Decreased Parvocellular Input and Its Effects on Depth Perception

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PURPOSE

This experiment was conducted in an attempt to better understand the magnocellular pathway's function in judging the position in space of a target during an eye-hand coordination task. By blocking the subjects' central vision, input into the parvocellular system could be reduced, allowing us to draw conclusions regarding the magnocellular pathway's role in coordinating vision and allowing us to accurately interact with objects in space. Our hypothesis was that there would be similar if not slightly increased accuracy with magnocellular vision being the primary pathway used during the eye-hand coordination task.

METHODS

We focused our experimentation on eye-hand coordination as it relates to tossing a beanbag into a bucket from 10 feet away. Our experimental group consisted of 17 individuals. (Fig 1 & 2).
Visual acuity was checked to ensure that each subject met the required visual acuity standard. All subjects met the 20/30 standard (with or without correction). The same (plano) eyewear frame was used, on all subjects, during the beanbag tosses. This was important because it provided a standardized vertex distance and Abbe value necessary for standardization of the experiment, as well as providing a surface on which to place a sticker to occlude the subject's central vision. Each subject performed 10 tosses without central vision occluded and 10 tosses with central vision occluded. No prior exposure to the task or experimental environment was allowed.

FIGURE 1: Subject performing experimental task

FIGURE 2: Exact beanbags, eyewear and bucket used

RESULTS

****The Results showed no significant difference in subjects' accuracy while central parvocellular vision was inhibited.**

Occluded vs. Un-occluded results
Paired T-TEST p = 0.732642548 = not statistically sig.

Difference in accuracy on occluded trial if occluded first vs. occluded last
Paired T-TEST p = 0.88 = not statistically sig.

Occluded vs. Un-occluded Results for MALES
Paired T-TEST p = 0.88 =not statistically sig.
Occluded vs. Un-occluded Results for FEMALES
Paired T-TEST p = 0.08 = not statistically sig.

Northeastern State University Students	N=17
Average Age	26.5
Number of Males	9
Number of Females	8

DISCUSSION

Since vision happens in the brain, not in the eye, increasing our understanding of the functions of the magnocellular and parvocellular visual pathways (Fig 3) and their integration with other sensory information can help us better serve patients with a wide range of conditions. The magnocellular (dorsal-parietal) pathway relates to our spatial understanding: where we are and how we guide movement in relation to the things around us and to our environment. This is the stream of visual information that communicates with the parts of our brains responsible for controlling our eye and body movements. The parvocellular (ventral-temporal) pathway helps us identify, recognize, and categorize what we see. A better understanding of the relationship between the magnocellular and parvocellular systems will be helpful for gaining more insight into developing better treatments for debilitating conditions such as traumatic brain injury, ADHD, dyslexia and many others.

Our subjects' performance was nearly identical for both the experimental and control trials. This would seem to indicate that having parvocellular visual information available does not significantly improve accuracy in spatial localization tasks.

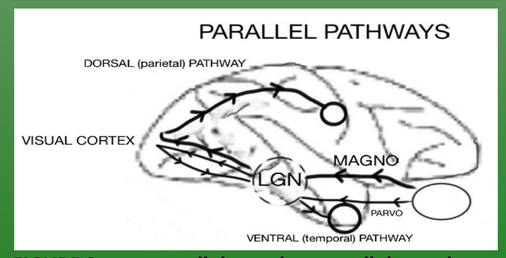

FIGURE 3: magnocellular and parvocellular pathways

Heart of America Contact Lens Society, Kansas City Feb. 13 2016