Rapid assessment of core visual deficits in Amblyopia

INTRODUCTION

Amblyopia (lazy eye) is defined as optically uncorrectable loss of vision, usually in one eye, without any known pathology. Two major amblyogenic factors include ocular misalignment and unequal refractive errors. Amblyopia is one of the leading causes of monocular vision loss in children in the US. A wide range of visual deficits are associated with amblyopia (Fig. 2), but currently acuity is the only outcome measure for amblyopia treatment. This is a widely recognized limitation but inefficacy of psychophysical assessments, such as long testing time, has been a major obstacle in resolving this limitation.

AIMS

- To develop efficient methods to rapidly assess core deficits in amblyopic vision.
- To validate the efficacy of these methods in characterizing amblyopic deficits.

RESULTS

1. Contrast Sensitivity

Reduced Contrast Sensitivity in the Amblyopic Eye

Lack of Binocular Summation in Amblyopia

Bipolar Summation Index = Sensitivity in Amblyopic Eye / Sensitivity in Normal Eye

2. Binocular Interaction

Effective contrast of the amblyopic eye was considerably attenuated in supra-threshold combined percept

Dichoptic matching task

100% match

Effective Contrast Ratio (ECR): The amount of contrast required for the weak eye to match 100% contrast in the strong eye.

3. Spatial Distortion

Larger Localization Errors in Amblyopia

CONCLUSIONS

- Despite short testing time our methods are as effective as laboratory assessments for quantifying the core deficits of amblyopia.
- Our efficient and comprehensive approach to characterize the broad range of amblyopic deficits are believed to facilitate diagnosis and treatment of amblyopia.

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