Cognitive Correlates of Action Video Gaming: A Cross-sectional Study of Habitual and Professional Counter-Strike Players

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Background

- Playing **Action Video Games (AVGs)** has been shown to have the potential to enhance information processing, especially in highly skilled AVG players who have experienced hundreds of hours of gameplay.
- However, AVG training studies yield mixed results. Previous research[2] has found AVG training to decrease reaction times (RTs) whilst others[3] found no such effect.
- By decomposing RTs using **the drift-diffusion model (DDM),** researchers[1] found AVG training to improve drift rates whilst others[3] found AVG training to increase boundary separations.
- These mixed results may be due to some methodological limitations such as short training periods, small samples and practice effects that the present study attempts to address.

Research Questions

- How should AVG expertise be measured?
- Is greater AVG expertise associated with enhanced processing speed and decision-making?
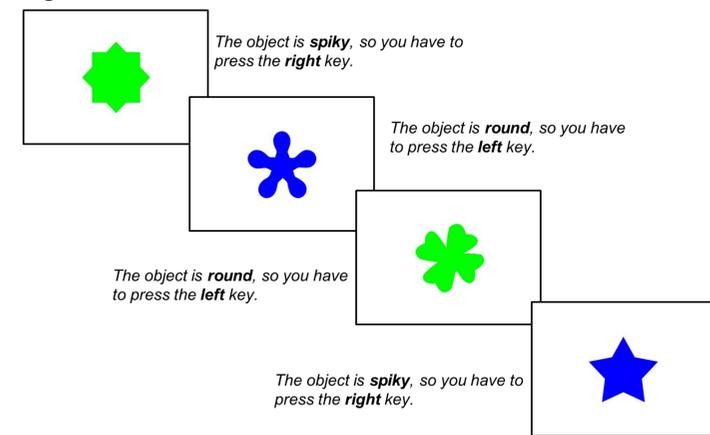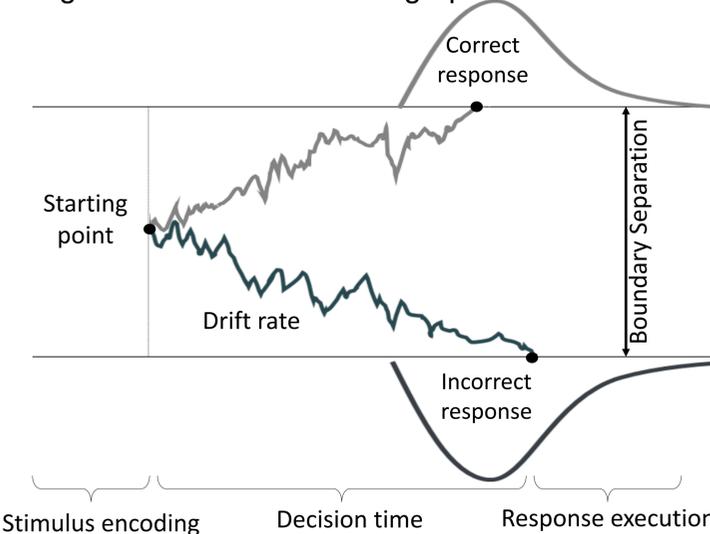
Method

Fig.1. Choice RT Task

*The object is **spiky**, so you have to press the **right** key.*

*The object is **round**, so you have to press the **left** key.*

*The object is **round**, so you have to press the **left** key.*

*The object is **spiky**, so you have to press the **right** key.*

Fig.2. Drift-diffusion model graph

Correct response

Boundary Separation

Starting point

Drift rate

Incorrect response

Stimulus encoding | Decision time | Response execution

Results

Casual | Experienced | Aspiring | Semi/Professional

Fig.3. K-means Clusters

Fig.4 Processing speed
$p=.001$

Fig.5 Drift rate
$p=.088$

NB: one extreme value cropped from the plot for clarity
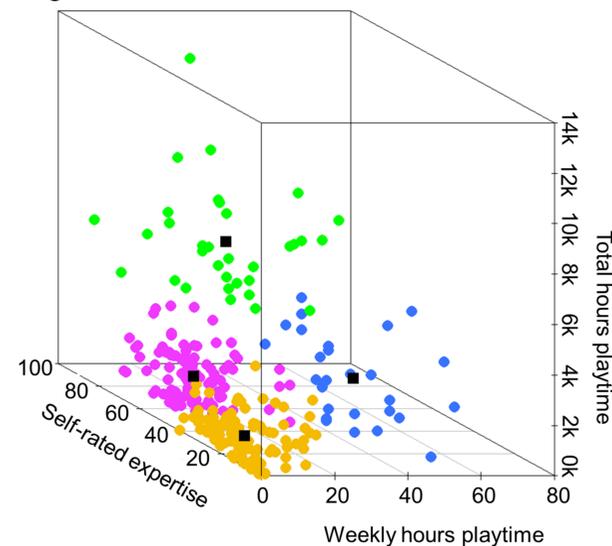
Fig.7 Boundary separation
$p=.603$

NB: four extreme values cropped from the plot for clarity

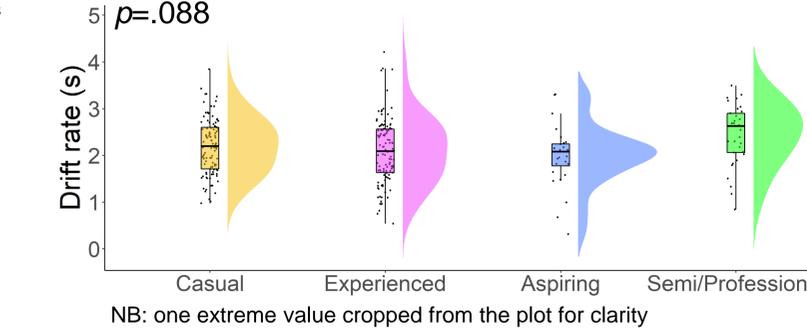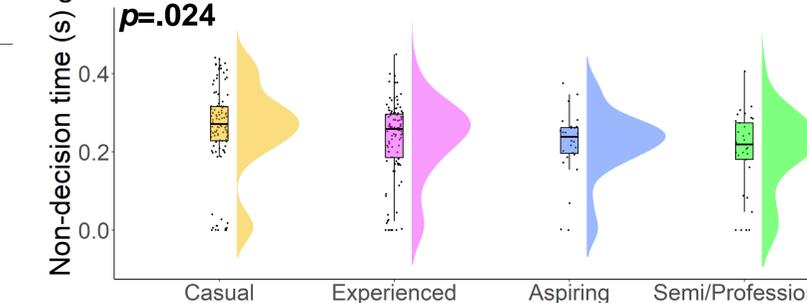### Fig.6 Non-decision time
$p=.024$
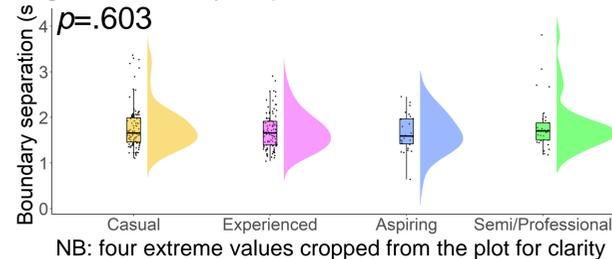
Scan for extra figures and more!
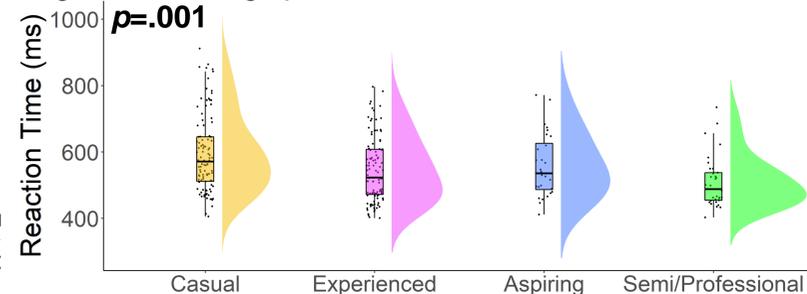
Method

Study 1
- Interviews with casual, expert and professional **Counter-Strike (CS)** players (*N*=3) to establish measures of expertise.
- Interview questions informed by the Questionnaire from Study 2.

Study 2
- Online cross-sectional study with habitual and professional CS players (*N*=273).
- **1. Questionnaire:** measured CS expertise.
- Total hours playtime, weekly hours playtime, self-rated expertise, current ranking, tournament participation, role.

Study 2
- **2. Choice RT task:** decide if a shape is round or spiky, or whether it is green or blue.
- Measured RT distribution and accuracy.

Conclusions

- AVG players with the highest level of expertise showed faster overall processing speed in a Choice RT task. DDM suggests these differences are mainly due to their faster **non-decision times** and (although non-significant) higher **drift rates.**
- These results support findings from previous literature. However, further intervention research is necessary to causally determine the relationship between AVG play, processing speed and decision-making.

1. Dye, M. W. G., Green, C. S., & Bavelier, D. (2009). Increasing speed of processing with Action Video Games. Current Directions in Psychological Science, 18(6), 321–326. doi:10.1111/j.1467-8721.2009.01660

2. Green, C. S., Pouget, A., Bavelier, D. (2010). Improved probabilistic inference as a general learning mechanism with action video games. Current Biology, 20(17), 1573–1579. doi:10.1016/j.cub.2010.07.040

3. Van Ravenzwaaij, D., Boekel, W., Forstmann, B. U., Ratcliff, R., & Wagenmakers, E. J. (2014). Action video games do not improve the speed of information processing in simple perceptual tasks. Journal of Experimental Psychology: General, 143(5), 1794–1805. doi:10.1037/a0036923