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Annotated Bibliography

Hoth, Timo. "Effects of induced latency on performance and perception in video games." *Proceedings of the International Conference on Game Performance*. 2022.

This peer-reviewed research paper was published through an international university and investigates the effects of latency in competitive online gaming using Rocket League players as its demographic. Rocket League is a fast-paced competitive game where players control rocket-powered cars to maneuver a ball into the opposing team's goal, making precise timing and responsiveness critical to gameplay. The study examines how latency, defined as the delay between a player's input and the game's visible response, affects player performance in high-pressure gameplay scenarios. The source addresses my research question as it provides measurable examples of how latency can influence competitive performance and potentially alter the outcome of matches in esports environments. It also explains multiple sources of latency, including network and system delay, giving technical background that supports broader discussions about input lag and competitive gaming performance. This source is reliable because it was published as a peer-reviewed academic study and uses a substantial sample size and structured research methodology.

Hoang, Duc Chi, Khoi D. Doan, and Linh Thai Hoang. "Lag of legends: The effects of latency on league of legends champion abilities." *Worcester Polytechnic Institute* (2017).

This capstone research project from an American university investigates the effects of input and network latency in competitive multiplayer gaming, specifically within the MOBA genre through League of Legends. Unlike fast-paced first-person shooters, MOBAs rely heavily on timing, strategic coordination, and precise ability execution, making them useful for evaluating whether latency affects performance outside reaction-heavy genres. The project quantifies player character performance changes under varying latency conditions and demonstrates that increased delay negatively impacts gameplay effectiveness, particularly in competitive environments. Although the study is not peer-reviewed, it provides practical experimental data and supports the broader argument that latency can influence competitive outcomes across multiple game genres, not only in high-speed esports titles.

Liu, Shengmei, et al. "Comparing the effects of network latency versus local latency on competitive first person shooter game players." *Proceedings of the ACM Esports and High Performance HCI Workshop (EHPHCI). Virtual Conference*. 2021.

This paper compares two major forms of latency that affect competitive gaming performance: local system latency, which can be interpreted as input latency, and network latency. Using the highly competitive first-person shooter *Counter Strike: Global Offensive* as the testing environment, the researchers evaluate how each type of latency impacts player accuracy, score, and overall quality of experience. The study uses experienced players with at least 100 hours of prior gameplay experience, helping establish credibility within the esports demographic. By comparing controlled increases in both local and network latency, the paper concludes that local latency has nearly twice the impact on player performance as equivalent amounts of network latency. Because *Counter-Strike: Global Offensive* has a mature and widely recognized esports scene, the source provides a familiar and relevant dataset for research on competitive gaming performance and hardware responsiveness. The paper's appearance in a conference assumes the status that the conference's committee may have peer-reviewed it.

Spjut, Josef, et al. "Latency of 30 ms benefits first person targeting tasks more than refresh rate above 60 Hz." *SIGGRAPH Asia 2019 Technical Briefs*. 2019. 110-113.

This conference paper was presented at the 2019 SIGGRAPH Asia Technical Briefs conference, a highly regarded venue for computer graphics and human-computer interaction research, and was authored by researchers from NVIDIA. The study uses a purpose-built first-person targeting application designed specifically to measure player performance under controlled conditions. Participants, consisting of highly skilled competitive players between the ages of 27 and 36 with rankings in games such as Counter-Strike: Global Offensive and Overwatch, completed aiming and tracking tasks while the researchers manipulated both monitor refresh rate and artificial latency. By independently adjusting latency at refresh rates ranging from 60 Hz to 360 Hz, the researchers were able to separate the effects of reduced input latency from the smoother visual presentation associated with high refresh-rate displays. Task completion time was used as the primary metric for performance evaluation. The paper concludes that reduced latency provides a significant competitive advantage, while higher refresh rates alone have a smaller but still measurable effect in certain tracking tasks. Because of its controlled methodology, skilled participant sample, and strong technical credibility through NVIDIA and SIGGRAPH, this source is highly useful for research on input latency and competitive gaming performance.

Murakami, Koshiro, Kazuya Miyashita, and Hideo Miyachi. "A study on the relationship between refresh-rate of display and reaction time of eSports." *International Conference on P2P, Parallel, Grid, Cloud and Internet Computing*. Cham: Springer International Publishing. 2020. 339-347.

This conference paper complements the SIGGRAPH study by providing additional experimental data on the relationship between monitor refresh rate and human reaction time in esports environments. The researchers use a simplified but tightly controlled testing methodology in which participants respond to visual stimuli with either keyboard or mouse inputs while operating under different display refresh rates of 60 Hz, 120 Hz, and 240 Hz. Unlike more complex gameplay studies, this experiment isolates refresh rate as the primary independent variable by maintaining the same computer hardware, software configuration, and display hardware throughout testing while only adjusting the monitor refresh rate settings. The paper also discusses related concepts such as display scanning delay, screen tearing, and motion blur as contributors to overall system latency in competitive gaming. Although the study uses a relatively small sample size and a simplistic reaction-time task compared to real competitive gameplay, the results still demonstrate a measurable correlation between higher refresh rates and reduced response times. Because of its controlled methodology and conference publication background, this source is useful for supporting arguments about refresh rate as a contributor to input latency and player performance in esports.