# Exploring the differences in performance between gamers and non-gamers when completing everyday tasks viewed from a third-person perspective

Arvid Bräne

Department of Computing Science
Umeå University, Sweden
arvidbrane@gmail.com

**Abstract.** The abstract will include the following:
- What have I done?
- How did I do it?
- What was the result of the study?
- What to take out from this study.
- Results suggest ...

## 1 Introduction

There is a constantly ongoing debate of whether playing video games produce negative side-effects or not [1]. Some earlier findings indicate that committing "immoral" virtual behaviors in a video game can lead to increased moral sensitivity of the player [2]. Others studies point towards that playing video games do not have any effect on depression, hostility, or, visuospatial cognition [3]. There are even results in experiments that suggest the opposite; violent games reduce depression and hostile feelings in players through mood management [4].

On the contrary, some research hint that video games can result in *positive* side-effects such as improved cognitive control, emotional regulation, spatial resolution of vision, hand-eye motor coordination, and contrast sensitivity [5]. Other results point towards an improved probabilistic inference without loss of measurable accuracy [6].

Studies in literature have previously shown that most readers do not have any recognition about whether a book they have read was written in first- or third-person [7] due to humans capability of "translating" and adapting from one pronouns to another. Kohler's experiments with inverted vision goggles showed subjects walking and riding bicycles while seeing upside-down [8], pointing towards even greater capability of the human brains ability to adapt. This could suggest that users might be able to adapt to seeing themselves from third-person perspective.

This study aims to investigate if there is a measurable difference in performance, such as number of errors made and time consumption, between people

who have played games and people who have not when they are prompted to complete everyday-like tasks viewed from third-person perspective (see Fig 1). Similar studies have been conducted, such as [9] and [10], but certain aspects about performance differences in everyday tasks remain unaddressed. The study was completed using a custom-made rig in order to fully simulate the experience of a life viewed from a third-person perspective.

## 2 Material & Method

Studies prior to this one have been done on the differences between gamers and non-gamers, such as [9] and [5], but none using hardware to simulate the out-of-body, third-person view experienced in games (see Fig 1) in real life. Our method of choice was to construct a custom designed rig where subjects saw themselves, in real-time from a third-person perspective. In order to see the differences between gamers and non-gamers the test subjects had to complete the same three tasks, in three different configurations, three times in a row. After the subjects finished their participation, they were prompted to fill in a form regarding the experience and their prior experience with video games. The two groups, consisting of 13[1] subjects (undergraduate volunteers, high male skew[2]), were then benchmarked against each other to see which performed better. In the following subsections we will thoroughly demonstrate the different steps in our method and the tasks needed to later concretize credible results.

### 2.1 Task Design

In order to get the required measurements with high credibility the tasks performed by the test subjects were carefully planed, pilot-tested, prepared, executed and then evaluated. To get as general spread results as possible 3 different types of tasks had to be completed by each test subject.

**Accuracy Task** The test subjects rolled, threw or bounced (depending on their preference) a multi-colored volleyball in order to try and hit a target (a regular sized chair) placed approximately 5 meters away to successfully complete the task (see Fig 2). If the test subject missed the target they were told to try again until the finally hit the target. This test measured the participants precise accuracy and ball control through the number of tries required in order to hit the target.

[1] 14 subjects were originally in the study, but one male could not complete the whole experiment due to the his poor eyesight when not wearing his glasses. He was therefore excluded from the study after the first task and not included int the results.

[2] 12 male subjects and 2 female, in ages ranging from 23 to 28

**Fig. 1.** A typical third-person perspective in a game from the game *Grand Theft Auto: V*.


**Fig. 2.** A *side-view* of the course used during Accuracy Task where green is tape on the floor and blue is the chair.

**Balance Task** The test subjects walked, in their preferred speed, on a thin straight line made out of tape, measured at 10 meters long (see Fig 5), placed on the ground. This test measured the participants balance skills through the number of errors they made. These errors were objectively measured and recorded using one pre-defined rule; if any part of the shoe/foot covered the width of the tape (approximately 2 centimeters wide) it was considered to be a legal foot placement, everything else was illegal. An example of an illegal foot placement can be found in Fig 4 and a legal example can be found in Fig 3.

**Fig. 3.** Two examples of **legal** foot placements.

**Fig. 4.** Two examples of **illegal** foot placements.

**Movement Task** The test subjects walked, facing forward, in their normal walking speed, thorough a pre-planned course approximately 25 meters long and circa 2 meters wide (see Fig 6) without touching anything other than the floor. The course was constructed using 40 chairs, 5 tables, 1 large wooden box, 5 meter


**Fig. 5.** An approximate *top-view* of the curse used during the Balance Task where green is tape on the floor.

long wall and a tall pillar(see Fig 7). Participants started between two chairs on the right and finished when they stepped on the cross marked with tape on the floor. This test measured the participants movement and navigational skills through the required time in order to complete the task. Errors made, such as touching the chairs or tables, were also recorded.

**Fig. 6.** A *side-view* of the course used during the Movement Task.

**Configurations** Each task was performed *3 times* by each participant, in 3 different configurations resulting in a total of nine results for each participant. The different configurations were completed in the following order:

1. *Not* wearing the rig, video goggles *off*.
2. Wearing the rig, video goggles *on*, viewed from *first-person* camera.
3. Wearing the rig, video goggles *on*, viewed from *third-person* camera.

Completing the task 3 times was done to get an accurate estimate of each of the participants performance. Completing the task in 3 different configura-

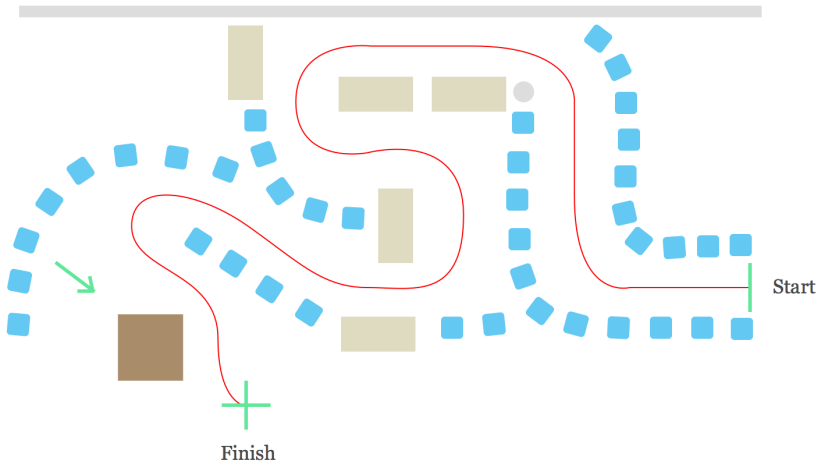


**Fig. 7.** A *top-view* of the course used during the Movement Task where red is the approximate distance where the participants walked, beige are tables, blue are chairs, green is tape on the floor, brown is the wooden box and gray is the wall and pillar.

tions was done to minimize the effects of individual differences amongst the test subjects.

The first configuration served as a baseline for how a participant performs when completing the task "normally". The second configuration was used to compare against the first configuration in order to understand how much the video goggles and the first-person camera affected the participants performance in completing the tasks. Comparing the third configuration and the second configuration was the main focus of this study which was why the third configuration was the most critical one.

### 2.2 Rig Design

In order to simulate a game-like, out-of-body experience and a third-person perspective (see Fig 1), without leaving the participants nauseated[3] the rig had to be as rigid as possible. The main parts in the rig were:

**Back & Camera Mount** A solid mounting foundation was constructed out of light weight and stiff materials such as carbon fiber, ABS and polymorph plastic. As a base for the whole construction a snowboard back protector was used in order to connect the carbon fiber rods to the subjects back.

[3] Early test showed that participants felt sea-sick due to unwanted camera movement created by an unstable test-rig.

Some 3D-printed parts where used to fasten the third-person camera to the subject.

**Third-Person Video Camera** The video camera used for the third-person view, constantly generating a live video stream, was mounted on a pole circa a meter approximately 45 degrees above/behind the participants head and tilted circa 30 degrees downwards in order to frame the video correctly. Since a large field-of-view, a compact- and lightweight design are the most important requirements for selecting the video camera a *GoPro Hero 3: Black Edition*[4] was chosen, weighing 163 grams and a field-of-view at 170 degrees. The camera was connected to the participants video goggles using a 3 meter long, 4 pole and a cable.

**Video Goggles & First-Person Video Camera** To cover the subjects eyes and view the live video stream a pair of specially designed video goggles were used. These goggles, a pair of *SkyZone SKY-01 V2*[5], have a field-of-view of approximately 30 degrees and a built in camera with a diagonal field-of-view at 120 degrees. This camera was used for the second configuration for each task (described in Section 2.1) to simulate first-person perspective.

The final result of the rigs design is somewhat inspired by [11] (but with more up-to-date hardware) and can be found in Fig 9 along with what the user saw[6] in Fig 8.

### 2.3 Survey Design

After each test subject finished his/hers participation in the experiment they were prompted to fill out a survey (the full form can be found in the Appendix in Section A.1) regarding the experience during the experiment and their prior experience with video games. The survey included the following seven questions:

1. Do you consider yourself a *gamer*?
2. What was the hardest parts in the experiment?
3. On average, how many hours per week do you spend playing video games?
4. How many years have you been playing video games?
5. In total, how many hours have you spent playing a game viewed from a third-person perspective?
6. If any, please name some of these third-person games you have played.
7. Did you find your participation in this experiment fun?

Each test subject also filled in details about their name, age and sex so the results from the test data could be paired up with the surveys. The details were later removed in the results in order to protect the test subjects anonymity.

[4] More info can be found at http://www.prisjakt.nu/produkt.php?e=1457108

[5] More info can be found at http://www.foxtechfpv.com/skyzone-fpv-gogglesmatte-blackpreorder-p-1218.html

[6] The top and bottom of the image is cut of due to the camera not being able to capture non-wide screen video. During the experiment the user was able to see approximately 30 centimeters behind his/hers feet.

**Fig. 8.** An approximate view of what the participant saw during the experiments.

## 3 Results

This section will cover the results from the tests that where done and;

- The results from the tests - No significant findings
- Performance in the third-person perspective was generally worse than in first-person perspective.
- No difference between men and women
- Diagrams comparing the results
- Results of earlier work
- Compare the performance between the different groups

### 3.1 Gamers versus Non-gamers

Results when comparing the two groups, gamers and non-gamers.

**Accuracy Task** This section will contain information about:

- Gamers slightly better when wearing goggles, worse when not wearing goggles. No significant results unfortunately. See 10
- Differences between the first configuration and the other two were both lower for gamers than for non-gamers. Same for the differences between the second and third configuration. Gamers slightly performed **better**.

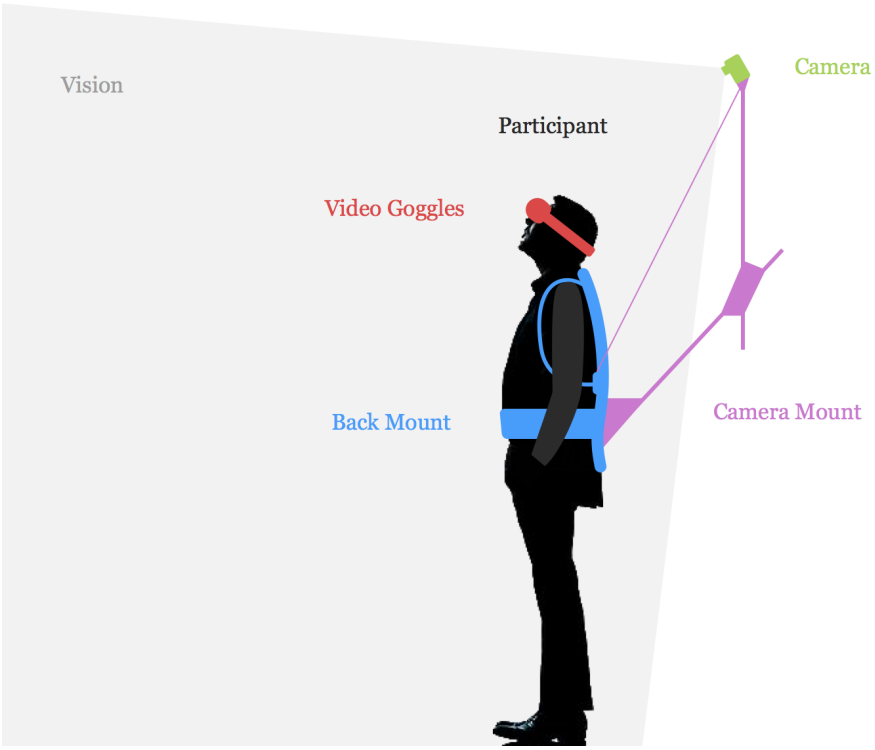


**Fig. 9.** A detailed overview of different parts of the rig.

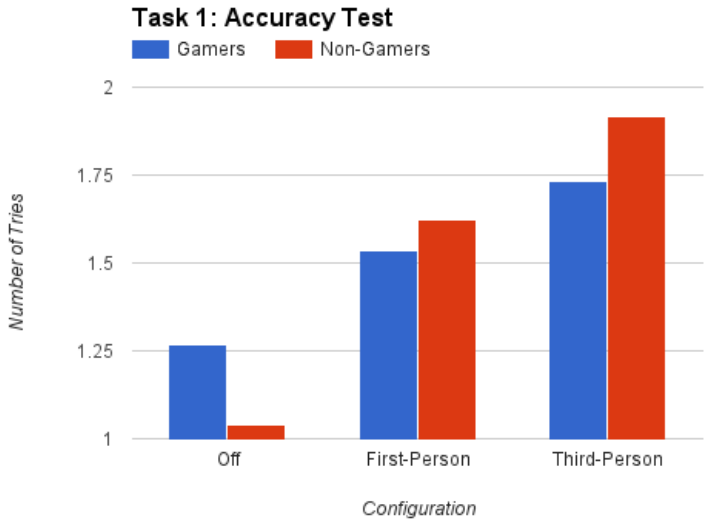


**Fig. 10.** Less is better

**Balance Task** This section will contain information about:

- Gamers performed a little bit worse but no significant difference in the two later configurations. See 11
- Differences between the number of errors made in the first-person perspective (configuration 2) and the third-person perspective were larger for gamers than for non-gamers. Gamers performed slightly **worse**.

**Movement Task** This section will contain information about:

- Gamers generally took longer time for all configurations. See 12
- Differences between the first configuration and the other two were both larger for gamers than for non-gamers. Same for the differences between the second and third configuration. Gamers slightly performed **worse**.

## 4 Discussion

A general discussion about the study such as:

- What part/conclusion in my study could be biast/not reliable
- What does my results mean?
- Earlier work, how do they compare to my work and what does that mean?
- References to earlier work such as [9]
- What defines a gamer? How many hours played etc.

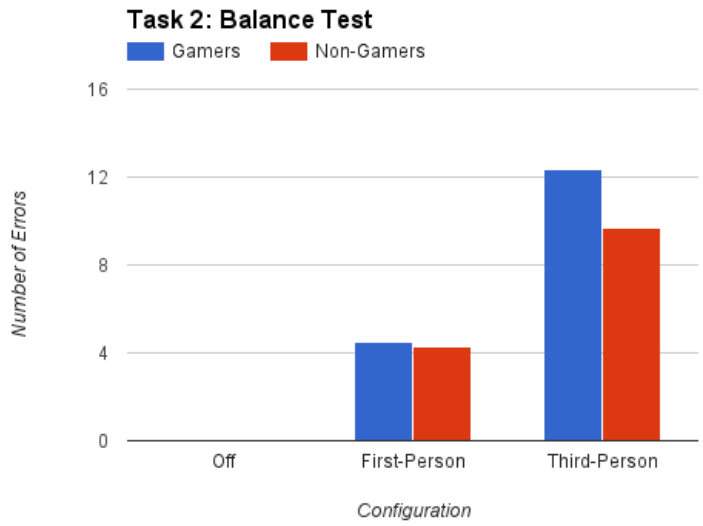


**Fig. 11.** Less is better

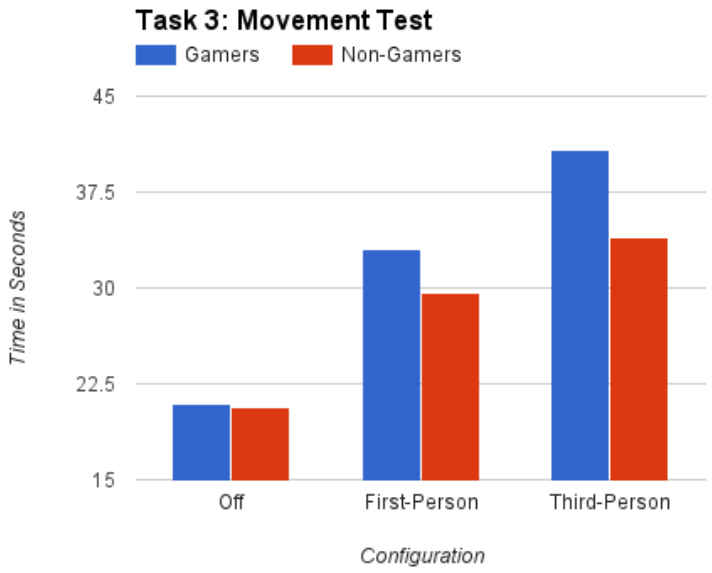


**Fig. 12.** Less is better

### 4.1 Limitations and Drawbacks

Due to the time and budget limit there are several ways to improve upon my study, ways of doing this might include:

- Building a more rigid rig.
- Using a more comprehensive camera mounted on a stabilized gimbal.
- Using more sophisticated video goggles, such as the Oculus Rift.
- Hard finding gamer women.

### 4.2 Conclusion

As a finish, and a complement to the abstract, the conclusion should contain:

- What to take out from the study
- How this study can be made more in-depth
- Future work

## 5 Acknowledgments

The authors would like to thank all participants in the study for their time, participation and feedback. We would also like to thank all the peer-reviewers (especially *Lars Englund* for his unquestionable loyalty and help during the experiments) who helped form this report into its final shape. Last but not least we would like to thank *Umeå University* for letting us use their facilities *Rotundan* (where we conducted our experiments) and *Robot Labbet* (where we built the rig) during the progress of the report.

## References

[1] Tear, M.J., Nielsen, M.: Video games and prosocial behavior: A study of the effects of non-violent, violent and ultra-violent gameplay. Computers in Human Behavior **41** (2014) 8–13

[2] Grizzard, M., Tamborini, R., Lewis, R.J., Wang, L., Prabhu, S.: Being bad in a video game can make us morally sensitive. Cyberpsychology, Behavior, and Social Networking **17**(8) (2014) 499–504

[3] Valadez, J.J., Ferguson, C.J.: Just a game after all: Violent video game exposure and time spent playing effects on hostile feelings, depression, and visuospatial cognition. Computers in Human Behavior **28**(2) (2012) 608–616

[4] Ferguson, C.J., Rueda, S.M.: The hitman study: Violent video game exposure effects on aggressive behavior, hostile feelings, and depression. European Psychologist (2015)

[5] Gong, D., He, H., Liu, D., Ma, W., Dong, L., Luo, C., Yao, D.: Enhanced functional connectivity and increased gray matter volume of insula related to action video game playing. Scientific reports **5** (2015)

[6] Green, C.S., Pouget, A., Bavelier, D.: Improved probabilistic inference as a general learning mechanism with action video games. Current Biology **20**(17) (2010) 1573–1579

[7] Hägg, G.: Nya författarskolan. Wahlström & Widstrand (2012)
[8] KOHLER, I.: Experiments with goggles. Scientific American **206** (May 1962) 62–72
[9] Schmierbach, M., Boyle, M.P., Xu, Q., McLeod, D.M.: Exploring third-person differences between gamers and nongamers. Journal of Communication **61**(2) (2011) 307–327
[10] Nakamura, R., Lago, L.L., Carneiro, A.B., Cunha, A.J., Ortega, F.J., Bernardes Jr, J.L., Tori, R.: 3pi experiment: immersion in third-person view. In: Proceedings of the 5th ACM SIGGRAPH Symposium on Video Games, ACM (2010) 43–48
[11] Salamin, P., Tadi, T., Blanke, O., Vexo, F., Thalmann, D.: Quantifying effects of exposure to the third and first-person perspectives in virtual-reality-based training. Learning Technologies, IEEE Transactions on **3**(3) (2010) 272–276

# A Appendix

All the files for this report, along with all the 3D-design-files can be found and downloaded on the GitHub page for this project: https://github.com/Kodagrux/Third-Person-Performance-Differences-Between-Gamers-and-Nongamers

## A.1 Survey

# Third-Person Tests

Thank you for participating in our study about *Exploring the differences in performance between gamers and non-gamers when completing everyday tasks viewed from a third person perspective*. Your information will be kept secret and anonymous once the scientific results are published, we collect them just so we can tell the different test subjects apart.

| **Name** | **Age** | **Sex** |
|---|---|---|
| _____ | _____ | ▢ Male ▢ Female |

## 1. Do you consider yourself a *"gamer"*?

*"Gamer" as in "Video gamer"*

▢ Yes ▢ No

## 2. What was the hardest part in the experiment?

*Circle as many as you like and/or add your own*

| | | |
|---|---|---|
| The tasks themselves | The third-person view | The first-person view |
| Unclear instructions | The resolution in the video goggles | Trusting in the rigs design |

**Other hard parts?**

_____

*Survey continues on the back!*

**3. On average, how many hours per week do you spend playing video games?**

*Circle the number closest to your answer*

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0,5 | 1 | 1,5 | 2 | 2,5 | 3 | 4 | 5 | 7 | 8 | 9 | 10+ |

**4. How many years have you been playing video games?**

*Circle the number closest to your answer*

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0,5 | 1 | 1,5 | 2 | 2,5 | 3 | 4 | 5 | 7 | 8 | 9 | 10+ |

**5. In total, how many hours have you spent playing a game viewed from a third-person perspective?**

*Circle the number closest to your answer*

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 3 | 5 | 10 | 15 | 20 | 25 | 30 | 40 | 50 | 60 | 80+ |

**6. If any, please name some of these third-person games you have played:**

*As many as you can think of*

_____

**7. Did you find your participation in this experiment fun?**

▢ Yes ▢ No

*Thank you, have a nice day! :)*