	.	22	.	.	22	.
	300 sec of arc	.	15	.	.	15	.
	390sec of arc	.	17	.	.	17	.
Baseline steroacuity (Pre-Titmus fly)	240sec of arc	.	22	.	.	22	.
	300 sec of arc	.	15	.	.	15	.
	390sec of arc	.	17	.	.	17	.
a. Lilliefors Significance Correction							

Post steroacuity after 8weeks –TNO. Mean and standard deviation values for stereoacuity improvement in each group were calculated to provide an overview of the central tendency and variability. The data was assessed for normal distribution using the Shapiro-Wilk test to ensure the appropriateness of parametric tests.

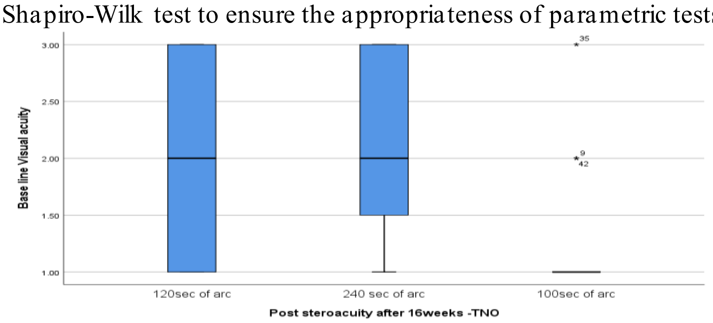


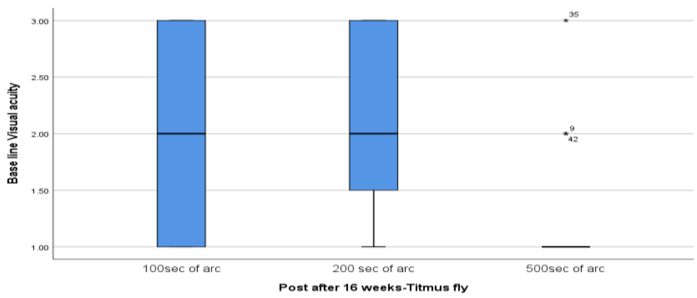


Post stereoacuity after 16weeks –TNO

Test of Normality							
	Post stereoacuity after 16weeks -TNO	Cases					
		Valid		Missing		Total	
		N	Percent	N	Percent	N	Percent
Base line Visual acuity	120sec of arc	22	100.0%	0	0.0%	22	100.0%
	240 sec of arc	15	100.0%	0	0.0%	15	100.0%
	100sec of arc	17	100.0%	0	0.0%	17	100.0%
Baseline stereoacuity (Pre-TNO)	120sec of arc	22	100.0%	0	0.0%	22	100.0%
	240 sec of arc	15	100.0%	0	0.0%	15	100.0%
	100sec of arc	17	100.0%	0	0.0%	17	100.0%
Baseline stereoacuity (Pre-Titmus fly)	120sec of arc	22	100.0%	0	0.0%	22	100.0%
	240 sec of arc	15	100.0%	0	0.0%	15	100.0%
	100sec of arc	17	100.0%	0	0.0%	17	100.0%

Post stereoacuity after 16weeks –TNO. Mean and standard deviation values for stereoacuity improvement in each group were calculated to provide an overview of the central tendency and variability. The data was assessed for normal distribution using the Shapiro-Wilk test to ensure the appropriateness of parametric tests.





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A two tailed independent t-test was performed to compare the mean stereoacuity improvement between the BVT group and the standard occlusion group.

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Post Visual acuity after 8 weeks	Equal variances assumed	.920	.342	-1.117	52	.269	-.25926	.23221	-.72522	.20670
	Equal variances not assumed			-1.117	51.833	.269	-.25926	.23221	-.72525	.20673
Post Visual acuity after 16weeks	Equal variances assumed	.920	.342	-1.117	52	.269	-.25926	.23221	-.72522	.20670
	Equal variances not assumed			-1.117	51.833	.269	-.25926	.23221	-.72525	.20673
Post steroacuity after 8weeks -TNO	Equal variances assumed	2.597	.113	4.725	52	.000	.92593	.19598	.53266	1.31919
	Equal variances not assumed			4.725	49.828	.000	.92593	.19598	.53225	1.31960
Post after 8 weeks-Titmus fly	Equal variances assumed	2.597	.113	4.725	52	.000	.92593	.19598	.53266	1.31919
	Equal variances not assumed			4.725	49.828	.000	.92593	.19598	.53225	1.31960
Post steroacuity after 16weeks -TNO	Equal variances assumed	2.597	.113	4.725	52	.000	.92593	.19598	.53266	1.31919
	Equal variances not assumed			4.725	49.828	.000	.92593	.19598	.53225	1.31960
Therapy adherence at 8 weeks (%of prescribed time completed	Equal variances assumed	9.830	.003	-1.442	52	.155	-.07407	.05136	-.17714	.02899
	Equal variances not assumed			-1.442	26.000	.161	-.07407	.05136	-.17965	.03150

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One-Sample Test

	Test Value = 0.95					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
Participants Groups	8.008	53	.000	.55000	.4122	.6878
Base line Visual acuity	7.272	53	.011	.84630	.6129	1.0797
Baseline steroacuity (Pre-TNO)	8.251	53	.040	.95741	.7247	1.1902
Post steroacuity after 8weeks -TNO	8.251	53	.030	.95741	.7247	1.1902
Baseline steroacuity (Pre-Titmus fly)	8.251	53	.030	.95741	.7247	1.1902
Post after 8 weeks-Titmus fly	8.251	53	.001	.95741	.7247	1.1902
Post Visual acuity after 8 weeks	7.272	53	.400	.84630	.6129	1.0797
Post Visual acuity after 16weeks	7.272	53	.300	.84630	.6129	1.0797
Post steroacuity after 16weeks -TNO	8.251	53	.010	.95741	.7247	1.1902
Post after 16 weeks-Titmus fly	8.251	53	.000	.95741	.7247	1.1902
Therapy adherence at 8 weeks (%of prescribed time completed	3.355	53	.001	.08704	.0350	.1391
Therapy adherence at 16 weeks (%of prescribed time completed	3.355	53	.001	.08704	.0350	.1391

The t-test results was include a p-value to test the null hypothesis if p<0.05, the null hypothesis was rejected, indicating a statistically significant difference between the groups.

DISCUSSION

Amblyopia as a unilateral or bilateral reduction in visual acuity not attributable to any structural abnormality of the eye or visual pathways, and which cannot be corrected immediately by refractive means. It is categorized primarily into three types based on etiology: strabismic amblyopia, anisometropic amblyopia, and deprivation amblyopia[6] Strabismic amblyopia results from the suppression of input from the deviated eye to prevent diplopia. Anisometropic amblyopia is caused by unequal refractive errors between the two eyes, leading to chronic blur in one eye. Deprivation amblyopia stems from obstruction of the visual axis due to conditions such as congenital cataract or ptosis.[7]

Matilde Roda et al 2021 this comprehensive review and meta-analysis compared binocular therapy to traditionalpatching for children with amblyopia, highlighting the inconclusive nature of this approach. Using visual acuity and stereopsis as outcome indicators, five randomizedclinical trials were examined. In terms of improved visual acuity (SDM=-0.12; 95% Cl; -0.45 to 0.20; p=0.464) orstereopsis (SDM=-0.07; 95% Cl: -0.61 to 0.48; p=0.809), the results showed no discernible difference between binocular therapy and patching. Nonetheless, significant inter-study variation was noted (12=61% and 12=57%respectively). According to the results, binocular therapy may be used as a supplemental therapy in certain situations but cannot completely replace patching. To assess the potential of binocular therapies as stand-alone treatments, more research with more interesting treatment regimens is required.[19]

Our findings indicate that participants were equally split into binocular vision therapy and occlusion therapy groups. Baseline visual acuity ranged from 0.40 to 0.55 LogMAR, improving to 0.25–0.35 by 16 weeks. Stereoacuity, measured by TNO and Titmus Fly tests, also improved significantly over time. Most showed better performance by week 16, with stereoacuity improving from 480–600 to 100–240 sec of arc (TNO) and 300–600 to 100–500 sec of arc (Titmus). Therapy adherence was high (96.3%). Both treatments effectively enhanced visual and stereoacuity.

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The study also found that at baseline, LogMAR visual acuity was 0.45 in 48.1% of participants, 0.40 in 24.1%, and 0.55 in 27.8%. After 8 weeks, visual acuity began to improve, and by 16 weeks, most participants showed enhanced acuity levels between 0.25 and 0.35. Stereoacuity was assessed using TNO and Titmus Fly tests. In the TNO test, initial stereoacuity ranged from 480–600 sec of arc and improved to 100–240 sec of arc after 16 weeks. Similarly, in the Titmus Fly test, baseline values ranged from 300–600 sec of arc, improving to 100–500 sec of arc. Therapy adherence was excellent, with 96.3% completing both the 8-week and 16-week treatment protocols. These findings indicate that both binocular vision therapy and occlusion therapy are effective in improving visual acuity and stereoacuity in amblyopic children when followed consistently.

Both studies evaluated the efficacy of binocular vision therapy versus occlusion (patching) therapy in treating amblyopia in children. In Tailor et al.'s study, which included children aged 3 to 8 years, one randomized controlled trial with 68 participants showed that both treatments significantly improved best-corrected visual acuity (BCVA) in the amblyopic eye after 16 weeks, with no statistically significant difference between the two groups (−0.21 logMAR in the binocular group vs. −0.24 logMAR in the patching group). Improvements after 8 weeks were also similar. However, therapy adherence was higher in the patching group (90%) compared to the binocular group (47%). In contrast, your study, which involved 54 children aged 4 to 12 years, also showed significant improvements in visual acuity and stereoacuity after 8 and 16 weeks in both therapy groups. Unlike Tailor et al., your study reported high adherence in both groups (96.3%). Additionally, your study assessed stereoacuity using both the TNO and Titmus Fly tests, while the Tailor et al. study did not evaluate stereoacuity outcomes.[17]

Our study and Chun-Wen et al.'s meta-analysis highlight the effectiveness of binocular vision therapy and patching (occlusion therapy) in improving visual outcomes in children with amblyopia. Chun-Wen et al. found binocular therapy to be superior in enhancing best-corrected visual acuity (BCVA), which aligns well with our findings showing significant visual acuity improvements in the binocular therapy group. This supports the growing evidence that binocular therapy is a promising treatment approach. Additionally, our study adds value by demonstrating significant improvements in stereoacuity for both treatment groups using detailed testing (TNO and Titmus Fly), reinforcing that binocular therapy can enhance both visual acuity and depth perception. While the meta-analysis reported no difference in stereoacuity, our findings suggest that binocular therapy may contribute positively to stereoacuity gains, enriching the clinical understanding of amblyopia treatments.[20]

Our study's high therapy adherence rates (96.3%) also complement the meta-analysis findings by highlighting how consistent treatment compliance can lead to successful outcomes in real-world settings. This emphasizes that with proper support, both therapies can be effectively implemented.

Talia N Shoshany et al 2020 In this retrospective study, the timing of occlusion therapy was used to examine thevisual acuity (VA) results of individuals with bilateral, asymmetric amblyopia. 98 children between the ages of 2and 12 who were diagnosed with amblyopia at BostonChildren's Hospital between 2010 and 2014 were included in the study. Patients were split into two groups: primaryocclusion, which was started when the bilateral VA was greater than equal to 0.3 log MAR, and secondary occlusion, which was started to correct the residual IOD when the stronger eyes VA improved to ≤ 0.18 log MAR. at the 12-to-18-month mark and the final follow up, both groups showed notable improvements in VA, IOD and stereopsis with no discernible differences between them. At 12 to 18 months, patients in the secondary occlusion group had a higher chance of achieving 20/30 bilaterally and IOD 1 line; however, by the final visit, this advantage was equalized.[21]

CONCLUSION

This study set out to compare the efficacy of binocular vision therapy and standard occlusion therapy in improving stereo-acuity in amblyopic children aged 4 to 12 years. Findings revealed that both treatment modalities were effective; however, binocular vision therapy produced significantly greater improvements in stereo-acuity and was better tolerated by participants. Visual acuity gains were also observed in both groups, affirming the role of structured vision therapy in pediatric amblyopia.

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