Generality of learning as driven by dichoptic visual training

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Introduction

- Sensory eye dominance refers to a situation where one eye's input dominates over that of the other eye.
- Visual training protocols employing dichoptic presentations of signal-noise motion stimuli have been shown to be promising in promoting eye rebalancing and strengthening binocular functions [1, 2].
- The mechanisms that underlie binocular balance are unknown.

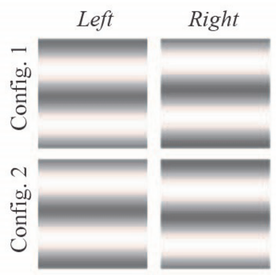
We aimed to characterize the mechanisms underlying training-driven improvements in sensory eye balance and binocular functions by examining the generality of training effects across different training and test cues.

Method

Tasks

Binocular phase combination task

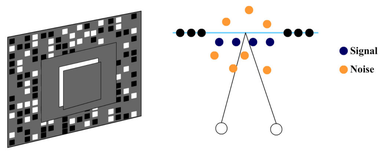
Balance



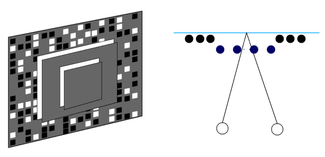
Perceived phase = [Phase setting (Config. 1)/2 - phase setting (Config. 2)/2]

Depth

SNR depth task

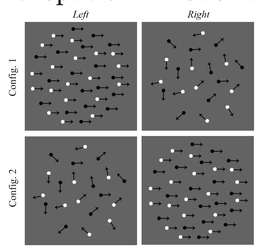


Fine depth task

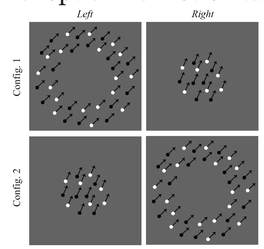


Dichoptic SNR motion task

Motion

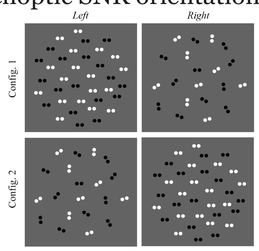


Dichoptic fine motion task

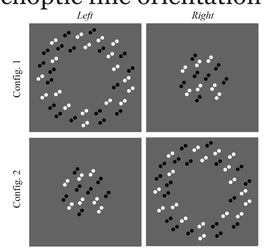


Dichoptic SNR orientation task

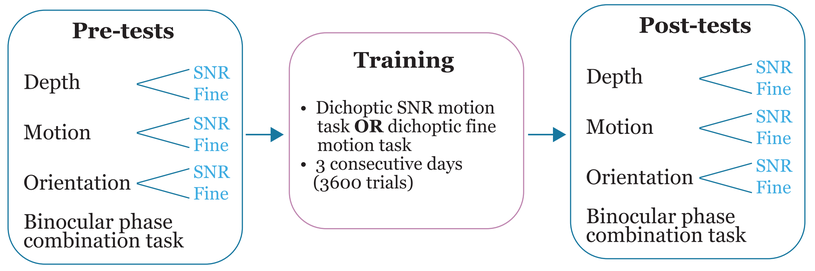
Orientation



Dichoptic fine orientation task



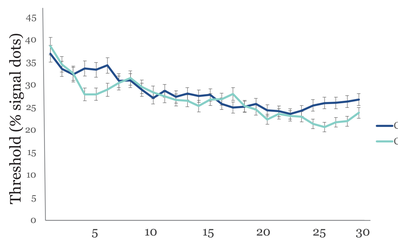
Procedure



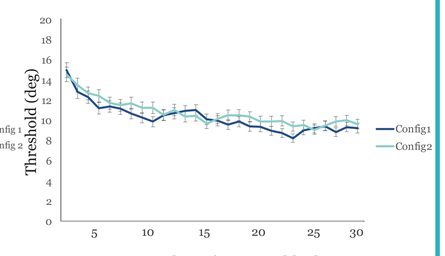
Current Results

Training Data

SNR motion training group

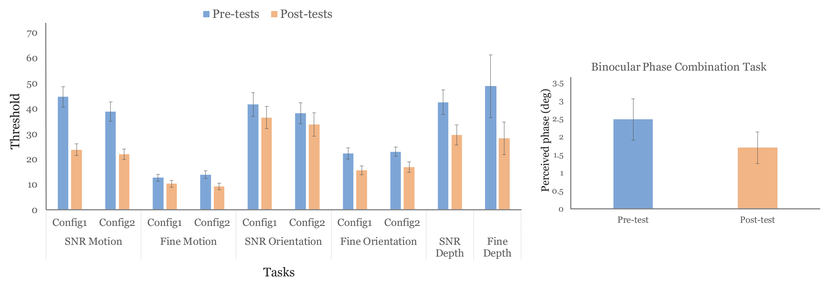


Fine motion training group



Pre-tests VS Post-tests Thresholds

SNR motion training group



Fine motion training group

- Current results show that both training tasks alter sensory eye balance and improve stereopsis.
- Training on both tasks drive improvement beyond the immediately-trained paradigm.

Discussion

- Our data suggest that training effectiveness does not depend on whether the training entails a signal-noise or fine feature discrimination, implicating the unique and significant role of dichoptic training paradigm for balancing interocular suppression.
- We speculate the training-driven changes of ocular strength happen in the early visual cascade.

References

1. Hess, R. F., Mansouri, B., & Thompson, B. (2010). A binocular approach to treating amblyopia: antisuppression therapy. Optometry and Vision Science, 87(9), 697-704.
2. Hess, R. F., Mansouri, B., & Thompson, B. (2010). A new binocular approach to the treatment of amblyopia in adults well beyond the critical period of visual development. Restorative neurology and neuroscience, 28(6), 793-802.