

Effect of Input Devices on Accuracy of a First Person Shooter

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Figure 1: Overview of the environment

ABSTRACT

The input device used could have a significant effect on the performance of the user. Yet, the best input device varies for each scenario. This experiment attempts to compare a DUALSHOCK4 controller with a keyboard and a mouse for a first person shooter game. With only 5 participants, the results found were not significant with

the DUALSHOCK4 controller performing only slightly better in general.

KEYWORDS

First Person Shooter, accuracy, keyboard and mouse, DUALSHOCK4, Human Computer Interaction

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1 INTRODUCTION

First person shooters (FPS) have been a staple in the video game industry since they were first introduced. Yet, depending on the game and system being used, the input devices for these games can vary. Specifically, many people who play games on consoles frequently use a handheld controller while others who play primarily on PC often use a keyboard and mouse.

While the various input devices are both effective for a FPS, it is relatively unknown which device actually functions better for the average user. I evaluated the accuracy for each device using a keyboard and mouse setup and a DUALSHOCK4 for the controller.

1.1 Motivation

As a person who plays FPS on both consoles and PC, the question always loomed; which method is more accurate? Therefore, this experiment was designed around this question. While only a DUALSHOCK4 and keyboard and mouse were tested, other devices could be easily added to this experiment, so that two different controllers could be compared as well. This would allow answers to how an XBOX controller could compare to a DUALSHOCK4.

1.2 Contributions

The results of this experiment could effect the growing e-sports industry. For example, if the controller was found to be significantly more accurate than the keyboard and mouse setup, then its possible future players would begin using controllers more consistently.

Since all PC players could use a controller there probably would be a big shift in usage. However, if a keyboard and mouse setup was found to be more accurate there would probably be less of a shift since many console players are not playing at a desk where they could put a keyboard and mouse easily. In fact, a majority of console users play from the comfort of their couch, so they might be less likely to give that up.

2 RELATED WORK

The input device used for a first person shooter could play a big role in the accuracy of the user. There can be many issues that cause a user to be less accurate. Lag is one possible hindrance to a players accuracy. However, prior studies [7] show that in using lag compensation, these issues could be greatly decreased and the user's accuracy increased by around 5%. In another study [1], it was found that it is possible to predict a user's skill when they first start playing, so therefore, no training will be required during this experiment. Other alternative devices have been proposed, but as found in a previous study [2], these devices, while often rated as more fun by the user, struggles to maintain a high accuracy rate. So this begs the question which device is currently the most accurate for a first person shooter.

The time for a user to fire is also important, and study [4] shows that the mouse was the second fastest on both a 2D and 3D environment, losing only to eye tracking. However, this acquisition speed could potentially make it more difficult to be accurate. Another study [9] found that while outlining a target may increase the target acquisition speed, it often decreased the user's accuracy especially when the user missed on the first shot. Motion blurring could also hinder a user's accuracy. Study [5] found that motion blurring does

effect accuracy quite significantly and therefore motion blurring will not be used in this experiment. Also, the heads-up display (HUD) can effect the user. In a previous study [10], it was found that a number-in-game diegetic ammunition display yielded the best performance and enjoyment of the user. Also, another study [3] found that a target only needs to be visible for around 2 to 3 seconds depending on the experience level of the user in order for a user to reach their best performance. Therefore, the time a target is visible does not need to be visible very long without effecting the accuracy of the user. Other technological differences between the devices should be considered, and another study [6] found that the game pad on the DUALSHOCK4 controller was significantly worse in enjoyment and accuracy compared to the traditional joystick controls. As study [8] shows, there are new models of target acquisition for 3D environments that might be viable. However, it is still important that we answer which device is best for our 2D environments.

3 EXPERIMENT DESIGN

The effects of input devices were compared between 2 devices and only had 5 participants, yet each participant used each device. Each participant was also given 1 minute to get used to the controls. Afterwards, the player was transferred to a different shooting range where they were asked to shoot a total of 20 targets.

3.1 Participants

Each participant was asked to take a survey prior to completing the experiment in order to gain an understanding of the user's experience with both a controller and keyboard and mouse set up. The responses for comfort level using keyboard and mouse result in 40% of participants answering above 5 out of 10 and another 40% responding below 5. The last participant gave a comfort rating of 5. However, 80% of participants gave a comfort rating above 7 for a controller with the last participant gave a rating of 1. The participants were all CSU students except for one, with 3 female participants and 2 male participants.

3.2 Environment

The experiment was run on a Windows laptop and created using Unity and C#. The application saved the survey responses and the accuracy of the participant in the shooting range. A new target appears every 3 seconds unless there are already 3 targets present. A DUALSHOCK4 was connected to the Windows 10 laptop using a micro-usb, while the built in keyboard and a wireless logitech mouse was used.

3.3 Testing Process

Latin squares were used to determine which device a participant would uses with 60% starting with the controller and the other 40% started with the keyboard and mouse. Then after having a minute to get comfortable with the controls, the player then had the task of shooting 20 targets that would spawn every 3 seconds but there would never be more than 3 targets at any given time. The total amount of shots the player took were recorded and the average was calculated by dividing the 20 hit targets by the total amount of shots that the user took. $Accuracy = 20 / totalshotstaken$

4 RESULTS

All participants had a low accuracy with the max being about 14% and a low of about 4%. The mean accuracy for using a controller was about 12% while the mean accuracy for using a keyboard and a mouse was only about 10%. The overall accuracy was also low at only about 11%. As revealed in the analysis of variance, the results were not statistically significant ($F_{1,4} = 0.842, ns$). This is most likely due to the bugs within the testing environment and with updates to the environment, better results could be found.

4.1 Limitations of the Study

Due to time restrictions, the rotational movement of the player for both controller and mouse were not smooth and probably contributed to a loss of accuracy to the participants. Also, despite the bullet registration being continuous, sometimes the bullets would not register a collision. This then caused compounding errors as the accuracy fell further. Also, due to a lack of participants, data could easily be skewed for the controller data since many participants felt comfortable with it. Also, occasionally a participant would run into a wall and the collision would result in the participant spinning. Since this made aiming pretty much impossible, if this happened the participant was allowed to restart. The transition from the warm up area to the testing area was also rather abrupt and could have potentially caused the player to accidentally shoot once or twice in the testing area. Also, the experiment was conducted at night after people were out of classes so that could have potentially affected the participants game play as they could have been tired. Also, while Latin squares were used, it is also possible that each participants second device would likely be better since they were more comfortable with the environment.

5 CONCLUSION AND FUTURE WORK

A small shooting range was set up for a FPS and each participant was asked to shoot 20 targets while their accuracy was recorded. Each participant used a DUALSHOCK4 controller and also a keyboard and a mouse. After shooting 20 targets with input device, an ANOVA test was conducted and found that the results were not significant. However, with improvements to the rotational movement of the character, the bullet registration, and general physics of the environment, could lead to more interesting results. Also, the experiment could easily be expanded to compare the accuracy of different controllers against each other and keyboard and mouse.

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