

A Comparative Study between Dissociative Treatment and Binocular Interactive Treatment in Amblyopia

Thesis

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Introduction

Amblyopia is a unilateral or, infrequently, a bilateral reduction of best corrected visual acuity (BCVA) which cannot be attributed to coexisting eye or visual pathway disease. Amblyopic eyes may have decreased contrast sensitivity and accommodation deficit. The fellow eye is not often normal but has subtle deficits. **(Pediatric Eye Disease Investigator Group, 2005; Ophthalmology P, 2012)** This can be explained by interocular suppression, or inhibition of the amblyopic eye by the strong eye, with psychophysical **(Baker et al., 2008; Mansouri et al., 2008; Maehara et al., 2011; Ding et al., 2013; Ding et al., 2014; Hess et al., 2014)** and physiological evidence **(Bi et al., 2011)**

Amblyopia can be classified as follows: 1) Strabismic occurring in early childhood 2) Refractive: a) Anisometropic b) High bilateral refractive errors 3) Visual deprivation. **(Attebo et al., 1998; American Academy of Ophthalmology Basic and Clinical Science Course Subcommittee, 2012)**

The prevalence of amblyopia worldwide is approximately 1%–5% **(Ganekal et al., 2013; Fu et al., 2014; Oscar, et al., 2014; Aldebasi, 2015)** In Egypt, a study that was held in Minia, Upper Egypt, found that the prevalence of amblyopia was 1.49%, which is higher in rural areas than in urban areas. **(Abdelrazik and Khalil, 2014)**

Several modalities of treatment for amblyopia are available, yet occlusion treatment is the gold standard involving covering the good eye with a patch for a prescribed period of time ranging from 10 minutes daily to all waking hours **(Von Noorden and Campos, 2002; Stewart et al., 2005)**. However, its effectiveness decreases in older children and adults **(Pediatric Eye Disease Investigator Group, 2005)**

Disadvantages include prolonged treatment leading to poor compliance, patching related distress, relationship strain and stigma. In extreme cases, non-compliance with patching results in a costly hospital admission to supervise the patching treatment. In addition, wearing a patch eliminates any advantage of binocularity **(Dixon-Woods et al., 2006)**. Not to mention that not all patients respond to patching and of those who do, many have residual amblyopia after treatment is stopped regardless of compliance **(Hess et al., 2014)**. More importantly, binocular vision is not automatically restored once the vision in the amblyopic eye has been improved. In fact, once

the patch is removed after therapy, the amblyopic eye could be suppressed by the better seeing eye and can lose some of the gains achieved as a result of therapy. **(Birch, 2013)**

Another modality of treatment is atropine eye drops and optical penalization which are usually secondary treatments to failed patching but carrying the same disadvantages as the ordinary patching **(Foss et al., 2013)**

Advances in amblyopia treatment include dichoptic training, perceptual learning, and video gaming **(Tsirlin et al., 2015)**. These depend on the fact that the adult brain has been shown to be much more plastic than it was once believed to be and hence have the advantage of expanding the age of response in adults. **(Pizzorusso et al., 2002; He et al., 2006)**

Perceptual learning approaches have the advantage of being a dichoptic (binocular treatment) approach which is independent of age and type of amblyopia. **(Polat et al., 2004; Levi and Li, 2009)** Furthermore, it has been shown recently that therapy promotes binocular vision by strengthening stereopsis and reducing suppression **(Hess et al., 2010; Hess et al., 2011)**

A step further to conventional treatment is the use of a home-based approach allowing remote internet monitoring of treatment between office visits and hence better compliance. **(Hess et al., 2014)** In addition a video game version of the treatment is developed to make it more enjoyable for improving compliance. **(Foss et al., 2013)**. Moreover, dichoptic presentation can be achieved on the iPod device using a lenticular overlay screen. The advantage of using a lenticular overlay screen is that the luminance contrast is preserved **(Hess et al.; 2014)**

Aim of the work:

The aim of this work is to compare the gold standard occlusion therapy alone with dichoptic therapy

Patients and Methods:

Design:

The study will be a prospective experimental controlled study.

Patients of the study:

From the vicinity of the ophthalmology outpatient clinic of Ain Shams University Hospital, 100 patients of both sexes with amblyopia will be enrolled to this study. Informed consents will be obtained from adult patients and children's parents.

Patients will be assigned randomly into two groups:

Group A: 50 patients will receive the gold standard occlusion therapy

Group B: 50 patients will receive dichoptic treatment in the form of playing a video game (Lazy Eye Tetris games such as Lazy Eye Blocks ®) while wearing a red/green goggle.

Each group will be subdivided according to age:

1. From 4 to 7 years.
2. From above 7 to 12 years.
3. From above 12 to 30 years.

Hours of occlusion will be classified according to the degree of amblyopia:

- Mild to moderate amblyopia (Best corrected visual acuity (BCVA) < 0.2): 2-4 hours occlusion
- Severe (BCVA > 0.2): 4-6 hours occlusion

Hours of dichoptic treatment in group B will be classified according to the degree of amblyopia:

- Mild to moderate amblyopia (BCVA < 0.2): 2-4 hours of treatment
- Severe (BCVA > 0.2): 4-6 hours of treatment

Inclusion Criteria:

- Any degree of amblyopia
- Orthotropia in primary position.

Exclusion Criteria:

- Any ocular disease affecting vision
- Angle of deviation in primary position (Heterotropia)
- Adult patients and children's parents unwilling to enter or complete the study
- Ignorance of patients to use the video game

Methods

All patients will undergo the following:

- 1) Full medical and ophthalmic history
- 2) Examination:
 - A) External Appearance:
Anomalous Head Posture, globes (e.g., proptosis), lids (e.g. ptosis).
 - B) Refraction:
With and without cycloplegia.
 - C) Visual acuity:
With and without correction using Snellen acuity chart and preferential looking test for non-verbal patients.
 - D) Motility:
Ductions and versions (9 positions of gaze)
 - E) Angle of deviation if any
 - F) Fixation :
Fixation behavior (fixation preference) will be tested via base down 10 PD fixation preference test.
 - G) Quantitative Binocular vision assessment
 - H) Anterior segment examination.
 - I) Posterior segment examination using indirect ophthalmoscopy with a 20-D (diopter) lens through a dilated pupil.

All patients in Group A will receive the gold standard occlusion therapy. All patients in Group B will receive dichoptic treatment

Treatment assessment:

All patients will be followed up in the following schedule: after 1 month, after 2 months and after 6 months with regards to visual acuity. Patients who fail to complete the full time of the follow up period will be excluded from the study.

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