Joystick versus Mouse in First Person Shooters: Mouse is Faster than Joystick

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Abstract. Many gamers use desktop or laptop computers with a mouse when gaming, instead of a special purpose gaming input device such as a joystick. This study compared the hitting speed and success rates of mouse and joystick for a simple first-person shooter. A between-subjects experiment with *n* = 22 participants using a tailor-made game task was conducted. The results show that the mouse only takes 68.8% of the time compared to the joystick in hitting targets. No significant differences were found in terms of success rate with the two methods.

Keywords: Computer games, First person shooter, Target-hitting, Mouse, Joystick, Game controller.

1 Introduction

Computer gaming are used on many platforms including dedicated consoles, mobile consoles and general-purpose computers. Computer game sales shows that many gamers use general purpose computers. Many of these rely on the standard input devices such keyboards and mice and may not have dedicated gaming controllers.

This study therefore set out to explore the difference between using a conventional mouse and a dedicated joystick game controller in terms of computer gameplay, or more precisely, target hitting in a first-person shooter. Klochek and MacKenzie has pointed out that there is relatively little research into the performance of computer game input devices [1]. Although studies have compared various types of game controllers there are only a few comparisons of joystick and mouse in gaming specifically. However, mice [2, 3] and joysticks [4, 5] have been studied extensively in their own right. The use of touch display devices in computer games have also been investigated [6]. Previous studies have contrasted the mouse to joysticks and the Wii controller [7] and the results showed that the mouse gave best performance, while the Wii controller was preferred by the users.

Trackball [8], thumb-stick, thumb-pad and gyro-sensors [9], gestures [10], tangible designs [11, 12] and exercise promoting input devices in games [13, 14, 15] has also been explored for controlling games.

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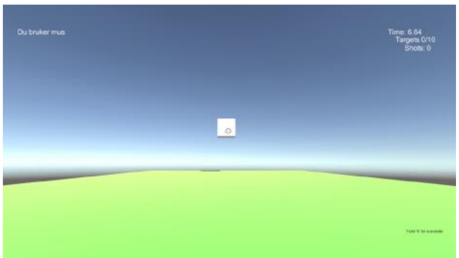
a) Start screen



b) Gameplay using mouse

c) Game completed screen

Fig. 1. Screenshots of experiment software.

Our first hypothesis was that the mouse will lead to faster target hitting compared to the joystick, as reported in [7]. The mouse offers a larger movement range compared to the analogue joystick. The mouse allows the user to move the pointer directly towards the target in one continuous motion which can be modelled using Fitts' law [16], while the joystick needs to be held in the desired direction until the aim has reached the target. The second hypothesis is that the mouse also will be associated with a higher success rate than the joystick as one may be more likely to overshoot the target while waiting to for the aim to reach the target.

2 Method

2.1 Experimental design

A between-subjects design was chosen for this study. The time to complete the task and number of shots fired was used as the two dependent variables and the input device was the independent variable. The between-subjects factor input device had two levels, namely joystick and mouse.

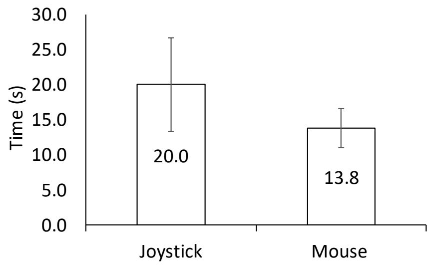


Fig. 2. Task completion times (seconds). Error bars show standard deviation.

2.2 Participants

A total of 22 participants were recruited for the experiment. The participants comprised 18 males and 4 females. The participants were all students at the authors institution and reported to be regular gamers.

2.3 Procedure

A simple first-person shooter was created using the Unity Game Engine (https://unity3d.com/) see Fig. 1. A standard Xbox360 controller was used for the experiments.

The participants were asked to hit 10 targets presented sequentially. The participants were not given any time constraints and could shoot as many times as they liked. The game finished once the participant had successfully hit 10 targets.

The participants were tested individually in a quiet meeting room with two of the authors present. The time from when the participant pressed start to when 10 targets had been successfully hit was measured as well as the total number of shots fired. Each test took less than one minute. Statistical analyses were conducted with JASP version 0.8.6.0.

3 Results

Figs. 2 and 3 show the results of the experiment. The mean completion time (in seconds) plotted in Fig. 2 was shorter for mouse (M = 13.8, SD = 2.8) than for joystick (M = 20.0, SD = 6.6) and a Welch t-test shows that this difference was significantly different ($t(13.356) = 2.873$, p = .006). A Welch test was used since a Levine test showed that the t-test assumptions of equal variances where not satisfied. A Shapiro-Wilk tests confirmed that the measurements were normally distributed.

The success rates plotted in Fig. 3 shows that the mouse is associated with slightly higher success rates (M = 0.95, SD = 0.10) than the joystick (M = 0.88, SD = 0.17). However, this difference is not statistically significant (U = 80.5, p = .083). A Mann-Whitney test was used as a Shapiro-Wilk test revealed that the measurements were not normally distributed.

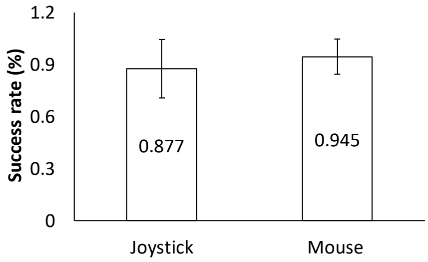


Fig. 3. Success rate. Error bars show standard deviation.

4 Discussion

The results support the first hypothesis that the mouse leads to faster target hitting, and the difference is quite large as the mouse only took 68.8% of the time of the joystick. Clearly, with the mouse the user can hit the target in one continuous motion, while with the joystick the user must hold the joystick in the desired direction until it hits the target. However, the second hypothesis is not supported, namely that the mouse leads to better accuracy. This may not necessarily translate to other game tasks such as steering a car in a driving game as experiments have shown no difference between joysticks and keyboards for such tasks [17].

5 Conclusion

The target hitting performance of regular mouse and a dedicated joystick game controller were compared for a simple first-person shooter. The results show that the mouse leads to faster target hitting taking 68.8% of the time of the joystick. This time difference can be critical in some games and the results are thus in favor of the mouse for games involving first person shooters compared to just joysticks. No differences were found in terms of success rate between the two methods.

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