

Age, Sex and Sporting Participation, and Their Effect on the Terminal Threshold of Visual Motion

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Abstract

The main aim of this study was to investigate the relationship between age, sex and sporting participation, and the terminal threshold of visual motion. 53 participants ranging in age from 18 to 71, (M=25, F=28) took part in the study consisting of a computer-based visual stimulus experiment and a questionnaire. Results showed that both age and the amount of sporting participation during childhood, had a significant relationship with the threshold. An increase in age was related to a reduction in motion sensitivity, and higher amounts of sporting participation were related to an increase in motion sensitivity. Gender differences and other measures of sporting participation were not shown to have a significant influence.

Hypotheses

- **Hypothesis 1.** Age will have a statistically significant predicting relationship with the terminal threshold.
- **Hypothesis 2.** There will be statistically significant differences found between males and females, in relation to the measured terminal threshold.
- **Hypothesis 3.** Sporting participation will have a statistically significant positive relationship with the measured terminal threshold.

Discussion

Similarly to other motion sensitivity and threshold based research, age was shown to have a significant influence. Previous research has theorised that this is due to the natural degeneration of the neural pathways that occur with age and these results would seem to further that concept.

Although gender differences were not shown to be significant, significance levels were only marginally outside of the 95% confidence interval. The null hypothesis cannot be rejected. Potentially, with further analysis and a larger sample size, significant differences may be found.

Only one of the four variables looking to address the third hypothesis was found to be significant. Although the null hypothesis cannot be rejected, these four variables were designed to look at different aspects of sporting participation. Therefore, a refinement of the theory and further analysis is needed to examine this relationship further.

Introduction

Within the visual cortex, the processing of visual stimuli to generate a pattern of motion is a very complex system. Psychophysics, which has been defined as the scientific study of the relationship between stimulus and sensation, examines the bottom-up aspect of sensory perception (Gescheider, 2013, p. 9). One of the main aspects of psychophysics research is the study of thresholds.

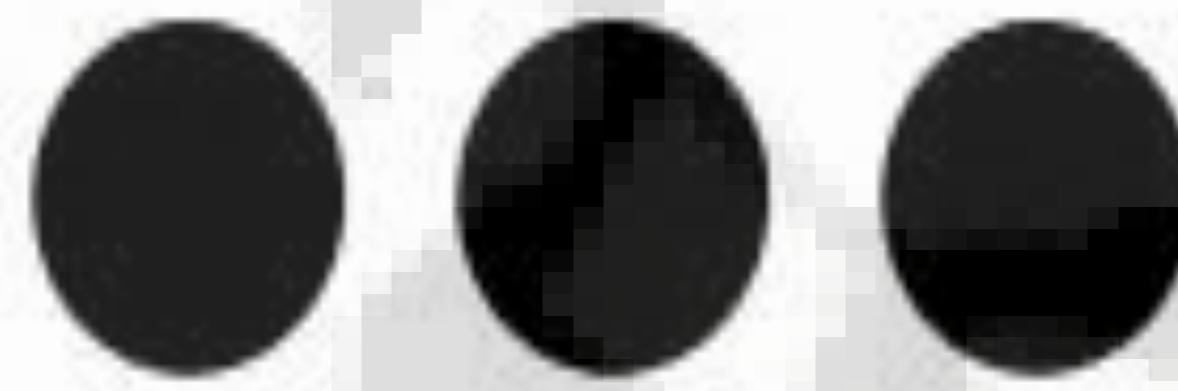
The terminal threshold is defined as the point at which an individual can no longer detect an increase in the stimulus (Oxford reference, 2008). Max Wertheimer (1912) conducted a range of experiments on motion perception. While examining the phenomenon of apparent motion between two images flashing sequentially, he noted that when the time delay was very small, participants could no longer distinguish which came first. This is rationalised as the terminal threshold of visual motion. When there is no differentiation between the appearance of images, no motion can be perceived. Since then, no known research on this threshold has been conducted.

Trick (1991) examined the discrimination threshold and found reductions in motion sensitivity as age increased and also within Alzheimer patients. This was attributed to degeneration of the neural pathways. Gilmore (1992) found similar influence on motion sensitivity with age, and also some gender differences.

Although some demographic differences in motion thresholds have been studied, potential developmental differences are not known. It was rationalised that sporting participation may be influential. Ward (2002) found that expert tennis players were superior at predicting motion in relation to novices.

Methods

The study used both a correlational and a cross-sectional quasi-experimental design. 53 participants were recruited using opportunity sampling from the general population. They were first given a short questionnaire to ascertain their age, gender and different aspects of sporting participation. Next, they completed a computer based experiment that consisted of two trials each repeated 5 times. The first trial, ATA, consisted of three dots appearing onscreen one after the other (left, middle, right). The motion of these dots appeared to get faster as the trial continued. Eventually, the time delay between each dot would be so small that all 3 would be perceived to appear together. Participants were asked to click the mouse when this was observed. The second trial, DTA, ran in reverse of the first. Initially the dots would be perceived to appear together but as they slowed, would appear one before the other. Participants were asked to respond when motion was first perceived.



Conclusion

Due to the novel nature of this study, most of the measures used were designed for the study. This led to some issues, yet valuable data was still gathered. Age was shown to be influential but further analysis and refinement is believed to be necessary to gain a better understanding of this threshold.



Results

Age

Age was shown to have a positive significant predicting relationship with ATA. ATA was an inverse measure of terminal threshold. Therefore, age has a negative relationship with the terminal threshold, with motion sensitivity decreasing with an increase in age.

Sex

Sex was not shown to have a significant relationship with ATA, even when controlling for age within groups.

Sporting Participation

Four measures were used to assess sporting participation, amount of sports participation during childhood, amount of sports participation current, highest current level of participation and highest level of participation ever. Amount of sports participation childhood was shown to have a significant relationship with ATA when controlling for age. Neither of the other measures were found to be significant.

Aims

The main aim of this study was to gain a better understanding of the terminal threshold of visual motion, as this threshold is a relatively novel area of research. It was rationalised that this would be best done by looking at simple demographic variables, along with variables that may have a developmental influence.



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