Gamers move differently depending on the game: An upper limb kinematics study

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1 BACKGROUND:

Video games vary depending on their **cognitive demands.**

Video games are also known to place **demands** on players' **physical movements.**

To date, **no work** has examined the **biomechanical differences** among players who play **various video game genres.**

Aim : Determine whether the kinematic behaviour of competitive video game players differs according to the game genre they play.

2 METHODS:

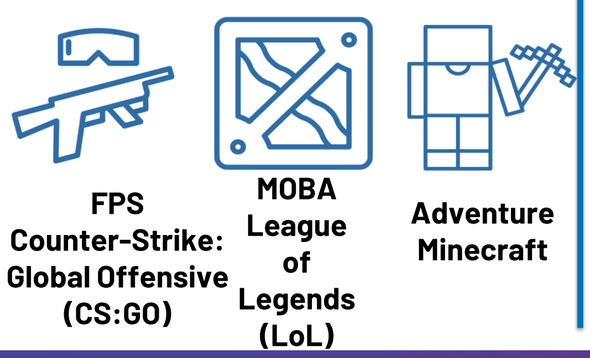
Demographics and Experimental Procedures:

63 Participants (61 males, 23.98 ± 4.9 y-o, 180.77 ± 7.5 cm, 86.47 ± 17.4 kg; 18.22 ± 11.8 gaming h/w)

3 tri-axial accelerometers (hand, forearm, & arm)

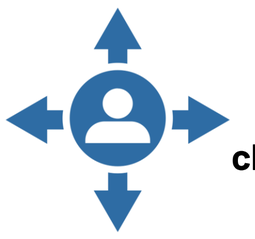
10 min of gameplay of participant's preferred game genre (**MOBA, FPS, Adventure**)

3 mouse sensitivity settings (400, 1000, & 1600 DPI)



Variables of interest:

Hand average acceleration



Hand direction changes frequency

Hand cumulative distance travelled

Hand displacement area (size and shape)

3 RESULTS:

***, ** and *** indicate significant differences at p ≤ 0.05, p ≤ 0.01 and p ≤ 0.001, respectively.**

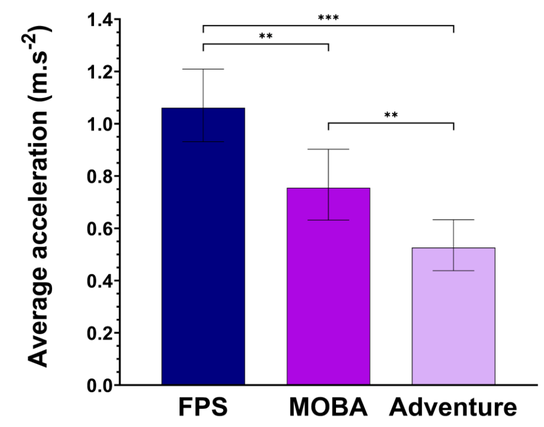


Fig. 1 Average hand acceleration (mean ± 95% CI) for *FPS players* (dark blue bar), *MOBA players* (purple bar) and *Adventure players* (light pink bar).

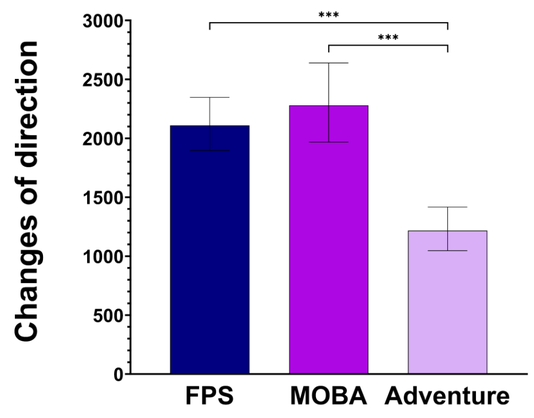


Fig. 2. Number of hand direction changes (mean ± 95% CI) for *FPS players* (dark blue bar), *MOBA players* (purple bar) and *Adventure players* (light pink bar).

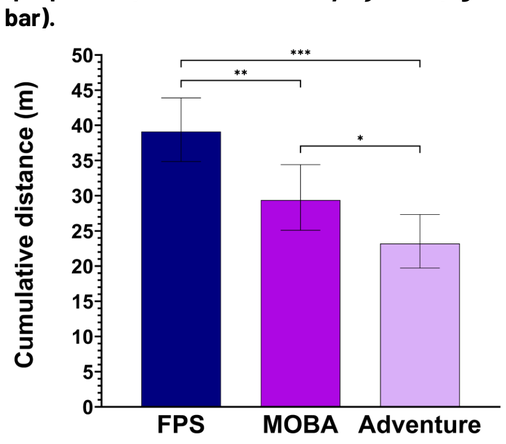


Fig. 3. Hand cumulative distance travelled (mean ± 95% CI) for FPS players (dark blue bar), MOBA players (purple bar) and Adventure players (light pink bar).

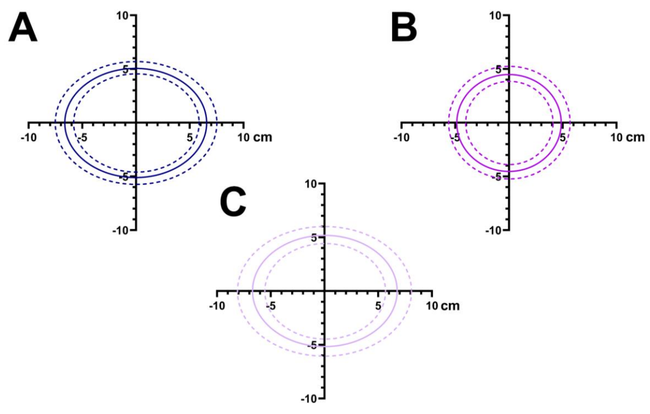


Fig. 4. Illustration of the mousepad area size and shape of use (mean displacement = solid lines; 95%CI = dotted lines) for A. FPS players. B. MOBA players C. Adventure players

4 SIGNIFICANCE:

Video games can be characterised by their movement demands

FPS moved faster on average than **MOBA** players who **moved faster** than **Adventure** players**.**

FPS and MOBA players **changed direction more frequently** as opposed to Adventure players.

FPS players moved their hand through a **greater distance** compared to **MOBA** players who **moved more** in contrast to **Adventure** players.

FPS and Adventure players moved their hand in a **greater area and more laterally** on the mousepad compared to MOBA players.

These findings provide **valuable insight** towards furthering our understanding of **biomechanical performance, injury risk and player-equipment interactions** across different **esports genres**.

References:

1. Campbell MJ, Toth AJ, Moran AP, Kowal M, Exton C. eSports: A new window on neurocognitive expertise? In: *Progress in Brain Research, Vol.240*. Elsevier B.V., 2018.p.161–74. https://doi.org/10.1016/bs.pbr.2018.09.006.

2. Li G, Wang M, Arippa F, Barr A, Rempel D, Liu Y, et al. Professional and High-Level Gamers: Differences in Performance, Muscle Activity, and Hand Kinematics for Different Mice. *Int J Hum Comput Interact* 2021;**38**:691–706. https://doi.org/10.1080/10447318.2021.1960742.

3. Park E, Lee S, Ham A, Choi M, Kim S, Lee B. Secrets of Gosu: Understanding physical combat skills of professional players in First-Person Shooters. *Conference on Human Factors in Computing Systems - Proceedings* 2021. https://doi.org/10.1145/3411764.3445217.

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