How People Search Video Game Environments for Enemies: Experts vs. Novices

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INTRODUCTION

What makes a professional gamer so good? What separates them from the novices that are only just beginning to play. We are setting out to find out. In this project, we tested to see the difference in eye movements and fixations between different levels of game players. Some players will be experts, while others will be just starting out. We expected to see that the experts eye movements be much quicker than the novices. Have you ever played a game with a person who has never played before? When they see an enemy, they focus solely on the one enemy and nothing else.

We predict that experts will not only see and notice the enemy faster, but move on more quickly to find other threats in the surroundings. With these findings, game designers can transform the way that they plan and implement games. Games can have smaller learning curves and people would be less likely to quit a game. If the gaming experience is more user friendly for novices as well as experts, gaming can be taken to a whole new level.

BACKGROUND

It is a general, common hypothesis that an expert's eye movements will be faster than a novice's. Many people have done research in experts versus novices, but never in the field of video games. Technology and gaming is an ever growing industry and it is important to find out what about a game makes a person stay to play.

Bobby Turnaisky wrote a paper on what makes an expert into an expert and what makes a novice into a novice. His analysis stated that novices memorize certain situations and how they should respond to them. This makes novices unable to adapt to new changing situations. Experts on the other hand realize that every situation is different and needs to be evaluated each time. This concept can be applied especially to video games. In video games, the situation is never the same when you play online with people from all over the world. Each user will act differently and have different reactions. Experts will know this and be ready for a new reaction where novices respond to the situation the only way they know how. Turnaisky's paper was only an analysis and general hypothesis of the reasoning why, but our experiment can provide actual tangible data to support that hypothesis.

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Figure 1. Example of a stimulus with a radar map included

APPARATUS

Gaze was recorded by a Gazepoint GP3 remote eye-tracker. The device is a pupil-corneal reflection video-based eye-tracker that records at 60 hertz and is accurate to about 1 degree as per the manufacturer specification. The monitor used is a 22 inch monitor, with resolution size of 1680 by 1050 pixels. The subjects viewed the monitor from 25.59 inches away. A standard American English QWERTY keyboard was used.

STIMULUS

Six screenshots from the Call of Duty: Modern Warfare 2 video game were the stimuli used. The resolution for each stimulus was scaled down to 1280 by 720 pixels if the original resolution was greater. This was done in order to minimize differences in graphical quality as well as to maintain a consistent size between stimuli. However, each stimulus was set to appear as large as possible during the experiment, to allow the subjects the most visibility of elements within the stimulus. Each picture had a range of enemies in them, some being obvious while others were more hidden. Three of the six screenshots contained a radar map in the corner showing where all of the enemies were. The subjects were tasked to look through the images and find all the enemies while we tracked their eye movements.

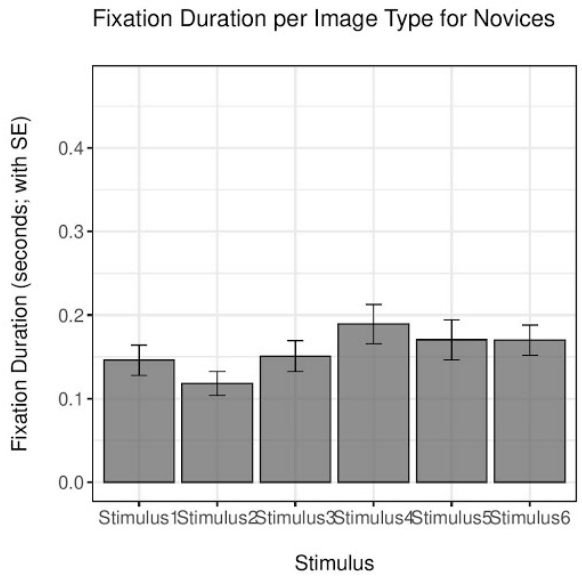

Figure 2. Average number of fixations of the novices per stimulus

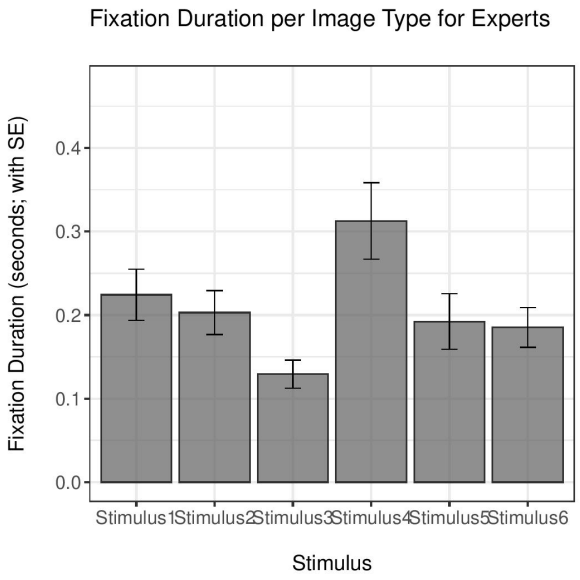

Figure 3. Average number of fixations of the experts per stimulus

SUBJECTS

There were 13 total number of participants in this study. The participants were divided into two categories. The participants were Clemson University students pulled by the school of computing. They were all volunteers who classified themselves as either expert or novice. They were classified into two categories, those who were comfortable with first-person shooters, and those who were not. The specifications were decided by the subjects themselves.

Each subject was given a scale of one to ten on how comfortable with first-person shooters they were. Subjects that chose one through five were considered a novice, while subjects who chose six through ten were considered an expert. Participants were required to have normal or corrected to normal vision to participate in the experiment.

EXPERIMENTAL DESIGN

The experiment is a two by two mixed experimental design. Each subject was categorized as either an expert or a novice based on their own perception about their proficiency with first-person shooters. Each subject viewed six stimuli and reported the number of enemies that they counted per stimulus. Each stimulus is in one of two categories, with a map, and without a map. The results of the experts were compared to the results of the novices. We measured how many stimuli each subject counted correctly, and the length of fixations on each character. We also measured the number of fixations on the map provided if the stimulus contained one. We expect that the experts will have shorter fixations and more correct answers in providing feedback. We also expect that the experts will have more fixations on the map if the stimulus provided one.

PROCEDURE

The subjects were prompted to sit down, keep their hands away from the keyboard unless instructed, and to follow the on-screen instructions. The experimenter asked the subject to calibrate the eye-tracker using a five-point calibration. The computer showed a screen of instructions telling the subject to quietly count how many enemies were in the picture that was displayed. The instructions told the user to press the space-bar whenever they are ready to continue after telling the experimenter the number of enemies counted. The subject was then shown the first picture for 10 seconds. We choose 10 seconds so that each subject had the same amount of time to search for enemies.

In this time, the subject scanned for enemies. Once the time was up, the subjects were shown a screen with instructions to tell the experimenters how many enemies they found. The instructions told the subject to continue to look at the screen as to not have to re-calibrate the eye tracker. Once the user presented how many enemies they found, they were prompted onto the next picture. Once the experiment was over, the subject was given a questionnaire. In this questionnaire, the subject was asked to identify their skills with first-person shooters on a scale of one to ten. With these numbers, we classified each user as an expert or a novice. An analysis on the number of fixations and time spent per each fixation was run on the two groups.

RESULTS

The results that we got did not align with our predictions. We predicted that the novices would have longer fixations, but to the contrary, the experts had notably longer fixations. You can see that the experts had longer fixation durations in every stimulus except for stimulus three in tables A and B. Stimulus two, three, and five had the maps while the others did not. The experts did not utilize the maps while the novices did. The

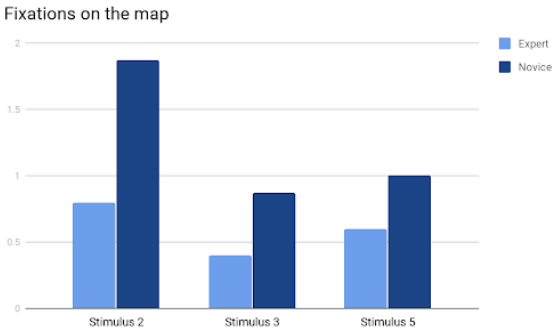

Figure 4. The average number of fixations on the radar map

experts got 63% of the stimuli correct total while the novices got 60% correct. Though the experts scored higher, it was not a significant amount. The experts counted 53% correct on the maps with the radars and 73% correct on the maps without. The novices got 54% correct on the maps with a radar while they got 67% right on the maps without.

CONCLUSION

The results countered our hypothesis in every way. The experts had longer fixations and moved more slowly than the novices. The experts also looked at the map far less than the novices. This could be due to the fact that the experts already have a schema made for the game-play. Experts who have played first-person shooters before may not look at the map during game play, so their instinct is to not look at it. Novices, on the other hand, have no existing schemas made for game play. They're looking at things for the first time, and don't know where things reside. They are discovering a whole new picture, looking at each aspect individually, versus the experts who are looking at things as a whole picture that they have seen before. Experts had longer fixations than novices did. This could be due to the fact that experts are more prone to second guessing themselves. Most gaming experts pride themselves on their expertise at games; they want to do the best that they can. This causes them to second guess and fixate longer to be sure that they have counted the correct enemy. Novices understand that they are not going to perform at a 100% rate, so they accept that they could be wrong and move on anyways.

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