

# Anisometropic Amblyopia: Analysis of Treatment Results with Patching of Dominant Eye and Refraction with Active Visual Therapy (AVT) in School Age Children

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## ABSTRACT

**Objective:** The purpose of this study is to conduct an analysis of the effectiveness of treating school-aged children by patching the eye that is considered to be dominant and performing refraction using active visual therapy (AVT).

**Place of study:** Jinah international hospital abbottabad

**Duration of study:** October 2021 to April 2022

**Methods:** There were 65 children with ages 6-16 years had anisometropic amblyopia included in this study. After informed written agreement, participants' demographics were recorded. Posterior and back anterior segments were checked. Recorded best visual therapy. Refractive error of amblyopic eyes was +7 to -5 diopters. Refraction was corrected. Improvement in visual acuity and refraction were assessed every two months. Post-treatment visual acuity of 6/24, 6/36, 6/60 was tested with a regression and correlation T-test. SPSS 21.0 analyzed all data.

**Results:** Among 65 children, 40 (61.5%) were males and 25 (38.5%) were females. Mean age of the patients was 8.7±4.17 years. Hypermetropia was the most common refractive error found in 45 (69.2%) cases followed by myopia in 20 (30.8%) cases. Pre-treatment 24 (36.9%) patients had BCVA 6/24, 12 (18.5%) patients had 6/36, 17 (26.2%) patients had 6/60 and 12 (18.5%) had CF. Post-treatment 18 (27.7%) had BCVA 6/6, 10 (15.4%) had 6/9, 11 (16.9%) cases had 6/12, 12 (18.5%) children had 6/18, 5 (7.7%) had 6/24, 6 (9.2%) had BCVA 6/60 and 3 (4.6%) had CF.

**Conclusion:** In this study, we came to the conclusion that the treatment for anisometropic amblyopia, which involves the patching of the patient's dominant eye and the refraction of the amblyopic eye using active visual therapy, is beneficial.

**Keywords:** Best Corrected Visual Acuity (BCVA), Counting Fingers (CF), Visual Acuity (V.A), Refractive Errors, Active Visual Therapy (AVT)

## INTRODUCTION

A common cause of monocular vision loss in youngsters is amblyopia. One of the most prevalent causes of blindness is anisometropia, a discrepancy in refractive error between two eyes that is present in 37% of instances, as well as with strabismus in another 24% of clinical populations. [1]

Anisometropic amblyopia can be treated with refractive correction alone, but the majority of patients will need further therapy since refractive correction alone will not be adequate to completely treat the amblyopia. Refraction correction is typically followed by therapy with patches or medication.[2,3]

The link between amblyopia and cortical dysfunction in the monocular and binocular regions has been thoroughly established in recent years [4]. In one binocular theory, an excess of interocular suppression may be to blame. In attempt to address the underlying cause of binocular dysfunction, a variety of binocular training methods have been developed [5-7]. Dichoptic image presentation is the basis for these studies; in order for the subject to get the complete information content of an altered reality device [8-11], video game [8], or movie, the subject must binocularly integrate two images. In order for binocular fusion to occur, one must lower the contrast of an image viewed by the non-amblyopic eye sufficiently to address the interocular balance that is caused by suppression. A dichoptic video game was used as a starting point for these tactics, which required the individuals to actively participate in order to use information simultaneously supplied to each eye [12]. Additionally, there is evidence that video game training in general can help alleviate bilateral amblyopia.[13]

There are some patients who do not wish to play video games, and there are others who are too amblyopic to be able to correct the vision needed to play video games. That's why we've been using contrast balancing techniques from movies and augmented reality to improve our perception of natural scene

stimuli in our everyday lives. Both eyes are shown complementary pictures in these techniques. A study on youngsters found that passive dichoptic movie watching improved their visual acuity, but no such findings have been made for adults. The passive viewing of any visual content, such as athletic events, movies, or children's cartoons, might theoretically benefit from this technique [9]. Amblyopic adults and children with stable and resistant amblyopia, who could not be cured with normal methods, were the first to be evaluated with this approach.

At the very least, technologies that identify amblyogenic variables may be limited in their utility because of two major issues. In the first place, amblyopia isn't something that can be detected this way. Because amblyopia is linked to refractive error and ocular misalignment, these tests look for these conditions. As a result of the wide range of refractive errors that might induce amblyopia, photoscreening has to overdetect youngsters and hence refer some of them erroneously. [14]

In addition, the natural history of an amblyopiogenic factor in a kid with good eyesight has never been researched since such patients have never been studied before. If a child has an amblyogenic component at the age of two, he or she may not have any issues by the age of four. Whether or if earlier detection and treatment of amblyopia as a consequence of early screening utilising new approaches is better than waiting until visual acuity can be evaluated directly is therefore unknown. [15]

New research in the field of anisometropic amblyopia therapy based on active AVT based on perceptual learning with the patching of the dominant eye and video game play with the amblyopic eye is fascinating and can complement and enhance standard treatment techniques.

## MATERIAL AND METHODS

This analytical study was conducted at Jinah international hospital abbottabad and comprised of 65 children. Those who had organic

amblyopia, congenital strabismus, any visual or neurological disorder, or developmental delay were excluded from the study. After informed written agreement, participants' demographics were recorded.

Documentation that is up to standard In order to keep track of patients, a proforma was devised for this purpose. Parents of patients gave their explicit consent after being given specific training to ensure their children's cooperation. A thorough examination of both the front and back of the body was carried out. The most effective visual treatment has been identified. An anisometric amblyopia was defined as a difference of two or more lines on the snellen chart between the two eyes.. From +7 to -5 diopters, the refractive error of amblyopic eyes was measured. Proper refractive correction was performed. Patching the normal eye for three hours every day was recommended at a dose of one week per year of age. The amblyopic eye was given active visual rehabilitation by playing video games on a computer and on a smart phone. Observations were made every two months to see if the patients' vision had improved or their refraction had changed. Pre and post-treatment visual acuity was used to evaluate the results. In the end, the post-treatment status of visual acuity of 6/24, 6/36, 6/60 and Counting finger was compared to the pre-treatment status of 6/24, 6/36, 6/60 and Counting finger using a T-test for regression and co-relation, which showed P = 0.005, which is a value less than 0.05 but statistically significant. SPSS 21.0 analyzed all data.

**RESULTS**

Among 65 children, 40 (61.5%) were males and 25 (38.5%) were females.(fig 1)

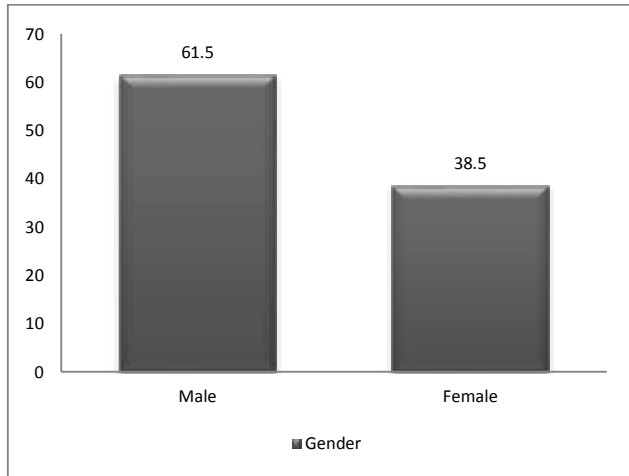


Figure-1: Sex distribution among children

Mean age of the patients was 8.7±4.17 years. Hypermetropia was the most common refractive error found in 45 (69.2%) cases followed by myopia in 20 (30.8%) cases. Pre-treatment 24 (36.9%) patients had BCVA 6/24, 12 (18.5%) patients had 6/36, 17 (26.2%) patients had 6/60 and 12 (18.5%) had CF.(table 1)

Table-1: Details of enrolled children

Variables	Frequency	Percentage
Mean age (years)	8.7±4.17	
<b>Refractive Errors</b>		
hypermetropia	45	69.2
myopia	20 (30.8%)	30.8
<b>Before Treatment BCVA</b>		
6/24	24	36.9
6/36	12	18.5
6/60	17	26.2
CF	12	18.5

Post-treatment 18 (27.7%) had BCVA 6/6, 10 (15.4%) had 6/9, 11 (16.9%) cases had 6/12, 12 (18.5%) children had 6/18, 5 (7.7%) had 6/24, 6 (9.2%) had BCVA 6/60 and 3 (4.6%) had CF.(fig 2)

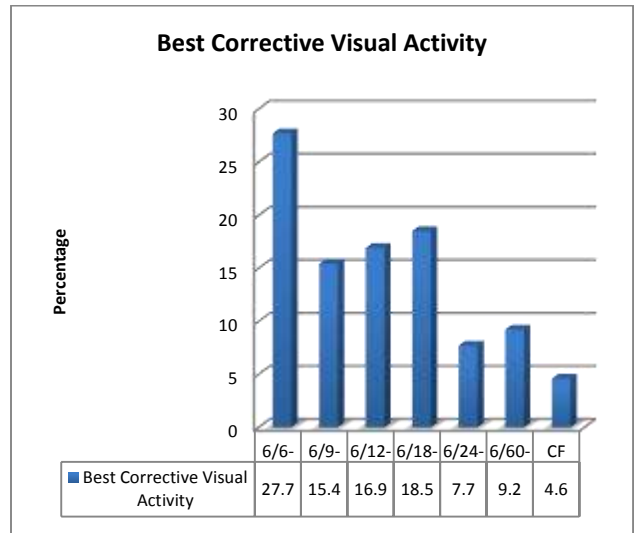


Figure-2: After treatment BCVA among children

**DISCUSSION**

Amblyopia can be exacerbated by anisometry, either because of the reduced resolution at the fovea induced by optical defocus or because of active suppression. [16,17] After an anisometropia surpasses around 1 diopter, the prevalence and depth of amblyopia are linked to the anisometropia's severity.[18,19] The research on the impact of patient age on the likelihood of developing amblyopia is inconsistent because of the small sample sizes and selection bias (for more information, see the "Introduction" and "Background" sections). [20] The most comprehensive investigation so far of individuals with anisometric amblyopia has found that both age and depth of the amblyopia have a significant role in deciding how well therapy works.

Anisometric amblyopia is treated with AVT and patching. Our study reveals AVT's effectiveness in treating anisometric amblyopia. Amblyopia severity, patient age, and therapy compliance determine results. Tables-IV and V indicate responsible outcomes for VA 6/24 and 6/36 with less severe amblyopia than Tables-VI and VII. In individuals with thick amblyopia and counting-finger visual acuity, 18.5% showed no change. Multiple national and international research with mixed outcomes favour patching the dominant eye with AVT of the amblyopic eye. National and worldwide outcomes vary according on AVT length, patient age, amblyopia severity, and therapy compliance. In our study, AVT was 3 hours per day at a dosage of one week per year of age, while other studies report 2-6 hours daily.

Total 65 children with ages 6-16 years were presented in current study. Among 65 children, 40 (61.5%) were males and 25 (38.5%) were females. Mean age of the patients was 8.7±4.17 years. Hypermetropia was the most common refractive error found in 45 (69.2%) cases followed by myopia in 20 (30.8%) cases. Pre-treatment 24 (36.9%) patients had BCVA 6/24, 12 (18.5%) patients had 6/36, 17 (26.2%) patients had 6/60 and 12 (18.5%) had CF. Findings of our research was comparable to the previous studies.[21,22] PEDIG 6 hours of full-time occlusion has demonstrated benefit in amblyopic treatment [23], although outcomes depend on severity. [24]

An 8-hour patching period is recommended by Wallace DK and Laizar E.L. if progress in visual acuity has plateaued after two

hours of patching, according to their study. [25] Patching and patching with AVT have considerable differences, according to Singh et al. Only patching has shown 1.8-line improvement, whereas patching with AVT has shown improvement of 2.4-lines, which supports our findings. [26] Researchers Carlos J Hernandez Rodriguez et al. found encouraging outcomes with AVT patching in anisometropic amblyopia in a randomised control experiment. [27] Similarly to previous studies our study also showed same results. Post-treatment 18 (27.7%) had BCVA 6/6, 10 (15.4%) had 6/9, 11 (16.9%) cases had 6/12, 12 (18.5%) children had 6/18, 5 (7.7%) had 6/24, 6 (9.2%) had BCVA 6/60 and 3 (4.6%) had CF.[21]

Patient age and compliance are two of the most important factors influencing treatment results. Poor treatment compliance raises the likelihood of treatment failure. Both Oliver and Chen have observed that younger amblyopic are more receptive to treatment than older amblyopic. [28] Lithander J, Sjostrand have found that therapy outcomes are greatly influenced by compliance, and that with strong compliance, amblyopia resolution is 95 percent, but with poor compliance, amblyopia resolution is only 50 percent. [29] Intermittent monocular patching of the amblyopic eye 2 hrs per day has been studied in two recent studies [30] that are similar to our patching protocols. There was higher physical activity in the Lunghi et al. research and more patching sessions in the Zhou et al study. Using patching and dichoptic movie watching, we saw an increase in amblyopic eye acuity of 0.19 logMAR, whereas they reported improvements of 0.15 and 0.13 logMAR. [31]

Toor et al. found that age, anisometropia, amblyopia depth and treatment technique were the most important criteria in determining whether therapy was successful or unsuccessful for anisometropic amblyopia. [32] Amblyopia caused by anisometropia is a curable ocular disease that can be improved with patching of the dominant eye and the addition of active treatment for the amblyopic eye. Amblyopia reversal is linked to a slew of different things. The patient's age and the degree of amblyopia have a direct impact on the likelihood of reversal. There are good outcomes with patching and active visual treatment for amblyopia at a young age and for milder cases. Amblyopia can be reversed if the patient adheres to the treatment plan. Compliance is essential to the success of any project.

## CONCLUSION

In this study, we came to the conclusion that the treatment for anisometropic amblyopia, which involves the patching of the patient's dominant eye and the refraction of the amblyopic eye using active visual therapy, is beneficial.

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